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Application Number: 16246940

Document Date: 01/14/2019

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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:



Practitioners associated with Customer Number:

23,446

OR

Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number

Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:



The address associated with Customer Number:

23,446

OR

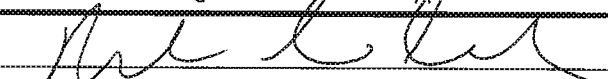
☐	Firm or Individual Name			
	Address			
	City		State	Zip
	Country			
	Telephone	Email		

Assignee Name and Address: Metrom Rail, LLC
244 Telser Road
Lake Zurich, IL 60047

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be Filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date	5-9-14
Name	Richard C. Carlson	Telephone	847-719-7747
Title	Chief Operating Officer, Metrom Rail, LLC		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

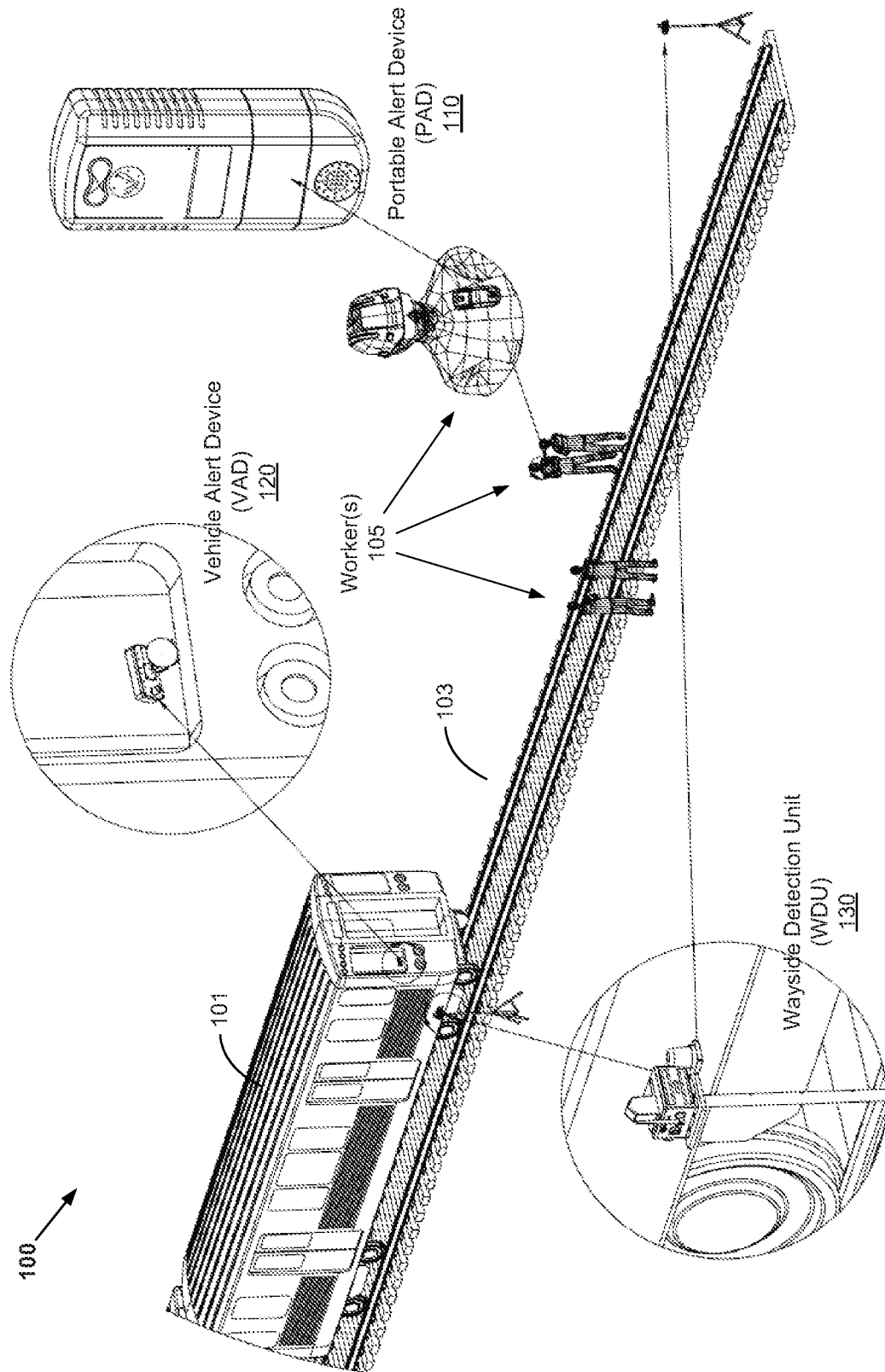
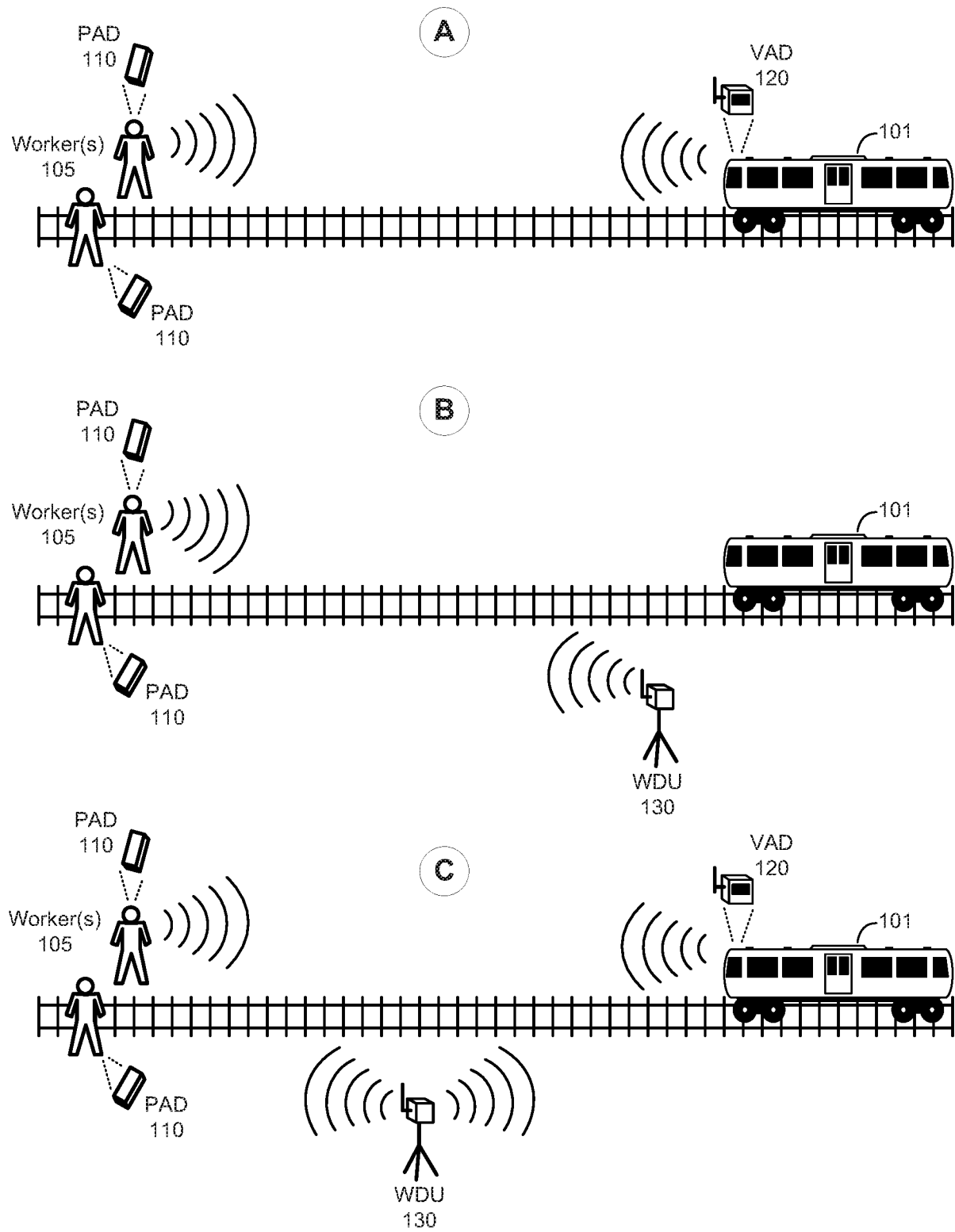


FIG. 1A

**FIG. 1B**

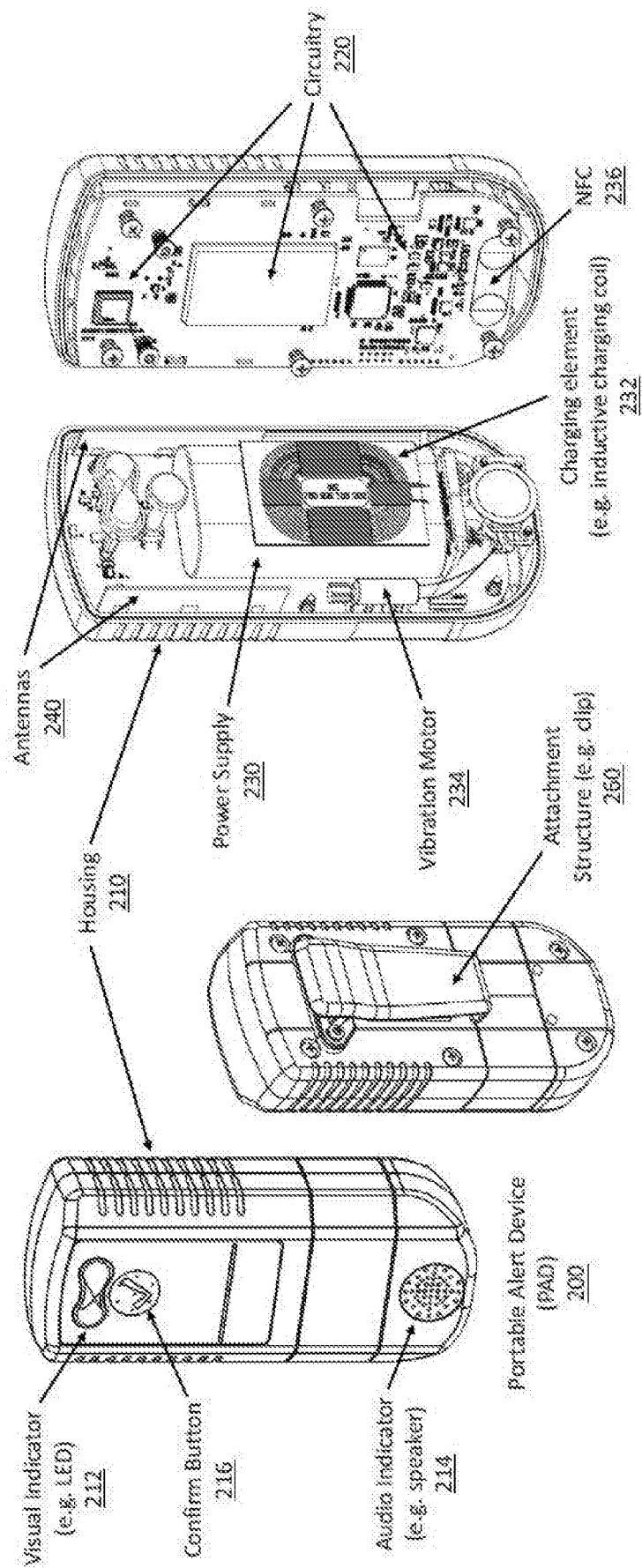
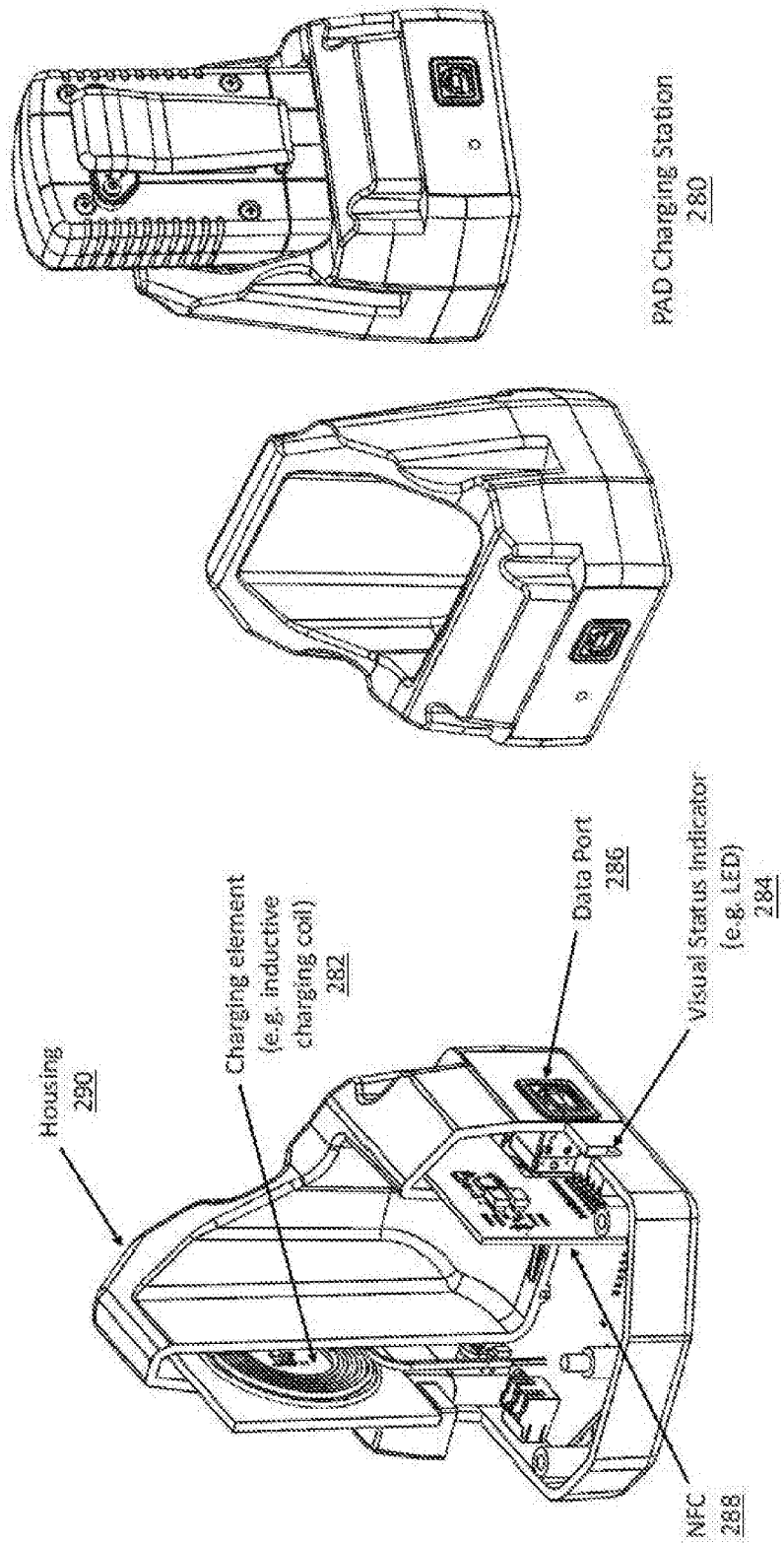


FIG. 2A



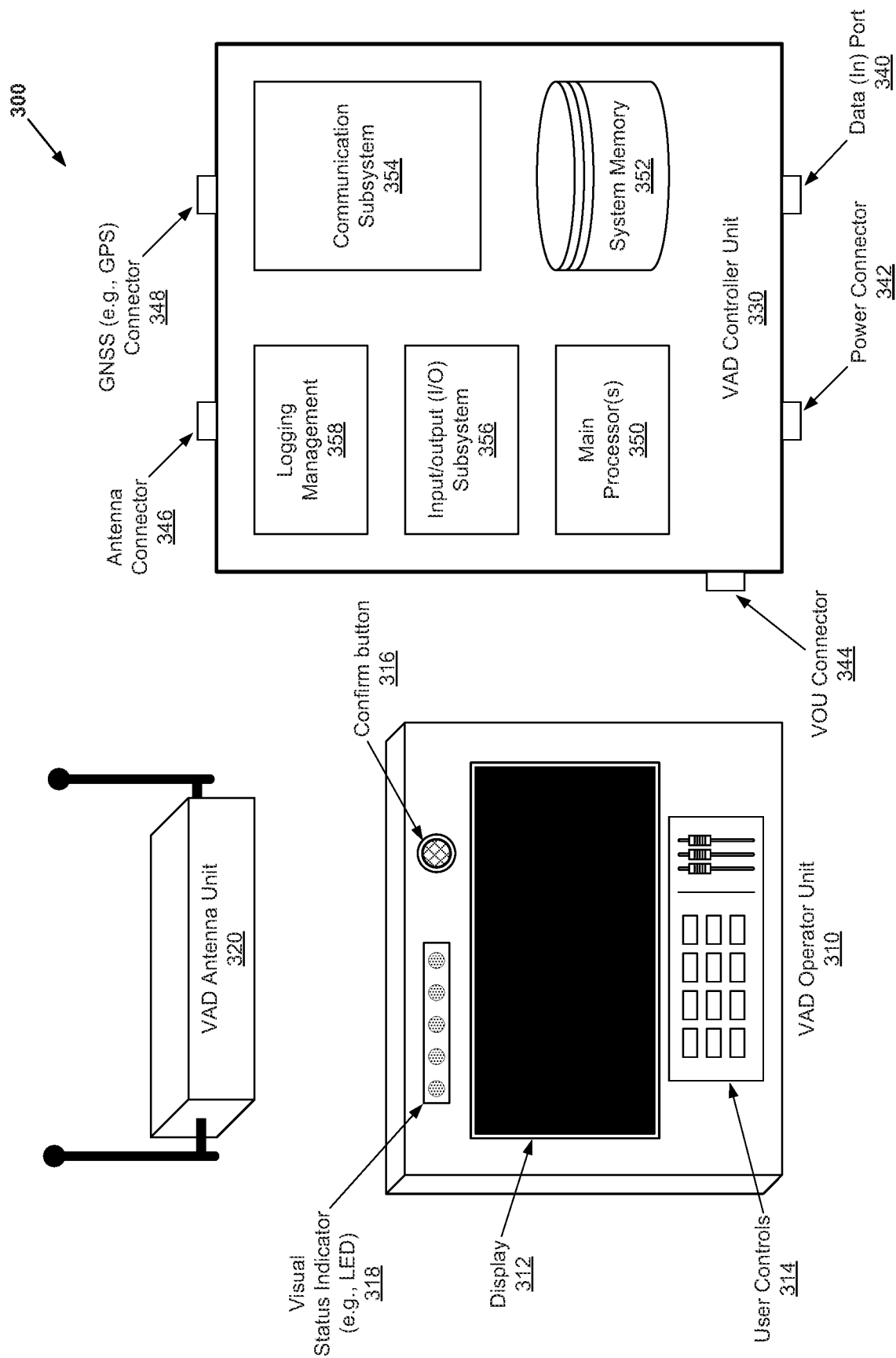
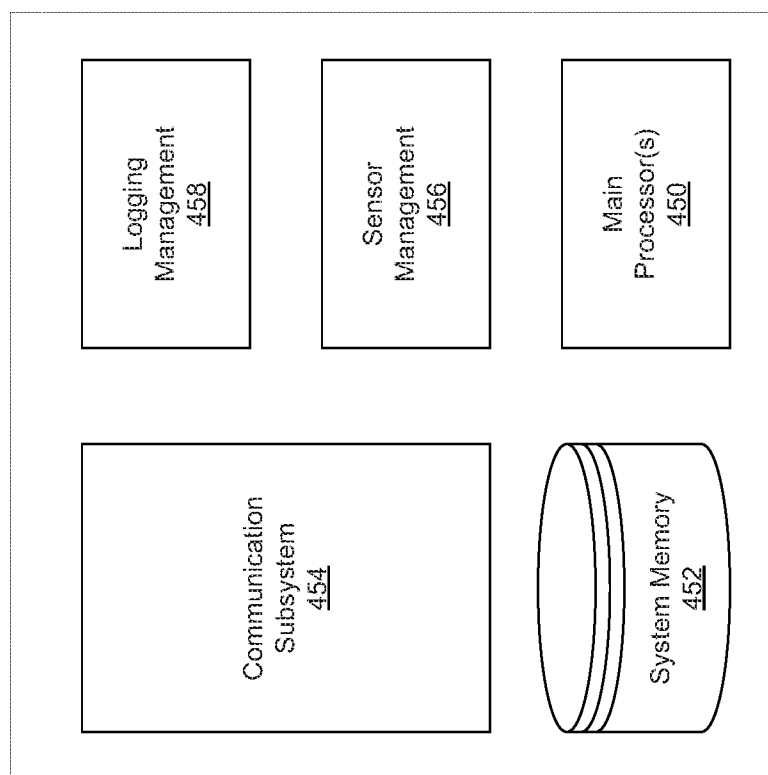
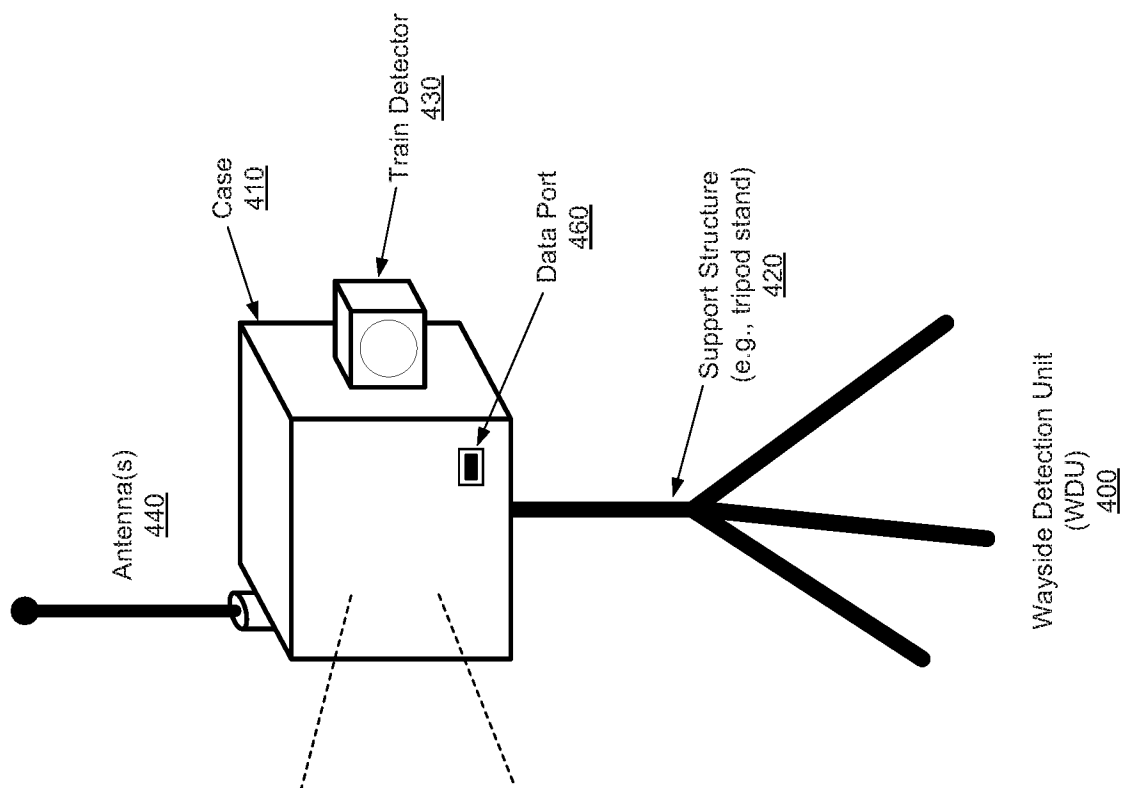


FIG. 3

**FIG. 4**

Electronic Acknowledgement Receipt

EFS ID:	34844282
Application Number:	16246940
International Application Number:	
Confirmation Number:	8489
Title of Invention:	WORKER PROTECTION SYSTEM
First Named Inventor/Applicant Name:	Richard Carlson
Customer Number:	23446
Filer:	Rami Naim Moussa/Elaine Maxson
Filer Authorized By:	Rami Naim Moussa
Attorney Docket Number:	29153US03
Receipt Date:	14-JAN-2019
Filing Date:	
Time Stamp:	15:21:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	29153US03_ADS.pdf	1226529	no	10
			88ecc09a2225d43fa1814edf43bad495be65dccb		

Warnings:

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Information:					
2		29153US03_Application.pdf	153010	yes	33
			8eebdb96c4d6904070799205125cf173ea18c01c		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	28	
	Claims		29	32	
	Abstract		33	33	
Warnings:					
Information:					
3	Oath or Declaration filed	29153US03_Executed_DECL_JP lutt.PDF	1291769	no	1
			e55daf7cd4a5076d6be5f455f602fe17c7bd5972		
Warnings:					
Information:					
4	Oath or Declaration filed	29153US03_Executed_DECL_S Woitel.PDF	1225944	no	1
			57123bb73c7c062eb10ce16ef74efc30ebdb6691		
Warnings:					
Information:					
5	Oath or Declaration filed	29153US03_Executed_DECL_R Carlson.pdf	126075	no	1
			122adaae2bb3bc166e252b55197e7e1504fc6eb0		
Warnings:					
Information:					
6	Oath or Declaration filed	29153US03_Executed_DECL_P Strezev.PDF	118798	no	1
			43c8fc40430d79fc5cc31ce2953cca77abb27c76		
Warnings:					
Information:					
7	Oath or Declaration filed	29153US03_Executed_DECL_M Cygnus.PDF	1239531	no	1
			a37f879188fa6d3ee86a6122da4dbcd7d61a3eb2		

Warnings:					
Information:					
8	Oath or Declaration filed	29153US03_Executed_DECL_K Gunther.PDF	1233309 b12edbb9aae561130cc99023588b5295db 25852b	no	1
Warnings:					
Information:					
9	Power of Attorney	POA_General_Assignee_AIA-80 .pdf	166113 c30d3f7d15b56b302dd71bab0e7565e129 aa0fb3	no	1
Warnings:					
Information:					
10	Drawings-only black and white line drawings	29153US03_Figures.pdf	686953 87da702acf18306daa03a28c7f2d2d130d13 9d4d	no	6
Warnings:					
Information:					
Total Files Size (in bytes):			7468031		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	29153US03
		Application Number	
Title of Invention	WORKER PROTECTION SYSTEM		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor	1				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Richard		Carlson		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Woodstock	State/Province	IL	Country of Residence	US

Mailing Address of Inventor:

Address 1	8210 Sudburg Ct.				
Address 2					
City	Woodstock	State/Province	IL		
Postal Code	60098	Country	US		

Inventor	2				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Kurt		Gunther		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Leland	State/Province	IL	Country of Residence	US

Mailing Address of Inventor:

Address 1	230 North Locust St.				
Address 2					
City	Leland	State/Province	IL		
Postal Code	60531	Country	US		

Inventor	3				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Sara	Jo	Woitel		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	29153US03
		Application Number	
Title of Invention	WORKER PROTECTION SYSTEM		

City	Lake Zurich	State/Province	IL	Country of Residence	US
------	-------------	----------------	----	----------------------	----

Mailing Address of Inventor:

Address 1	601 Courtland Drive				
Address 2					
City	Lake Zurich	State/Province	IL		
Postal Code	60047	Country	US		
Inventor	4				Remove
Legal Name					

Prefix	Given Name	Middle Name	Family Name	Suffix	
	Marc	Wayne	Cygnus		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Mundelein	State/Province	IL	Country of Residence	US

Mailing Address of Inventor:

Address 1	214 N. Lakeshore Dr.				
Address 2					
City	Mundelein	State/Province	IL		
Postal Code	60060	Country	US		
Inventor	5				Remove
Legal Name					

Prefix	Given Name	Middle Name	Family Name	Suffix	
	Peter		Strezev		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Apollo Beach	State/Province	FL	Country of Residence	US

Mailing Address of Inventor:

Address 1	6508 Clair Nest Ct.				
Address 2					
City	Apollo Beach	State/Province	FL		
Postal Code	33572	Country	US		
Inventor	6				Remove
Legal Name					

Prefix	Given Name	Middle Name	Family Name	Suffix	
	John	Albert	Plutt, Jr.		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Chicago	State/Province	IL	Country of Residence	US

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number		29153US03	
		Application Number			
Title of Invention	WORKER PROTECTION SYSTEM				
Mailing Address of Inventor:					
Address 1		1238 West Henderson St.			
Address 2					
City	Chicago	State/Province		IL	
Postal Code	60657	Country i		US	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence Information of this application.			
Customer Number	23446		
Email Address	mhmpto@mcandrews-ip.com	Add Email	Remove Email

Application Information:

Title of the Invention	WORKER PROTECTION SYSTEM		
Attorney Docket Number	29153US03	Small Entity Status Claimed ☒	
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	6	Suggested Figure for Publication (if any)	1

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐ Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	29153US03
		Application Number	
Title of Invention	WORKER PROTECTION SYSTEM		

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	23446		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	15078427	2016-03-23
Prior Application Status	Expired	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
15078427	Claims benefit of provisional	62177683	2015-03-23
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	29153US03
		Application Number	
Title of Invention	WORKER PROTECTION SYSTEM		

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	29153US03
	Application Number	
Title of Invention	WORKER PROTECTION SYSTEM	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	29153US03
		Application Number	
Title of Invention	WORKER PROTECTION SYSTEM		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant	1	Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section. Clear		
☒ Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:		
Name of the Deceased or Legally Incapacitated Inventor:		
If the Applicant is an Organization check here. ☒		
Organization Name	Metrom Rail, LLC	
Mailing Address Information For Applicant:		
Address 1	1125 Mitchell Court	
Address 2		
City	Crystal Lake	State/Province IL
Country	US	Postal Code 60014
Phone Number		Fax Number
Email Address		
Additional Applicant Data may be generated within this form by selecting the Add button. Add		

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	29153US03
		Application Number	
Title of Invention	WORKER PROTECTION SYSTEM		

Assignee	1			
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
Remove				
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country ⁱ		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add				

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Rami N. Moussa/		Date (YYYY-MM-DD)	2019-01-14
First Name	Rami N.	Last Name	Moussa	Registration Number
				69528
Additional Signature may be generated within this form by selecting the Add button. Add				

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	29153US03
		Application Number	
Title of Invention	WORKER PROTECTION SYSTEM		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

- 1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
- 2 A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
- 3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
- 4 A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
- 5 A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
- 6 A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
- 7 A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
- 8 A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
- 9 A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

WORKER PROTECTION SYSTEM

CLAIM OF PRIORITY

[0001] This patent application is a continuation of United States Provisional Patent Application Serial No. 15/078,427, filed on March 23, 2016, which makes reference to, claims priority to and claims benefit from United States Provisional Patent Application Serial No. 62/177,683, filed on March 23, 2015. The above identified application is hereby incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] Aspects of the present disclosure relate to safety solutions particularly in conjunction with railway systems. More specifically, various implementations of the present disclosure relate to methods and systems for worker protection.

BACKGROUND

[0003] Various issues may exist with conventional approaches for worker protection in conjunction with railway systems. In this regard, conventional systems and methods, if any existed, for worker protection in conjunction dangers posed by work on or near tracks, can be costly, inefficient, and/or ineffective. Further limitations and disadvantages of conventional and traditional approaches will become apparent to one of skill in the art, through comparison of such systems with some aspects of the present disclosure as set forth in the remainder of the present application with reference to the drawings.

BRIEF SUMMARY

[0004] System and methods are provided for enhanced worker protection, substantially as shown in and/or described in connection with at least one of the figures, as set forth more completely in the claims.

[0005] These and other advantages, aspects and novel features of the present disclosure, as well as details of an illustrated embodiment thereof, will be more fully understood from the following description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1A illustrates an example work protection system, in accordance with the present disclosure.

[0007] FIG. 1B illustrates example use scenarios of a work protection system, in accordance with the present disclosure.

[0008] FIG. 2A illustrates an example portable alert device (PAD), in accordance with the present disclosure.

[0009] FIG. 2B illustrates an example charging station for use in conjunction with portable alert devices (PADs), in accordance with the present disclosure.

[0010] FIG. 3 illustrates an example vehicle alert device (VAD), in accordance with the present disclosure.

[0011] FIG. 4 illustrates an example wayside detection unit (WDU), in accordance with the present disclosure.

DETAILED DESCRIPTION OF THE INVENTION

[0012] As utilized herein the terms “circuits” and “circuitry” refer to physical electronic components (e.g., hardware) and any software and/or firmware (“code”) which may configure the hardware, be executed by the hardware, and or otherwise be associated with the hardware. As used herein, for example, a particular processor and memory may comprise a first “circuit” when executing a first one or more lines of code and may comprise a second “circuit” when executing a second one or more lines of code. As utilized herein, “and/or” means any one or more of the items in the list joined by “and/or”. As an example, “x and/or y” means any element of the three-element set {(x), (y), (x, y)}. In other words, “x and/or y” means “one or both of x and y.” As another example, “x, y, and/or z” means any element of the seven-element set {(x), (y), (z), (x, y), (x, z), (y, z), (x, y, z)}. In other words, “x, y and/or z” means “one or more of x, y, and z.” As utilized herein, the term “exemplary” means serving as a non-limiting example, instance, or illustration. As utilized herein, the terms “for example” and “e.g.” set off lists of one or more non-limiting examples, instances, or illustrations. As utilized herein, circuitry is “operable” to perform a function whenever the circuitry comprises the necessary hardware and code (if any is necessary) to perform the function, regardless of whether performance of the function is disabled or not enabled (e.g., by a user-configurable setting, factory trim, etc.).

[0013] FIG. 1A illustrates an example work protection system, in accordance with the present disclosure. Shown in FIG. 1A is a worker protection system 100, which may be used in providing and/or enhancing workers safety, particularly with regard to dangers posed by trains in railway work environments.

[0014] The worker protection system 100 is a proximity warning system operable to issue alerts (e.g., to railroad worker(s) 105) when a particular vehicle (e.g., a train 101) is approaching. In this regard, the worker protection system 100 comprises one or more devices or components, each comprising suitable hardware (including, e.g.,

circuitry), software, or any combination thereof configured for supporting worker protection related operations or functions.

[0015] For example, the worker protection system 100, as shown in FIG. 1A, comprises one or more wearable devices, referred to as portable alert devices (PADs) 110, which are worn by worker(s) 105. The PADs 110 communicate with one or more companion devices, which are configured to directly trigger (and transmit to the PADs 110) alerts, or transmit signals causing issuing of alerts by the PADs 110. The companion devices comprise vehicle-mounted companion devices, referred to as vehicle alert devices (VADs) 120, mounted on vehicles (e.g., the train 101) that may pose danger to the workers, and/or stand-alone devices that are placed in “wayside” manner—that along or near path of the approaching object (e.g., track 103 traversed by the train 101), referred to wayside detection units (WDUs) 130, which are portable devices placed by the workers 105 at the work site. The VAD 120 is configured to trigger alerts under particular conditions—e.g., when it detects it is approaching a crew equipped with the corresponding wearable devices (PADs 110). The VAD 120 may also be configured to alert the vehicle operator—that workers are in proximity, and may provide additional information in this regard (e.g., display the number of detected workers, indicate distance to workers, indicate whether workers have confirmed the alarm, etc.). Similarly, the WDU 130 is configured to trigger alerts under particular conditions, such as when it detects the approaching vehicle (the train 101). In this regard, the WDU 130 may be used when no VADs 120 are being used, or even when VADs 120 are utilized, such as to provide redundant warning capabilities with additional range.

[0016] The PAD 110 may be designed and configured as small and light device, with low profile so as not to impede normal working activities of the worker(s) 105 wearing it. For example, the PAD 110 may be worn by either a clip, arm band or belt clip. The PAD 110 is operable to issue an indication (e.g., audio, visual, tactile, etc.) to alert the worker wearing it of an approaching object (that pose a safety concern). For

example, the PAD 110 may comprise audio warning component (e.g., a speaker), a visual warning component (e.g., a multi-color LED indicator), tactile indicator component (e.g., vibration), etc. Further, the PAD 110 may be operable to enable the user to provide feedback in response to issued alarm indication. For example, the PAD 110 may comprise an alert acknowledgement element, such as a confirmation button to silence alarms (i.e., a “mute” or “confirm” switch). To improve and optimize wearability of the PAD 110, its housing may be designed to include various features to support multiple mounting locations and/or approaches (e.g., clipped on the user’s clothing/equipment, around the user’s wrist, etc.). The PAD 110 may be configurable to provide alerts adaptively based on particular pre-set conditions—e.g., to provide at least a 15 second warning in line of sight conditions, when a train is approaching at 60 mph.

[0017] The VAD 120 may be configured either as a portable device (e.g., brought into and that may be mounted to vehicles only when needed), or as permanently mounted or integrated component (of vehicles). Implementing the VAD 120, which typically is the most costly component of the system, as a detachable device may be desirable as it allows use of small number of the VADs 120, being only moved into and used on vehicles being operated, thus reducing the deployment cost significantly. The VAD 120 may be operable to broadcast signals that are specifically configured to interfaces with the wearable devices (PADs 110) and may also interface with the wayside unit (WDU 130) to provide increased distance. Further, in some instances the VAD 120 may be operable to, when worker(s) is/are detected, provide indication to the operator(s) of the vehicle, such as by displaying and/or sounding warnings. In some instances, the VAD 120 may provide detailed information (rather than generic warning), such as indicating the quantity of workers detected, and the approximate distance to the workers.

[0018] While the VAD 120 is illustrated in FIGs 1A and 1B as a singular physical component, incorporating all components (including antennas), the disclosure is not so limited, and in some instances VADS may be implemented to support distributed

arrangements—e.g., comprising a plurality of physical units, which may be placed at different locations or positions within the vehicles. For example, VADs may comprise a first physical unit comprising the antennas (and related circuitry or other support components), and one or more other physical units housing the remaining components of the VADs. In this regard, the physical antenna unit may be configured for optimal placement (e.g., on roof of front car in train) which may be deemed optimal based on one or more placement criteria (e.g., optimal broadcast characteristics, maximum safety to operators and other individuals on train, such as passengers, etc.).

[0019] The WDU 130 is configured to operate as stand-alone device, placed on or near the path of the object(s) being detected. For example, the WDU 130 may be attached to placement component (e.g., a tripod), and is temporarily placed near the track 103. The placement of the WDU 130 may be subject to particular criteria—e.g., no closer than certain distance (for example, four feet) to the nearest rail, at or in advance of each end of a work zone. The WDU 130 broadcasts a signal when a train or vehicle passes. The WDU 130 may have dual functionality as it may interface with the VAD while also broadcasting signals to PADs. The WDU 130 may be utilized in areas where trains or other vehicles may not have vehicle mounted companion devices (e.g., VADs 120). Nonetheless, the disclosure is not so limited, and in some instances all three types of devices may work together, as described below.

[0020] In certain implementations, worker protection systems in accordance with the present disclosure, such as the worker protection system 100, may incorporate various solutions for providing worker alerts (particularly, e.g., for railway work environments) in enhanced and adaptive manner. For example, worker protection system 100 may be configured to trigger alerts based on speed, at least in part, rather than simply based on distance between workers and approaching trains. In this regard, the worker protection system 100 may be configured to utilize the approach speed to appropriately time to the alert so that the alerts are not triggered too late, but also are not triggered too early causing the workers 105 to start ignoring and suppressing alerts

(e.g., on very slow moving or stationary vehicles), until the vehicle is actually a potential threat. Thus, the distance at which the alerts are triggered may be based on the speed of the vehicles. For example, for trains approaching at speeds under 4 mph, no alerts are triggered until the train is within 100 feet, whereas for a train approaching at 30 mph the alerts are triggered when the train is with 1000 feet. In this regard, the conditions at which the alerts are triggered (e.g., speed, distances, or combinations thereof) may be configurable.

[0021] Various aspects of the alert related operations (triggering criteria) and/or associated functions (e.g., logging) may be location-dependent. As such, worker protection systems in accordance with the present disclose (e.g., the worker protection system 100) may support use of positioning solutions (e.g., Global Navigation Satellite System (GNSS) technologies, such as GPS, GLONASS, Galileo, etc.), to enable obtaining location/positioning information that may be used in alert related operations or functions. This may be done by incorporating into the various devices (e.g., the PADs 110, the VADs 120, and the WDUUs 130) dedicated GNSS resources (e.g., receivers, antennas, etc.) and/or by configuring them to use existing GNSS resources where possible (e.g., use of existing positioning application in the train 101 by the VAD 120).

[0022] The alerts may be triggered only when a preset (programmed) alert trigger threshold is satisfied (e.g., vehicle's speed exceeding particular limit, distance to workers falling below particular value, etc.). In certain implementation, multiple threshold types may be used. For example, in one example implementation, three alert threshold types may be used: time-to-arrival (TTA), distance-from-train (DFT), and low-speed close proximity distance alert (CPD). These different types of thresholds may be applicable at different conditions. For example, at low speeds, below a configurable speed threshold, the workers will not get TTA or DFT alerts; rather, the alert triggering is held off until the train/vehicle comes within a programmed short distance. This may avoid triggering DFT alert prematurely (time-wise), when it still might be a long time (e.g., minutes) until the train arrives due to its low speed.

[0023] In certain implementations, worker protection systems in accordance with the present disclosure, such as the worker protection system 100, may support location-specific rule customization. For example, an operator (e.g., a transit agency) may desire modified alerting rules at particular areas/locations (e.g., due to unique geography, or greater difficulty in seeking safe shelter, etc.). Thus, alert devices that are intended for use in such areas/locations may be reconfigured dynamically. This may be done by use of (re-)customization stations at entry points to those areas/locations, to reconfigure the alert devices dynamically. This may be done using near field communication rule modification. The alert units may be placed in proximity to the customization stations briefly, and the rules are then updated. Further, indications (e.g., visual, audible, etc.) of successful (or failed) rule changes may be provided. In some instances, the special/customized rules may be configured to expire, such as after a certain period of time, after next power down or charging cycle, etc.

[0024] In certain implementations, worker protection systems in accordance with the present disclosure, such as the worker protection system 100, may be configured to provide alerts for both the vehicle operator as well as all workers. The worker protection system 100 may be configurable based on user preferences and/or parameters. For example, the worker protection system 100 may be configured to operate (trigger alerts) within operator-configurable combinations of distances, speeds, location, etc. Further, the PADs 110 may be customized to operate according to individual organizations' rules and regulations.

[0025] In certain implementations, worker protection systems in accordance with the present disclosure, such as the worker protection system 100, may be operable to allow assignment and/or unique identification of vehicle-mounted units (i.e., VADs 120), such that the wearable units (PADs 110), as well as the wayside units (WDUs 130) would only respond to alerts corresponding to particular tracks. In other words, each VAD 120 would be identified uniquely, and assigned to a particular track, to enable only PADs 110 and/or WDUs 130 used by workers on that particular track to respond to

alerts triggered by that VAD 120, while ignoring other VADs 120 (thus avoiding false alerts).

[0026] In certain implementations, worker protection systems in accordance with the present disclosure, such as the worker protection system 100, may be configured to provide optimized power performance (e.g., power supply, power consumption, etc.). In this regard, the power supply may be adaptively selected and/or configured for each of different devices in the worker protection system 100, based on the type and/or working conditions for the device. For example, the PAD 110 may be powered using integrated power supply (e.g., batteries or similar power sources). In this regard, rechargeable batteries may be used, allowing the recharging of the device when not in use (e.g., being inserted or docked into charging stations at the end of each day to be charged for work the following day. The VAD 120 may be powered by the vehicle to which it is mounted or integrated. The WDU 130 may be powered using integrated power supply (e.g., batteries or similar power sources), which may be rechargeable.

[0027] Further, certain solutions may be incorporated and/or used to enhance overall power consumption. For example, the PAD 110 may be configured to support one or more power-saving modes (e.g., modes with the PAD 110, or at least some of the components thereof, transitioning to low functionality states, or completely shutting down). The PAD 110 may be operable to facilitate transitioning back to full functionality (or powering up) when necessary. For example, the PAD 110 may be configured to automatically shut down when it is not being used (e.g., when placed in a charger or docking bay for recharging). Further, the PAD 110 may be operable to dynamically determine when to transition to (or from) power saving modes. For example, the PAD 110 may comprise a component (e.g., accelerometer) for determining when the device is idle for an extended period of time, and respond to that by entering power saving mode (e.g., shut down, or operate with less frequent polling). Such accelerometer detects the lack of motion for a period of time to enter the power-saving mode; then trigger return to normal operating mode when movement is detected.

[0028] In certain implementations, worker protection systems in accordance with the present disclosure, such as the worker protection system 100, may be configured to provide logging and data recording. The logging and data recording may be used, for example, for training, for location tracking, and/or for even recreating (e.g., during accident investigation). For example, the PAD 110 may comprise circuitry for data recording and/or logging—e.g., to compile downloadable log files, which may be accessible (remotely, such as via any available communication means, or by direct connection to the PAD 110, such as when the device is docked for recharging). Such log files are then available to allow examination of alerts as well as related events and/or activities (e.g., users' responses, such as alert silencing actions). The VADs 120 and/or the WDU 130 may similarly be configured to support logging of worker protection/alert related information, such as by also compiling downloadable log files that are available when needed. The log files may contain data recording triggered alerts and related information (e.g., alerts' times and/or location, distances to workers and traveling speed within work zone workers' acknowledgment or response actions, etc.), as well as other information relating to, e.g., faults, mechanical shock over thresholds, etc. Further, logs may include GPS positioning information (e.g., coordinate of locations of alerts), time of events, compass bearing, received signal strength, and antenna used, when available.

[0029] In certain implementations, worker protection systems in accordance with the present disclosure, such as the worker protection system 100, may be incorporate various communication techniques for optimizing performance, with respect to the broadcast, reception, and processing of signals used in triggering alerts. For example, the PAD 110 may incorporate diversity antennas of identical or differing polarity, to improve signal reception reliability. Use of such diversity antennas (with corresponding signal processing functions) allows for improved performance in certain conditions, such as when the worker 105 is not in the optimal position of antenna orientation.

[0030] In certain implementations, worker protection systems in accordance with the present disclosure, such as the worker protection system 100, may be configured to provide backward compatibility with existing protection solutions and/or protocols. Further, it may be particularly designed and implemented such that it may be integrated into future communications based train control systems.

[0031] In certain implementations, multiple devices in worker protection systems in accordance with the present disclosure, such as the worker protection system 100, may be configured to operate collaboratively, to ensure that alerts are received by all workers. For example, the PADs 110 and/or the WDUs 130 may be configured to relay alerts (e.g., of approaching trains) to other devices nearby, thus improving the field strength of warning signals, by increasing the probability that all nearby PADs 110 receive the alert (even devices that may have not been able to receive the signals/alerts directly).

[0032] The various devices (PADs, VADs, WDUs) used in the worker protection systems may be designed and/or implemented to meet certain operational requirements (relating to, e.g., shock/vibration, temperature/ humidity, salt conditions, icing, hose down, electrostatic discharge (ESD), electromagnetic compatibility (EMC), electromagnetic interference (EMI), electromagnetic compatibility, etc.) in accordance with particular standards that may be pertinent to the related industries (MIL-STD-810, AREMA 11.5.1, IEC 61000-4, SAE J1113, CISPR 22, FCC Title 47, Association of American Railroads (AAR) All Applicable AAR S-9401, etc.).

[0033] Accordingly, worker protection systems in accordance with the present disclosure, such as the worker protection system 100, with many of the components being portable and/or configurable, offer portability and ease of configuration, allowing them to be set up in any work environment seamlessly.

[0034] FIG. 1B illustrates example use scenarios of a work protection system (e.g., the work protection system 100 of FIG. 1A), in accordance with the present

disclosure. In this regard, the different use scenarios may be based on which of and how the different devices in the work protection system 100—that is the PADs 110, the VADs 120, and the WDUs 130—interact during operation of the system, to provide the intended protection.

[0035] For example, in a first use scenario (denoted as ‘A’ in FIG. 1B), only worker wearable devices (PADs 110) and vehicle-mounted devices (VADs 120) are used—i.e., no wayside devices (WDUs 130) are used. In other words, as shown in FIG. 1B, the train 101 is equipped with a VAD 120, which broadcasts signals to interface with the PADs 120 worn by worker(s) 105, to detect if the train 101 is in proximity where an alarm is activated. In this regard, the PADs 120 will issue an alert (e.g., audible alarm) once they are detected by any train-based VAD 120, such as within a specified distance. On the vehicle side, the VAD 120 may further provide information to the operator when the PADs 120 are detected. For example, a user interface may indicate such information as how many PADs 120 (and thus worker(s) 105) are present within the specified distance. Further, the workers and/or operators may respond to issued alarms—e.g., silencing them, such as by acknowledging them on the wearable devices and/or on the user interface of the vehicle mounted devices.

[0036] In a second use scenario (denoted as ‘B’ in FIG. 1B), no vehicle-mounted devices (VADs 120) are used; rather, the worker wearable devices (PADs 110) are only in communication with the wayside devices (WDUs 130). In this regard, the wayside devices monitor for and detect approaching vehicles (e.g., the train 101), broadcast alarms (or signals triggering alarms) when a vehicle is in proximity (e.g., determined when at particular distance from the wayside device and/or moving at particular speed). For example, when the train 101 is detected by the WDU 130 (e.g., when it passes it, or moves within certain distance from it, at particular speed), it sends a proximity warning to all local PADs 110. Once the alarms is triggered at the wearable devices, they may continue until acknowledged by the workers—e.g., audible alarms continue until silenced, such as by hitting a “confirm” button.

[0037] In a third use scenario (denoted as 'C' in FIG. 1B), all three types of devices—that is worker wearable devices (PADs 110), vehicle-mounted devices (VADs 120) and wayside devices (WDUs 130)—are used, and may communicate with one another to provide the desired protection. In such scenarios, a worker wearable device may be activated and/or triggered by vehicle-mounted devices as well as wayside devices, for redundancy (thus enhanced protection). For example, the train 101 may be equipped with the VAD 120, which may communicate directly with the WDU 120 as the train 101 approaches it, such as when the train 101 is at a specified distance. In response, the WDU 130 may send proximity warnings (trigger alarms) to all local PADs 110. Under certain conditions (e.g., at particular distance and/or speed), the VAD 120 may communicate directly with the local PADs 110, to trigger alarm (which may be configured differently, such as for heightened risk).

[0038] FIG. 2A illustrates an example portable alert device (PAD), in accordance with the present disclosure. Shown in FIG. 2A is a portable alert device (PAD) 200.

[0039] The PAD 200 may comprise suitable one or more of hardware (including circuitry and/or other hardware components), software, and combination thereof for implementing various aspects of the present disclosure, particularly with respect to the support of portable wearable functionality in worker protection solutions, as described above. The PAD 200 may be a particular example implementation of the PAD 110, as described with respect to FIGs. 1A and 1B. In this regard, as noted above PADs may be configured as portable devices that are wearable by users (e.g., workers) to provide alerts regarding approaching vehicles that may pose safety threats to workers at particular locations. The PAD 200 is operable to perform such functions, in support of work protection systems in accordance with the present disclosure, as receiving alerts (or triggering alerts in response to broadcast warning signals) and providing alert indications to the user (the worker wearing the device), as well as additional alert related functions, such logging alert related data, etc.

[0040] In the example implementation illustrated in FIG. 2A, the PAD 200 may comprise a housing 210 for enclosing various components of the PAD 200. The housing 210 may be constructed to be suitable for the intended operations (and environment and/or conditions thereof) of the PAD 200 (e.g., strong enough to withstand harsh work environment but light enough as to not encumber the worker or hinder his/her activities), and to withstand environmental conditions associated with outside/external use (e.g., rain, extreme cold/heat), etc.).

[0041] The PAD 200 may comprise (or may be integrated with) an attachment structure 260, for facilitating the wearability of the PAD 200, by enabling the PAD 200 to be attached to the worker and/or to item used by the worker (e.g., clothing, equipment, etc.). In this regard, the PAD 200 may support various types of attachment structures, to allow worker to select preferable way for apply the device. For example, as shown in FIG. 2A, the PAD 200 may comprise or be coupled to a clip structure 260, so that the PAD 200 may be clipped onto the worker's clothing, belt, etc. In another implementation (not shown), the PAD 200 may comprise or be coupled to a strap structure, so that the PAD 200 may be attached around the worker's wrist.

[0042] The PAD 200 has one or more antennas 240, which may be integrated or enclosed within the housing 210, configured for transmitting and/or receiving signals (e.g., broadcast alert related signals). As noted above, PADs may support use of various optimization techniques, including use of diversity, and as such the antennas 240 may comprise diversity antennas of identical or differing polarity.

[0043] The PAD 200 may have an integrated/internal power supply 230, for powering the various components of the PAD 200. In this regard, the power supply 230 may be rechargeable. For example, charging stations (an example of which is described with respect to FIG. 2B) may be used. The recharging of the power supply 230 may be done in various ways, including by use of charging stations (an example of which is described with respect to FIG. 2B) for example. In this regard, the PAD 200

may be connected (e.g., coupled, inserted, docked, etc.) to the charging station when it is not being used (e.g., at the end of each day) to be charged.

[0044] The PAD 200 may comprise suitable circuitry 220 for performing various operations in support of its functions. For example, the circuitry 220 may be operable to store data (including code); run and/or execute various applications and/or functions (alert related); handle transmission and/or reception of signals (and processing transmitted and/or received signals); provide power management; manage logging operations in the PAD 200; and handle input/output functions (e.g., supporting different forms of alert indications, including visual, audio, and/or tactile, and handling user input, such as acknowledges of alerts).

[0045] As shown in FIG. 2A, the PAD 200 comprises a visual indicator (e.g., LED) 212 and an audio indicator (e.g., speaker) 214, which are integrated into the housing 210, and are configured to provide visual and/or audio indication in response to triggering of alerts. Also, within the housing 210, the PAD 200 comprises a vibration motor 234, which may be configured to cause vibrations in response to triggering of alerts. The PAD 200 may be configured to use one or more of available indications means—e.g., one or more of visual, audio, and tactile indications. This may be done based on pre-set criteria, user selected preferences, dynamic configuration of the device, etc.

[0046] Further, as shown in FIG. 2A, the PAD 200 comprises a confirmation button 216, which is configured to receive indication of user acknowledgment (e.g., by pressing the confirmation button 216), when alert indication(s) is/are outputted. In some instances, the PAD 200 may, in response to receiving user confirmations, generate and transmit acknowledge messages, to other alert devices (e.g., PADs, WDUs, and/or VADs broadcasting and/or forwarding signals triggering alerts that were confirmed).

[0047] In some example implementations, PADs in accordance with the present disclosure (such as, e.g., the PAD 200) may not have any openings for connectors or

the like (for enhanced rigidity and/or protection against the elements). The functions of the PADs may be configured to account for and/or accommodate such design.

[0048] For example, only wireless communications are used such as using near field communications (NFC), for communication of data, and charging of the power supply is performed indirectly, such as using magnetic induction. Thus, as shown in FIG. 2A, the PAD 200 comprises a NFC component 236 for supporting NFC transmission and/or reception. Further, the PAD 200 comprises a charging element 232, for enabling (re)charging the power supply 230 in connectless manner—e.g., without requiring plugging a power cord or other wired cabling. The charging element 232 may comprise an inductive charging coil, for example. The PAD may also include an environmentally sealed button to allow the operator to perform alarm confirmation and silencing.

[0049] FIG. 2B illustrates an example charging station for use in conjunction with portable alert devices (PADs), in accordance with the present disclosure. Shown in FIG. 2B is a PAD charging station 280, which may be used in conjunction with portable alert devices (PADs), such as the PAD 200 of FIG. 2A.

[0050] The PAD charging station 280 may comprise suitable one or more of hardware (including circuitry and/or other hardware components), software, and combination thereof for implementing various aspects of the present disclosure, particularly with respect to the support of portable alert devices (PADs). In this regard, the main function of the PAD charging station 280 may be (re)charging PADs (e.g., the PAD 200 of FIG. 2A). The PAD charging station 280 may support additional functions, however. For example, the PAD charging station 280 may support and/or facilitate exchange of data with the PADs, such as to enable extraction of data from the PADs (e.g., log files) and/or input of data into the PAD (e.g., (re)configuration data), etc.

[0051] As shown in the example implementation illustrated in FIG. 2B, the PAD charging station 280 may comprise a housing 290 for enclosing various components of

the PAD 200. The housing 290 may be constructed to be suitable for intended uses and/or functions of the PAD charging station 280. For example, the housing 290 may be configured such that it defines a space into which the supported PADs (e.g., the PAD 200 of FIG. 2A) may be inserted and/or docked.

[0052] The PAD charging station 280 may comprise various components for supporting and/or enabling charging power supplies of supported PADs. In this regard, the PAD charging station 280 (and charging related components thereof) may be configured to facilitate the charging in the manner required by the supported PADs. For example, in the example implementation illustrated in FIG. 2B, the PAD charging station 280 comprises a charging element 282 integrated within the housing 290, and configured for supporting recharging in connectless manner. The charging element 282 may comprise an indicative charging coil, for example, for enabling (re)charging by induction.

[0053] The PAD charging station 280 may comprise a data port 286 for extracting data from and/or inputting data into the PADs, while docked into the PAD charging station 280. Further, the PAD charging station 280 may comprise suitable communication circuitry for facilitating the actual exchange of data with the docked PADs. For example, the data exchanges may be done via near field communication (NFC) connections, and as such the PAD charging station 280 may comprise an NFC component 288 for supporting such communications.

[0054] In some instances, the PAD charging station 280 may comprise input and/or output (I/O) component for use in conjunction with operations of the PAD charging station 280. For example, the PAD charging station 280 may comprise a visual status indicator (e.g., LED) 284, integrated within the housing 290, to provide useful feedback (e.g., indication when charging, data extraction, data input, etc. is complete).

[0055] FIG. 3 illustrates an example Vehicle Alert Device (VAD), in accordance with the present disclosure. Shown in FIG. 3 is a vehicle alert device (VAD) 300.

[0056] The VAD 300 may comprise suitable one or more of hardware (including circuitry and/or other hardware components), software, and combination thereof for implementing various aspects of the present disclosure, particularly with respect to the vehicle-mounted functionality in support of worker protection. The VAD 300 may be a particular example implementation of the VAD 120, as described with respect to FIGs. 1A and 1B. In this regard, as noted above VADs may be configured as portable (moveable) devices or as permanent components integrated into vehicles. The VAD 300 is operable to perform such functions, in support of work protection systems in accordance with the present disclosure, as broadcasting signals configured for interfacing with wearable devices (e.g., PADs 100), as well as additional alert related functions, such alert-related interactions with vehicle operators (e.g., to indicate when worker(s) is/are detected, for example by sounding a warning and/or providing a visual indicators, and/or displaying related information, such as the quantity of workers detected, and the approximate distance to the workers), logging alert related data, etc.

[0057] While VADs may be implemented as singular devices (that is within a single housing incorporating and/or attaching all components of the VAD), in some implementations, such as the example implementation illustrated in FIG. 3, VADs may be implemented in a distributed manner—e.g., comprising a plurality of physical units, each of which may be placed at particular location and/or position, selected for optimal performance with respect to functions and/or operations provided by that unit. For example, as shown in FIG. 3, the VAD 300 may comprise a VAD operator unit 310, a VAD antenna unit 320, and a VAD (main) controller unit 330.

[0058] The VAD operator unit 310 may comprise components for supporting interactions with the vehicle operator—e.g., to received user input and/or provide user feedback relating to operation of the VAD 300 and/or to alerts. For example, the VAD

operator unit 310 may comprises input/output (I/O) components (and related circuitry and/or support hardware), such as a display 312 and user controls 314, to enable user interactions. Further, the VAD operator unit 310 may comprise and/or be operable to utilize I/O components configured for providing indications relating to triggering of alerts and/or receiving feedback (e.g., confirmation) relating to such indications. For example, the VAD operator unit 310 may comprise a speaker (not shown), configured for providing audible indications of triggered alerts, a visual status indicator (e.g., LED) 318, configured for providing visual indication of triggered alerts, and a configuration button 316, configured to receive indication of user acknowledgment (e.g., by pressing the confirmation button 316), when alert indication(s) is/are outputted. The user controls 314 may comprise various types of user input elements, such as buttons, dials, etc. for allowing vehicle operator(s) or device users to provide input, such as to configure the VAD 300 and/or its operations, to respond to alerts (when triggered), etc. The user controls 314 may be implemented in the form of a touch screen (e.g., as part of the display 312), or be implemented with an alpha-numeric display. The display 312 (or any type of user interface) may be used to provide the vehicle operator with various information, such as alert related data (e.g., indicate the quantity of workers detected, and the approximate distance to the workers, calculated time till reaching the workers, etc.).

[0059] In some instances, rather than incorporating dedicated I/O components, the VAD 300 (or the VAD operator unit 310) may be operable to connect to and use existing I/O components (e.g., displays, speakers, etc.) in the vehicle, thus obviating the need to (and cost of) incorporating such dedicated components. For example, the VAD operator unit 310 may be operable to utilize existing audio systems to provide audible indication of triggered alerts.

[0060] The VAD antenna unit 320 may comprise one or more antennas 340 (and related circuitry and/or support hardware), configured for use in transmitting and/or receiving signals (e.g., broadcast alert related signals, receiving signal indicating

triggering of alerts and/or confirmation of such alerts by workers, etc.). In some implementations, however, the VAD antenna unit 320 may not incorporate dedicated antennas, and may instead simply comprise connecting means (e.g., coaxial connectors for wiring) to existing and/or external antennas in the vehicle.

[0061] The VAD controller unit 330 may comprise suitable circuitry for performing (remaining) operations and/or functions of the VAD 300. The VAD controller unit 330 may comprise, for example, one or more main processors 350, a system memory 352, a communication subsystem 354, an input/output (I/O) subsystem 356, and a logging management component 358.

[0062] Each main processor 350 may comprise suitable circuitry operable to process data, and/or control and/or manage operations of the VAD 300, and/or tasks and/or applications performed therein. In this regard, the main processor 350 may configure and/or control operations of various components and/or subsystems of the VAD 300, by utilizing, for example, one or more control signals. The main processor 350 may comprise a general purpose processor (e.g., CPU), a special purpose processor (e.g., application-specific integrated circuit (ASIC)), or the like. The disclosure, however, is not limited to any particular type of processors. The main processor 350 may enable running and/or execution of applications, programs and/or code, which may be stored, for example, in the system memory 352. Alternatively, one or more dedicated application processors may be utilized for running and/or executing applications (or programs) in the VAD 300.

[0063] The system memory 352 may comprise suitable circuitry for permanent and/or non-permanent storage, buffering, and/or fetching of data, code and/or other information, which may be used, consumed and/or processed. In this regard, the system memory 352 may comprise different memory technologies, including, for example, read-only memory (ROM), random access memory (RAM), Flash memory, solid-state drive (SSD), and/or field-programmable gate array (FPGA). The disclosure,

however, is not limited to any particular type of memory or storage devices. The system memory 352 may store, for example, configuration data, which may comprise parameters and/or code, comprising software and/or firmware, logging data, etc.

[0064] The communication subsystem 354 may comprise suitable circuitry operable to communicate signals from and/or to the electronic device, such as via one or more wired and/or wireless connections. In this regard, the communication subsystem 354 may be configured to support one or more wired or wireless interfaces, protocols, and/or standards, and to facilitate transmission and/or reception of signals to and/or from the VAD 300, and/or processing of transmitted and/or received signals, in accordance with the applicable interfaces, protocols, and/or standards. Examples of signal processing operations that may be performed by the communication subsystem 354 comprise, for example, filtering, amplification, analog-to-digital conversion and/or digital-to-analog conversion, up-conversion/down-conversion of baseband signals, encoding/decoding, encryption/decryption, and/or modulation/demodulation. For example, the communication subsystem 354 may be configured to support broadcast of alert related signals, via the antenna(s) 340.

[0065] The I/O subsystem 356 may comprise suitable circuitry for managing user interactions with the VAD 300, such as to enable obtaining input from and/or providing output to device user(s). The I/O subsystem 356 may support various types of inputs and/or outputs, including, for example, video, audio, tactile, and/or textual. In this regard, dedicated I/O devices and/or components, external to (and coupled with) or integrated within the VAD 300, may be utilized for inputting and/or outputting data during operations of the I/O subsystem 356. Examples of such dedicated I/O devices may comprise user interface components or devices (e.g., the display 312), audio I/O components (e.g., speakers and/or microphones), mice, keyboards, touch screens (or touchpads), and the like. In some instances, user input obtained via the I/O subsystem 356, may be used to configure and/or modify various functions of particular components or subsystems of the VAD 300.

[0066] The logging management component 358 may comprise suitable circuitry for managing logging operations in the VAD 300. The logging operations may comprise compiling log files (stored in the system memory 352) containing data relating to alerts, as described above.

[0067] Also, while not shown in FIG. 3, the VAD controller unit 330 may also comprise component for managing power supply (e.g., to the VAD controller unit 330 itself, and/or to other units, such as the VAD operator unit 310).

[0068] As noted above, as shown in the example implementation illustrated in FIG. 3, the VAD 300 may be implemented as multi-unit system, comprising multiple separate components (the VAD operator unit 310, the VAD antenna unit 320, and the VAD controller 330). In this regard, as noted each of the different physical unit may be configured for placement at particular location and/or position, selected for optimal performance with respect to functions and/or operations provided by that unit. For example, the VAD operator unit 310 may be configured for placement within the operator compartment (e.g., train cockpit) at position optimal for providing output to and/or receiving input from the operator (e.g., top of the dashboard). The VAD antenna unit 320, may be configured for placement outside (and on top) of the engine car. The VAD controller unit 330 may be configured for placement within the engine car, but out of the way (for convenience).

[0069] As the VAD controller unit 330 may house the bulk of the VAD resources (e.g., processing resources, storage resources, etc.), the VAD controller 330 may be configured to support connect to and/or communicate with the remaining unit(s) and/or available resources that may be utilized in support of operations of the VAD 300. For example, the VAD controller unit 330 may comprise data port 340, for enabling connecting to the VAD 300 for extracting data therefrom (e.g., log files) and/or inputting data thereto (e.g., for (re)configuration); a power connector 342 (e.g., drawing power from sources within the train); a VAD operator unit (VOU) connector 344; configured for

connecting to the VAD operator unit 320 (e.g., to provide power thereto, exchange data therewith, etc.); one or more antenna connectors 346 (e.g., for connecting to the VAD antenna unit 320, existing antennas in the train, etc.); one or more GNSS connectors 348, for connecting to existing GNSS systems (or transceivers); etc.

[0070] FIG. 4 illustrates an example wayside detection unit (WDU), in accordance with the present disclosure. Shown in FIG. 4 is a wayside detection unit (WDU) 400.

[0071] The WDU 400 may comprise suitable one or more of hardware (including circuitry and/or other hardware components), software, and combination thereof for implementing various aspects of the present disclosure, particularly with respect to the wayside detection and/or alert related functions in support of worker protection solutions. The WDU 400 may be a particular example implementation of the WDU 130, as described with respect to FIGs. 1A and 1B. In this regard, as noted above WDUs may be configured as portable (moveable) devices that are placed along the expected path (e.g., train tracks) of vehicles that may pose safety threats to workers at particular locations. The WDU 400 is operable to perform such functions, in support of work protection systems in accordance with the present disclosure, as detecting approaching vehicles, triggering alerts at wearable devices (e.g., by broadcasting signals configured for interfacing with the wearable devices (e.g., PADs 100) to trigger the alerts thereby), and triggering critical alarms when a train enters a work area, as well as additional alert related functions, such logging alert related data, etc.

[0072] In the example implementation illustrated in FIG. 4, the WDU 400 may comprise a housing 410 for enclosing various components of the WDU 400 and/or allowing attachment to certain external elements or structures. The housing 410 may be constructed to be suitable for the intended operation environment and/or conditions of the WDU 400 (e.g., being constructed to be very rigid, to withstand accidental impacts during deployment and/or when it knocked down), and to withstand environmental conditions associated with outside/external use (e.g., rain, extreme

cold/heat), etc.). The WDU 400 has one or more antennas 440, used in transmitting and/or receiving signals (e.g., broadcast alert related signals). Further, the WDU 400 may have sensory elements, such as a train detector 430. In this regard, the train detector 430 may be operable to monitor, detect, and track approaching vehicle, using one or more suitable technologies (e.g., visual, infrared, laser ranging, etc.), and/or to enable generating corresponding data (distance, relative speed, etc.). The WDU 400 typically would also comprise (or can be coupled to) a support structure 420, such as a rigid tripod, to enable placement of the WDU 400, such as near train tracks.

[0073] Internally, the WDU 400 may comprise suitable circuitry for performing various operations in support of its functions. For example, the WDU 400 may comprise one or more main processors 450, a system memory 452, a communication subsystem 454, a sensor management component 456, and a logging management component 458.

[0074] Each main processor 450 may comprise suitable circuitry operable to process data, and/or control and/or manage operations of the WDU 400, and/or tasks and/or applications performed therein. In this regard, the main processor 450 may configure and/or control operations of various components and/or subsystems of the WDU 400, by utilizing, for example, one or more control signals. The main processor 450 may comprise a general purpose processor (e.g., CPU), a special purpose processor (e.g., application-specific integrated circuit (ASIC)), or the like. The disclosure, however, is not limited to any particular type of processors. The main processor 450 may enable running and/or execution of applications, programs and/or code, which may be stored, for example, in the system memory 452. Alternatively, one or more dedicated application processors may be utilized for running and/or executing applications (or programs) in the WDU 400.

[0075] The system memory 452 may comprise suitable circuitry for permanent and/or non-permanent storage, buffering, and/or fetching of data, code and/or other

information, which may be used, consumed and/or processed. In this regard, the system memory 452 may comprise different memory technologies, including, for example, read-only memory (ROM), random access memory (RAM), Flash memory, solid-state drive (SSD), and/or field-programmable gate array (FPGA). The disclosure, however, is not limited to any particular type of memory or storage devices. The system memory 452 may store, for example, configuration data, which may comprise parameters and/or code, comprising software and/or firmware, logging data, etc.

[0076] The communication subsystem 454 may comprise suitable circuitry operable to communicate signals from and/or to the electronic device, such as via one or more wired and/or wireless connections. In this regard, the communication subsystem 454 may be configured to support one or more wired or wireless interfaces, protocols, and/or standards, and to facilitate transmission and/or reception of signals to and/or from the WDU 400, and/or processing of transmitted and/or received signals, in accordance with the applicable interfaces, protocols, and/or standards. Examples of signal processing operations that may be performed by the communication subsystem 454 comprise, for example, filtering, amplification, analog-to-digital conversion and/or digital-to-analog conversion, up-conversion/down-conversion of baseband signals, encoding/decoding, encryption/decryption, and/or modulation/demodulation. For example, the communication subsystem 454 may be configured to support broadcast of alert related signals, via the antenna(s) 440.

[0077] The sensor management component 456 may comprise suitable circuitry for managing sensors, such as the train detector 430. For example, the sensor management component 456 may control the selection of detection and ranging technology implemented by the train detector 430, set the parameters required for its operations, and/or process information obtained via the train detector 430, to generate corresponding data (e.g., distance to approaching train, relative speed, etc.).

[0078] The logging management component 458 may comprise suitable circuitry for managing logging operations in the WDU 400. The logging operations may comprise compiling log files (stored in the system memory 452) containing data relating to alerts, as described above.

[0079] The WDU 400 may comprise a data port 460 for extracting data (e.g., log files) from and/or inputting data (e.g., (re)configuration data) into the WDU 400.

[0080] Other embodiments of the invention may provide a non-transitory computer readable medium and/or storage medium, and/or a non-transitory machine readable medium and/or storage medium, having stored thereon, a machine code and/or a computer program having at least one code section executable by a machine and/or a computer, thereby causing the machine and/or computer to perform the processes as described herein.

[0081] Accordingly, various embodiments in accordance with the present invention may be realized in hardware, software, or a combination of hardware and software. The present invention may be realized in a centralized fashion in at least one computing system, or in a distributed fashion where different elements are spread across several interconnected computing systems. Any kind of computing system or other apparatus adapted for carrying out the methods described herein is suited. A typical combination of hardware and software may be a general-purpose computing system with a program or other code that, when being loaded and executed, controls the computing system such that it carries out the methods described herein. Another typical implementation may comprise an application specific integrated circuit or chip.

[0082] Various embodiments in accordance with the present invention may also be embedded in a computer program product, which comprises all the features enabling the implementation of the methods described herein, and which when loaded in a computer system is able to carry out these methods. Computer program in the present context means any expression, in any language, code or notation, of a set of

instructions intended to cause a system having an information processing capability to perform a particular function either directly or after either or both of the following: a) conversion to another language, code or notation; b) reproduction in a different material form.

[0083] While the present invention has been described with reference to certain embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted without departing from the scope of the present invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the present invention without departing from its scope. Therefore, it is intended that the present invention not be limited to the particular embodiment disclosed, but that the present invention will include all embodiments falling within the scope of the appended claims.

CLAIMS

What is claimed is:

1. A system for worker protection, the system comprises:
 - a compact wearable personal alert device, configured for use by a worker, the personal alert device comprising:
 - a housing for enclosing components of the personal alert device;
 - an attachment structure for attaching the personal alert device to the worker or an item used by the worker;
 - a power supply for powering components of the personal alert device;
 - a communication component, comprising one or more antennas, configured for transmitting and/or receiving wireless signals;
 - one or more indicator components, for outputting alert indications; and
 - one or more circuits operable to process signals and data, and to perform one or more applications or functions relating to operations of the personal alert device;
 - wherein the personal alert device is operable to:
 - process signals received from a companion alert device; and
 - generate, in response to signals received from a companion alert device, a safety alert; and
 - output, via the one or more indicator components, one or more alert indications to the worker based on the safety alert.
2. The system of claim 1, wherein the personal alert device is operable to implement a power management scheme for optimizing power consumption in the personal alert device.

3. The system of claim 2, wherein the power management scheme comprises transitioning the personal alert device from a full operation mode to a power-saving mode, the power-saving mode comprising at least one of shut-down mode and low-function mode.

4. The system of claim 2, wherein the personal alert device comprises at least one control component for generating control data applicable to the power management scheme.

5. The system of claim 4, wherein the at least one control component comprises a movement sensor for sensing movement of the worker, configured to generate indications when the personal alert device is moving or not.

6. The system of claim 1, wherein the one or more antennas comprise diversity antennas of identical or differing polarity, and the personal alert device is operable to support use of diversity during the transmitting and/or receiving of wireless signals.

7. The system of claim 1, wherein triggering of alerts and/or broadcast of signals triggering of the alerts is based on one or more types of alert thresholds.

8. The system of claim 7, where the one or more types of alert thresholds comprise time-to-arrival (TTA), distance-from-train (DFT), and low-speed close proximity distance alert (CPD).

9. The system of claim 1, wherein the personal alert device is operable to communicate with one or more nearby alert devices, to forward received signals and/or alerts generated in response to the received signals among the personal alert device and the one or more nearby alert devices.

10. The system of claim 1, wherein the personal alert device is operable to log data relating to alerts triggered and/or handled by the personal alert device.

11. The system of claim 1, wherein the companion alert device comprises a vehicle-mounted alert device, a wayside detection unit, or another personal alert device.

12. The system of claim 1, wherein the one or more indicator components comprise at least one of visual indicator, audio indicator, and a tactile indicator.

13. The system of claim 1, wherein the power supply comprises a rechargeable power supply.

14. The system of claim 13, wherein the rechargeable power supply is operable to recharge without direct connection.

15. The system of claim 1, wherein the attachment structure comprises a clip structure or a strap structure.

16. The system of claim 1, wherein the personal alert device comprises one or more acknowledgment components, configured for receiving input from the worker, to indicate acknowledgment of the safety alert.

17. The system of claim 16, wherein the personal alert device is operable to communicate a signal to the companion alert device to indicate the acknowledgment of the safety alert by the worker.

18. The system of claim 1, wherein the housing completely seals internal space enclosing components of the personal alert device, and wherein charging the power

supply and/or communication of data to and/or from the portable alert device is done without direct connection.

19. The system of claim 1, wherein the personal alert device is operable to implement configurable alarm management for allowing setting and/or adjusting of rules controlling triggering and/or handling of alerts.

20. The system of claim 1, wherein the personal alert device is operable to:
receive Global Navigation Satellite System (GNSS) signals;
determine location information based on the received GNSS signals; and
utilize the location information in conjunction with at least one of the operations of the personal alert device.

ABSTRACT

Systems and methods are provided for worker protection. The worker protection systems include a plurality of alert devices, including one or more wearable personal alert devices, each worn by a person (e.g., worker), and one or more companion alert devices that broadcast alerts or signals triggering alerts. The companion alert devices include vehicle-mounted alert devices, configured for operation on vehicles (e.g., trains), and wayside detection units, configured for placement on or near paths of the vehicles. The wayside detection units may be operable to autonomously detect and track the vehicles.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of
Invention

Worker Protection System

As the below named inventor, I hereby declare that:

This declaration
is directed to:



The attached application, or



United States application or PCT international application number _____

filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

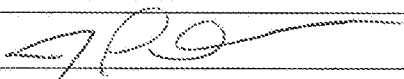
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LEGAL NAME OF INVENTOR

Inventor: John Albert Plutt Jr.

Date (Optional): 3/23/2016

Signature: 

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This declaration is directed to: ☒ The attached application, or
☐ United States application or PCT international application number _____
filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

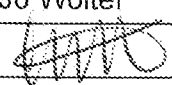
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LEGAL NAME OF INVENTOR

Inventor: Sara Jo Woitel Date (Optional): 3/21/16

Signature: 

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Invention**

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United States application or PCT international application number _____
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The above-identified application was made or authorized to be made by me.

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LEGAL NAME OF INVENTOR

Inventor: Richard Carlson

Date (Optional): _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

**Title of
Invention**

Worker Protection System

As the below named inventor, I hereby declare that:

This declaration
is directed to:



The attached application, or



United States application or PCT international application number _____
filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

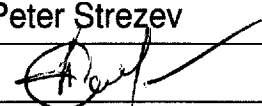
WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Peter Strezev

Date (Optional) : _____

Signature: 

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
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Worker Protection System

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The above-identified application was made or authorized to be made by me.

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LEGAL NAME OF INVENTOR

Inventor: Marc Wayne Cygnus

Date (Optional): 3-21-16

Signature: Marc W. Cygnus

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	Worker Protection System
---------------------------	--------------------------

As the below named inventor, I hereby declare that:

This declaration is directed to: ☒ The attached application, or

☐ United States application or PCT international application number _____

filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

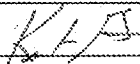
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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LEGAL NAME OF INVENTOR

Inventor: Kurt Gunther Date (Optional): 3/23/2016

Signature: 

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/246,940	01/14/2019	2685	0.00	29153US03	20	1

CONFIRMATION NO. 8489

FILING RECEIPT



23446
MCANDREWS HELD & MALLOY, LTD
500 WEST MADISON STREET
SUITE 3400
CHICAGO, IL 60661

Date Mailed: 02/07/2019

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Richard Carlson, Woodstock, IL;
Kurt Gunther, Leland, IL;
Sara Jo Woitel, Lake Zurich, IL;
Marc Wayne Cygnus, Mundelein, IL;
Peter Strezev, Apollo Beach, FL;
John Albert Plutt JR., Chicago, IL;

Applicant(s)

Metrom Rail, LLC, Crystal Lake, IL;

Power of Attorney: The patent practitioners associated with Customer Number 23446

Domestic Priority data as claimed by applicant

This application is a CON of 15/078,427 03/23/2016 PAT 10179595
which claims benefit of 62/177,683 03/23/2015

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 02/05/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/246,940**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

WORKER PROTECTION SYSTEM

Preliminary Class

340

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 16/246,940	
APPLICATION AS FILED - PART I							
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	75		N/A	
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	330		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	380		N/A	
TOTAL CLAIMS (37 CFR 1.16(j))	20	minus 20 = *	x 50 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1	minus 3 = *	x 230 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
			TOTAL	785		TOTAL	
* If the difference in column 1 is less than zero, enter "0" in column 2.							
APPLICATION AS AMENDED - PART II							
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	OR	x =
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	OR	x =
	Application Size Fee (37 CFR 1.16(s))					OR	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR	
				TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	OR	x =
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	OR	x =
	Application Size Fee (37 CFR 1.16(s))					OR	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR	
				TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.							



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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/246,940	01/14/2019	Richard Carlson	29153US03

CONFIRMATION NO. 8489

FORMALITIES LETTER



23446
MCANDREWS HELD & MALLOY, LTD
500 WEST MADISON STREET
SUITE 3400
CHICAGO, IL 60661

Date Mailed: 02/07/2019

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
- The application search fee must be submitted.
- The application examination fee must be submitted.
- Surcharge as set forth in 37 CFR 1.16(f) must be submitted.

The surcharge is due for any one of:

- late submission of the basic filing fee, search fee, or examination fee,
- late submission of inventor's oath or declaration,
- filing an application that does not contain at least one claim on filing, or
- submission of an application filed by reference to a previously filed application.

SUMMARY OF FEES DUE:

The fee(s) required within **TWO MONTHS** from the date of this Notice to avoid abandonment is/are itemized below. Small entity discount is in effect. If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- \$ **75** basic filing fee.
- \$ **80** surcharge.
- \$ **330** search fee.
- \$ **380** examination fee.
- \$(**0**) previous unapplied payment amount.
- \$ **865** TOTAL FEE BALANCE DUE.

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice".
<https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/mhaile/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Attorney Docket Number 29153US03

IN THE APPLICATION OF:

Richard Carlson, et al.

Serial No.: 16/246,940

Filed: January 14, 2019

For: WORKER PROTECTION SYSTEM

Examiner: Not yet assigned

Group Art Unit: 2685

Confirmation No.: 8489

Electronically Filed On:

June 6, 2019

CERTIFICATION OF ELECTRONIC FILING

I hereby certify that this correspondence is being electronically filed with the Patent and Trademark Office on June 6, 2019.

Rami N. Moussa (Reg. No. 69,528)

/Rami N. Moussa/

Signature

**RESPONSE TO NOTICE TO FILE MISSING
PARTS OF NON-PROVISIONAL APPLICATION**

Mail Stop Missing Parts
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Notice to File Missing Parts of Non-Provisional Application mailed February 7, 2019, enclosed are the following:

Attorney Docket Number 29153US03

1. The basic filing fee, search fee, examination fee, surcharge fee and 2 month extension of time fee are being charged to a credit card in the name of McAndrews, Held & Malloy, in the amount of **\$1,165.00**.

The Commissioner is hereby authorized to charge any additional fees or to refund any overpayment that may be due to Deposit Account No. 13-0017 in the name of McAndrews, Held & Malloy, Ltd.

Respectfully submitted,

/Rami N. Moussa/

Rami N. Moussa

Reg. No. 69,528

Attorney for Applicants

Dated: June 6, 2019

McAndrews, Held & Malloy, Ltd.
500 West Madison Street--34th Floor
Chicago, Illinois 60661
Phone: (312) 775-8000
Fax: (312) 775-8100



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/246,940	01/14/2019	Richard Carlson	29153US03

23446

MCANDREWS HELD & MALLOY, LTD
500 WEST MADISON STREET
SUITE 3400
CHICAGO, IL 60661

RECEIVEDBy Docket *LC*

FEB 07 2019

Action Due

MISSING PARTS

Due Date

4-7-2019

McAndrews, Held & Malloy

CONFIRMATION NO. 8489

FORMALITIES LETTER



0000000105641969

Date Mailed: 02/07/2019

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

*Filing Date Granted***Items Required To Avoid Abandonment:**

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
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The surcharge is due for any one of:

- late submission of the basic filing fee, search fee, or examination fee,
- late submission of inventor's oath or declaration,
- filing an application that does not contain at least one claim on filing, or
- submission of an application filed by reference to a previously filed application.

SUMMARY OF FEES DUE:

The fee(s) required within **TWO MONTHS** from the date of this Notice to avoid abandonment is/are itemized below. Small entity discount is in effect. If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- \$ 75 basic filing fee.
- \$ 80 surcharge.
- \$ 330 search fee.
- \$ 380 examination fee.
- \$(0) previous unapplied payment amount.
- \$ 865 TOTAL FEE BALANCE DUE.

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice".
<https://portal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/mhaile/

Electronic Patent Application Fee Transmittal

Application Number:	16246940			
Filing Date:	14-Jan-2019			
Title of Invention:	WORKER PROTECTION SYSTEM			
First Named Inventor/Applicant Name:	Richard Carlson			
Filer:	Rami Naim Moussa/Elaine Maxson			
Attorney Docket Number:	29153US03			
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	75	75
UTILITY SEARCH FEE	2111	1	330	330
UTILITY EXAMINATION FEE	2311	1	380	380
Pages:				
Claims:				
Miscellaneous-Filing:				
LATE FILING FEE FOR OATH OR DECLARATION	2051	1	80	80
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 2 months with \$0 paid	2252	1	300	300
Miscellaneous:				
Total in USD (\$)				1165

Electronic Acknowledgement Receipt

EFS ID:	36222489
Application Number:	16246940
International Application Number:	
Confirmation Number:	8489
Title of Invention:	WORKER PROTECTION SYSTEM
First Named Inventor/Applicant Name:	Richard Carlson
Customer Number:	23446
Filer:	Rami Naim Moussa/Elaine Maxson
Filer Authorized By:	Rami Naim Moussa
Attorney Docket Number:	29153US03
Receipt Date:	06-JUN-2019
Filing Date:	14-JAN-2019
Time Stamp:	15:07:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1165
RAM confirmation Number	060719INTEFSW15083700
Deposit Account	130017
Authorized User	Elaine Maxson

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

SIEMENS et al. EXHIBIT 1002

37 CFR 1.19 (Document supply fees)
 37 CFR 1.20 (Post Issuance fees)
 37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Response to Pre-Exam Formalities Notice	29153US03_Response_to_Missing_Parts.pdf	240005	no	4
			79db76ca787007531f210743b66ff0de74f84e23		

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	38956	no	2
			127b08d93cb650986f1c904118dbb7e48075de5b		

Warnings:

Information:

Total Files Size (in bytes):	278961
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 16/246,940				
APPLICATION AS FILED - PART I										
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)			
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	75		N/A				
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	330		N/A				
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	380		N/A				
TOTAL CLAIMS (37 CFR 1.16(j))	20	minus 20 = *	x 50 =	0.00	OR					
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1	minus 3 = *	x 230 =	0.00						
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00						
			TOTAL	785		TOTAL				
* If the difference in column 1 is less than zero, enter "0" in column 2.										
APPLICATION AS AMENDED - PART II										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.										



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/246,940	01/14/2019	2685	865	29153US03	20	1

CONFIRMATION NO. 8489

UPDATED FILING RECEIPT

23446
MCANDREWS HELD & MALLOY, LTD
500 WEST MADISON STREET
SUITE 3400
CHICAGO, IL 60661



Date Mailed: 06/10/2019

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Richard Carlson, Woodstock, IL;
Kurt Gunther, Leland, IL;
Sara Jo Woitel, Lake Zurich, IL;
Marc Wayne Cygnus, Mundelein, IL;
Peter Strezev, Apollo Beach, FL;
John Albert Plutt JR., Chicago, IL;

Applicant(s)

Metrom Rail, LLC, Crystal Lake, IL;

Power of Attorney: The patent practitioners associated with Customer Number 23446

Domestic Priority data as claimed by applicant

This application is a CON of 15/078,427 03/23/2016 PAT 10179595
which claims benefit of 62/177,683 03/23/2015

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 02/05/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/246,940**

Projected Publication Date: 09/19/2019

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

WORKER PROTECTION SYSTEM

Preliminary Class

340

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

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page 2 of 4

this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16246940
	Filing Date		2019-01-14
	First Named Inventor	Richard Carlson	
	Art Unit	3617	
	Examiner Name	Not yet assigned	
	Attorney Docket Number	29153US03	

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5727758		1998-03-17	Penza et al.	
	2	5924651		1999-07-20	Penza et al.	
	3	5939986		1999-08-17	Schiffbauer et al.	
	4	6113037		2000-09-05	Pace	
	5	6145792		2000-11-14	Penza et al.	
	6	6650242		2003-11-18	Clerk et al.	
	7	7167082		2007-01-23	Stigall	
	8	7624952		2009-12-01	Bartek	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
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First Named Inventor	Richard Carlson	
Art Unit		3617
Examiner Name	Not yet assigned	
Attorney Docket Number		29153US03

9	8109474		2012-02-07	Bartek	
10	8248263		2012-08-21	Shervey et al.	
11	8344877		2013-01-01	Sheardown et al.	
12	8786428		2014-07-22	Sheardown et al.	
13	8952805		2015-02-10	Baines et al.	
14	92475578		1949-07-05	Halstead	
15	92762913		1956-09-11	Jepson	
16	96208260		2001-03-27	West et al.	
17	96232887		2001-05-15	Carson	
18	95620155		1997-04-15	Michalek	
19	95554982		1996-09-10	Shirkey et al.	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number		16246940
Filing Date		2019-01-14
First Named Inventor	Richard Carlson	
Art Unit		3617
Examiner Name	Not yet assigned	
Attorney Docket Number		29153US03

20	5652570		1997-07-29	Lepkofker	
21	5198800		1993-03-30	Tozawa et al.	
22	5675190		1997-10-07	Morita	
23	4302811		1981-11-24	McElhenny	
24	4327415		1982-04-27	Rush et al.	
25	4459668		1984-07-10	Inoue et al.	
26	4495578		1985-01-22	Sibley et al.	
27	4538228		1985-08-27	Brearey et al.	
28	4869557		1989-09-26	Gerum et al.	
29	8200380		2012-06-12	Ghaly	
30	8478463		2013-07-02	Knott et al.	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16246940
Filing Date	2019-01-14
First Named Inventor	Richard Carlson
Art Unit	3617
Examiner Name	Not yet assigned
Attorney Docket Number	29153US03

31	8651433	2014-02-18	Ghaly
32	9134411	2015-09-15	Soderi et al.

If you wish to add additional U.S. Patent citation information please click the Add button.

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U.S.PATENT APPLICATION PUBLICATIONS

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Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	20100102954		2010-04-29	Radivojevic et al.	
	2	20130166114		2013-06-27	Baines et al.	
	3	20110006912		2011-01-13	Sheardown et al.	
	4	20110152971		2011-06-23	Nghiem et al.	
	5	20120296562		2012-11-22	Carlson et al.	
	6	20140045547		2014-02-13	Singamsetty et al.	
	7	20160280240		2016-09-29	Calson et al.	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number		16246940
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First Named Inventor	Richard Carlson	
Art Unit		3617
Examiner Name	Not yet assigned	
Attorney Docket Number		29153US03

8	20170282944		2017-10-05	Carlson et al.	
9	20140229096		2014-08-14	Carlson	
10	20110046845		2011-02-24	Kozlay	
11	20080114519		2008-05-15	Defaux	
12	20060151672		2006-07-13	Heddebaut	
13	20100225527		2010-09-09	Talty	
14	20040155760		2004-08-12	Grisham	
15	20030214417		2003-11-20	Peltz et al.	
16	20120286563		2012-11-15	Lichterfield et al.	
17	20140046514		2014-02-13	Jennek et al.	
18	20140214247		2014-07-31	Myokei	

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First Named Inventor	Richard Carlson	
Art Unit		3617
Examiner Name	Not yet assigned	
Attorney Docket Number		29153US03

19	20150032302		2015-01-29	Foerster et al.	
20	20150329130		2015-11-19	Carlson et al.	
21	20150367822		2015-12-24	Jennek et al.	
22	20050010338		2005-01-13	Kraeling et al.	
23	20050110628		2005-05-26	Kernwein et al.	
24	20060015224		2006-01-19	Hilleary	
25	20080040023		2008-02-14	Breed et al	
26	20100063656		2010-03-11	Knott et al.	
27	20100268466		2010-10-21	Amutham	
28	20110184621		2011-07-28	Bock et al.	
29	20110234451		2011-09-29	Bock et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16246940
	Filing Date		2019-01-14
	First Named Inventor	Richard Carlson	
	Art Unit	3617	
	Examiner Name	Not yet assigned	
	Attorney Docket Number	29153US03	

30	20120029740	2012-02-02	Bock et al.
31	20130138276	2013-05-30	Soderi et al.
32	20150060608	2015-03-05	Carlson et al.

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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ² i	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	102923158	CN		2013-02-13	Chen Gengtian	English Language Abstract provided	×
	2	1417071	CN		2003-05-14	Shenzhen Maishiwei Sci-Tech Co., Ltd.	English Language Abstract provided	☒
	3	1676375	CN		2005-10-05	Shantou Univ.	English Language Abstract provided	☒

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NON-PATENT LITERATURE DOCUMENTS		Remove
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	International Search Report and Written Opinion for PCT/US2016/023754, mailed August 8, 2016. (10 pages)	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16246940
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	Art Unit	3617	
	Examiner Name	Not yet assigned	
	Attorney Docket Number	29153US03	

2	Chinese Office Action for Application No. 201710074449.6, dated January 17, 2019 (22 pages).
3	PCT, Notification of Transmittal of the International Search Report and the Written Opinion of the International Searching Authority, or the Declaration, in International application no. PCT/US2014/053900, dated February 18, 2015 (21 pages).

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16246940
Filing Date	2019-01-14
First Named Inventor	Richard Carlson
Art Unit	3617
Examiner Name	Not yet assigned
Attorney Docket Number	29153US03

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Rami N. Moussa/	Date (YYYY-MM-DD)	2019-06-11
Name/Print	Rami N. Moussa	Registration Number	69528

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Detector for detecting moving speed and safety interval of vehicles
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Abstract of CN1417071 (A)

The present invention relates to a vehicle safety, and especially to a detector for detecting moving speed and safety interval of vehicles. The detector consists of power supply, microprocessor, electronic switches, amplifiers, detector circuit, A/D converter and ultrahigh frequency vibrator circuit to constitute emitter circuit and receiver circuit. The detector can calculate the relative distance the vehicle should keeps to some moving object based on the practical speed and sends out warning signal timely. It has fixed emitting and receiving microwave frequency set, can avoid interference effectively and detect the speed of the vehicle and safety distance.



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权利要求书 2 页 说明书 12 页 附图 6 页

[54] 发明名称 一种用于检测车辆移动速度与安全
间距的检测装置

[57] 摘要

本发明涉及车辆的附加安全装置，确切地说是一种用于检测车辆的移动速度和安全间距的检测装置。本发明由电源装置、微处理器、电子开关一、电子开关二、电子开关三、前置放大器一、前置放大器二、功率放大器、放大器、带通放大器、检波电路、A/D 转换器和超高频振荡电路组成，构成发射电路和接收电路。本发明能以车辆移动之实际速度为计算基础，计算车辆与对应移动物体所应保持的相对间距，并适时地提出警示，而且设定发射和接收的固定微波频率，并通过有效的装置避免干扰，能很好地起到检测车速和安全距离的作用。

I S S N 1 0 0 8 - 4 2 7 4

1 一种用于检测车辆移动速度与安全间距的检测装置，包括有微波
5 波天线，蜂鸣器及其驱动电路，其特征在于本发明由电源装置、微处理器、电子开关一、电子开关二、电子开关三、前置放大器一、前置放大器二、功率放大器、放大器、带通放大器、检波电路、A/D 转换器和超高频振荡电路组成；电源装置提供动力，电子开关一、功率放大器、前置放大器一、超高频振荡电路构成微波发射电路，电子开关
10 二、前置放大器二、放大器、带通放大器、检波电路、A/D 转换器和电子开关三构成检波电路，微处理器和电源装置、电子开关一、电子开关二、电子开关三、超高频振荡器、蜂鸣器的驱动电路、车速信号源连接。

2 如权利要求 1 所述的用于检测车辆移动速度与安全间距的检测
15 装置，其特征在于所述微处理器与放大器一之间设置有反馈电路，可补偿回波信号增益过大或不足的问题，增加回波信号的稳定性。

3 如权利要求 1 所述的用于检测车辆移动速度与安全间距的检测装置，其特征在于所述微处理器还可以连接输入界面，如输入键盘，用以达成命令输入之用，可使用键盘做为输入装置，并以其输入的数字
20 字做为开始起动回波检测之起始速度，自动激活本发明的检测车辆速度与报警功能。

4 如权利要求 1 所述的用于检测车辆移动速度与安全间距的检测装置，其特征在于所述放大器设置两个，放大器一位于前置放大器二和带通放大器之间，并与反馈电路连接，放大器二设置在带通放大器
25 与检波电路之间。

5 如权利要求 1 所述的用于检测车辆移动速度与安全间距的检测装置，其特征在于所述电源装置包含汽车蓄电池及电源转换电路，电源转换电路用以将电源输出的电压转换为本发明所需的范围；

6 如权利要求 1 所述的用于检测车辆移动速度与安全间距的检测
5 装置，其特征在于所述微处理器还可以连接引擎启动电路，以作为启动本发明之条件。

7 如权利要求 1 所述的用于检测车辆移动速度与安全间距的检测装置，其特征在于所述电子开关一和该功率放大器、电源、微处理器、电子开关二、微波天线连接，受微处理器控制，做为传送信号及接收
10 信号之开关电路。

一种用于检测车辆移动速度与安全间距的检测装置

技术领域

- 5 本发明涉及车辆的附加安全装置，确切地说是一种用于检测车辆的移动速度和安全间距的检测装置。

背景技术

- 10 车辆的安全距离检测，随着现代生活中汽车的增多和人们自我安全意识的增强，越来越引起人们和汽车生产厂家的重视，汽车生产厂家也倾向于在汽车内安装以提起人们注意的车辆安全间距的检测装置。现今市场测量汽车的安全距离的产品，一般采用的技术有超声波测距、电磁波雷达测距、光波测距等三种。

- 15 超声波测距是利用超声波产生器不间断地发射出 40Kz 超声波，遇到障碍物后会反射成为反射波，待超声波接收器接收到反射波信号，并将其转换为电信号，信号值反映间距的大小，当车辆的间距低于预定的安全值时，该装置就会自动产生报警信号，提醒驾驶者注意。但是超声波测距因使用低频率 40Kz 作为发射波，使用距离范围最高至 10 米左右的范围，检测距离太小，一般只适合使用于倒车的距离检测，像车辆在行驶时的安全间距却不适合使用该装置。

- 20 光波测距是利用发射光波后遇到目标物反射回来反射光，检测发射光和反射光的相隔时间，利用两者之间的时间差计算车辆与目标物的距离。光波测距是使用光束向远方照射，并利用前方车辆（目标物）后部

反光镜的反射光，透过受光装置检测其距离。因此所有车辆后面必须安装反光镜，否则效果将会大打折扣，而且会产生很大的误差，显然在所有的车辆后部安装反光镜是不可能的；同时，遇到其他的障碍物没有反光时，安全检测距离的装置就变得毫无用处。

- 5 所以，目前最受到驾驶者和车辆生产厂家所接受的是电磁波雷达测距装置，它是利用电磁波发射后遇到障碍物反射的回波，对其不断检测，检测结果转换成电信号，传输给控制器，由控制器对比信号的强弱，并计算前方障碍物的相对速度和距离，经过分析判断，当信号与预定的车辆安全距离所对应的相符合或者强于预定信号时，蜂鸣器就会不
- 10 断地发出报警声音，对驾驶者构成危险的目标进行警告。

- 由于现今市场的电磁波雷达测距都使用固定距离检测的方式，无论汽车行驶时速多少，都必须保持在所设定的距离或以上，如果低于设定距离以下，则驾驶人必然听见警报，即使驾驶者了解情况并做了相应的安全措施，也会如此，这样会造成驾驶者不胜其烦，极其容易分散注意
- 15 力。因为有此不便，故使用此微波雷达测距方式的车辆只有在高速行驶时，驾驶者才会启动车上微波测距雷达。在车速较低的情况下，如在城市内或者交通繁忙的区域，反而达不到预期的作用，而这对大多数驾驶者来说是经常遇到的情况。

- 因此，上述的电磁波雷达测距装置效果并不理想，无法在车辆的低
- 20 速行驶状态下为大多数驾驶者使用。

发明内容

 本发明的目的提供一种用于检测车辆移动速度与安全间距的检测装置，该装置在车辆高于一定的速度时自动启动该装置，检测车辆与障碍

物的间距，并以车辆的实际速度为基础，当间距低于实际速度相应的安全距离时，该装置能够自动报警。

本发明的另一个目的是驾驶者可以自己设定启动该装置的预定速度，以方便驾驶者根据自己的驾驶习惯和交通状况设定最低的开启本发
5 明的车辆速度。

本发明的另一个目的是当一移动体高速该装置接近时，当移动体超出所设定的距离或/和速度对应值时，该装置可向车辆驾驶者本身发出警示，以提早做好闪躲的准备，并向该移动体发出声光音效的警示，以通知该移动体减缓速度并拉大安全间距。

10 一种用于检测车辆移动速度与安全间距的检测装置，包括有微波天线，蜂鸣器及其驱动电路，其特征在于本发明由电源装置、微处理器、电子开关一、电子开关二、电子开关三、前置放大器一、前置放大器二、功率放大器、放大器、带通放大器、检波电路、A/D 转换器和超高频振荡电路组成；电源装置提供动力，电子开关一、功率放大器、前置
15 放大器一、超高频振荡电路构成微波发射电路，电子开关二、前置放大器二、放大器、带通放大器、检波电路、A/D 转换器和电子开关三构成检波电路，微处理器和电源装置、电子开关一、电子开关二、电子开关三、超高频振荡器、蜂鸣器的驱动电路、车速信号源连接。

微处理器与放大器一之间设置有反馈电路，可补偿回波信号增益过
20 大或不足的问题，增加回波信号的稳定度。

微处理器还可以连接输入界面，如输入键盘，用以达成命令输入之用，可使用键盘做为输入装置，并以其输入的数字做为开始启动回波检测之起始速度，自动激活本发明的检测车辆速度与报警功能。

放大器设置两个，放大器一位于前置放大器二和带通放大器之间，并与反馈电路连接，放大器二设置在带通放大器与检波电路之间。

电源装置包含汽车蓄电池及电源转换电路，电源转换电路用以将电源输出的电压转换为本发明所需的范围；

5 微处理器还可以连接引擎启动电路，以作为启动本发明之条件。

电子开关一和该功率放大器、电源、微处理器、电子开关二、微波天线连接，受微处理器控制，做为传送信号及接收信号之开关电路；

电子开关二和该前置放大器二、电源、微处理器、电子开关一、微波天线连接，受微处理器控制，做为传送信号及接收信号之开关电路；

10 电子开关三和该 A/D 转换器、电源、微处理器连接，受微处理器控制，将完成转换之回波检测的数字讯号经此开关电路输入至微处理器；

前置放大器一和该电源、超高频振荡器、功率放大器连接，做为发射检测讯号的小信号放大之用；

前置放大器二和该电源、电子开关二、放大器一连接，做为接收回
15 波讯号的小信号放大之用；

功率放大器和该电源、电子开关一、前置放大器一连接，做为发射检测信号的功率放大之用；

放大器一和该电源、前置放大器二、反馈电路、带通放大器连接，做为回波信号的一级放大之用；

20 放大器二和该电源、检波电路、带通放大器连接，做为回波信号的二级放大，并做为灵敏度调整之用；带通放大器和该电源、放大器一、

放大器二连接，带通频率仅能让信号为 24.125GHz 的回波频率能通过此放大器，以抑制其它的噪声通过，避免产生讯号干扰的情形；

反馈电路和该电源、放大器一、微处理器连接，此电路可补偿回波信号增益过大或不足的问题，增加回波信号的稳定度。

- 5 检波电路和该电源、放大器二、A/D 转换器连接，此电路功能为将 24.125GHz 的混波信号过滤，只剩下所需要的低频回波信号通过。

A/D 转换器和该电源、检波电路、电子开关三连接，其将模拟信号转变为可供微处理器处理的数字信号。

- 10 超高频振荡器和该电源、前置放大器一、微处理器连接，其负责产生 24.125GHz 的固定频率，做为检测信号发射的载波之用。

输入界面和该电源及微处理器连接，用以达成命令输入之用，可使用键盘做为输入装置，以其输入的数字做为开始起动回波检测之起始速度，并自动激活本发明之避撞雷达警示功能。

- 15 输出界面系以驱动电路与蜂鸣器构成，和该电源及微处理器连接，用以达成声音输出之功能；

微处理器先检测引擎起动电路是否起动，如果车辆引擎是起动的状态，则开始检测车速信号源之车速，并与键盘输入之设定速度做程序运算比较。

- 20 当车速信号源之车速高于键盘输入之设定速度时，则微处理器便自动激活本发明之雷达警示功能，同时微处理器会控制超高频振荡电路产生预先设定的固定发射频率，例如 24.125GHz，经过前置放大器一、功率放大器，放大其检测信号，并增强检测信号的发射功率，此时微处理

器打开电子开关一的开关，同时关闭电子开关二及电子开关三，检测信号的电磁波就经由微波天线发射出去。

这时微处理器的定时器归零重新计时，并关闭电子开关一的开关，同时停止超高频振荡电路的运作及打开电子开关二和电子开关三的开关，准备接收发射波碰到障碍物而产生的回波检测信号。

如果所接收之回波检测信号的时间，超过微处理器的定时器规定时间或在规定时间内未接收到回波检测信号，即表示移动车辆与障碍物之间距离超过所设定的距离，则雷达警示功能不动作，蜂鸣器亦不响。

当微波天线接收到回波检测信号，经过电子开关二、前置放大器二，将其信号放大输入至放大器一，如果障碍物是在近距离处，此时回波检测信号将非常强，故微处理器会自动打开反馈电路，以抑制放大器一之增益，可增加信号稳定度。

回波检测信号经过带通放大器时，带通频率仅能让信号为预先设定的固定发射频率相同的回波频率能通过此放大器，如固定发射频率为 24.125GHz 时，带通放大器只让 24.125GHz 的回波频率通过，而过滤其它不必要的频率，再经过放大器二放大其信号。

因所有的零件都有误差，会使得产品灵敏度不一致，可使用灵敏度调整来补正此问题。

当回波检测信号通过检波电路时，此检波电路的功能是将与固定发射频率相同频率的混波信号过滤，只剩下所需要的低频回波信号通过，再送到 A/D 转换器，转换成数字信号输入至微处理器运算处理。

微处理器接收到回波检测信号后，立即停止定时器计时，并记录该时间，再以接收到回波检测信号的时间总和，运算转换成与车辆间之距

离，并与车辆的车速信号源之实际速度为计算基础，计算比较车辆与对应移动物体所应保持的相对间距，如果检测距离等于或者小于所应保持的相对间距，则微处理器输出音频信号至驱动电路，使蜂鸣器作动发出警示。

- 5 于车辆后方安装本发明时，本发明的微处理器可以与车辆的尾灯和喇叭连接，当移动体以高速向本发明后方接近时，若移动体超出所设定的距离和/或速度对应值时，本发明除可向车辆本身发出警示，以提早做好闪躲的准备外。还可以向该移动体发出声、光的警示，以通知该移动体减缓速度并拉大安全间距。

- 10 上述之电源，其可为任意电源，以直接使用汽车电池作为电源为较佳。

上述之电子开关，其可为超高频电子开关或集成块。

上述之功率放大器、放大器、前置放大器、带通放大器、A/D 转换器等，其可为超高频差动放大器或集成块。

- 15 上述之超高频振荡电路，其可为公知之超高频振荡电路。

- 20 本发明具有由于有车速信号源引入微处理器，使车辆移动在高于所设定的速度时，自动激活本发明，启动检测车辆速度和安全间距之装置，能够根据自身车速来检测调整安全间距，并对低于相对本身车速的安全距离发出警告，防止追撞，车辆于高速移动时，本发明能以车辆移动之实际速度为计算基础，计算车辆与对应移动物体所应保持的相对间距，并适时地提出警示，而且设定发射和接收的固定微波频率，并通过有效的装置避免干扰，能很好地起到检测车速和安全距离的作用。

本发明具有使用者自行输入能自动开启防撞系统车辆移动最低速度的功能，以使车辆在移动中速度高于此速度时，自动开启本发明的检测车辆行驶速度和安全距离的功能，车辆移动中速度若低于此速度则自动关闭该功能，使得车辆驾驶者能够根据自己的驾驶习惯和路况随时调节最低的启动检测速度，避免预定的检测速度和间距引起的不必要的警报。

本发明具有当一移动体以高速向本发明接近时，当移动体超出所设定的安全距离和 / 或速度对应值时，本发明可向车辆本身发出警示，以提早做好闪躲的准备，并向该移动体发出声光音效的警示，以通知该移动体减缓速度并拉大安全间距。

当移动体以高速向本发明后方接近时，若移动体超出所设定的安全距离和 / 或速度对应值时，本发明可向车辆本身发出警示，以提早做好闪躲的准备。并向该移动体发出声光音效的警示，以通知该移动体减缓速度并拉大安全间距。

15 附图说明

图一为本发明实施例的结构图，

图二为本发明实施例微处理器的控制流程图，

图三为本发明实施例接收中断的控制流程图，

图四为本发明实施例回波检测信号接收中断的控制流程图，

图五为本发明实施例时间中断的控制流程图，

图六为本发明实施例发射时间中断的控制流程图。

图中，10 为 12V 汽车蓄电池，11 为电源转换电路，12 为微波天线，13 为超高频振荡电路，14 为前置放大器一，15 为功率放大器，16 为电子开关一，17 为电子开关二，18 为前置放大器二，19 为放大器一，20 为带通放大器，21 为放大器二，22 为检波电路，23 为 A/D 类比分
5 数码转换器，24 为电子开关三，25 为反馈电路，26 为蜂鸣器的驱动电路，27 为蜂鸣器，28 为车速信号源，29 为引擎启动检测电路，30 为微处理器，31 为键盘。

图一所示，电源转换电路 11 将汽车蓄电池的 12V 输出电压转换为 5V，并输出至上述的电路和微处理器 30。

10 电子开关一 16、功率放大器 15、前置放大器一 14、超高频振荡电路 13 构成微波发射电路；电子开关二 17、前置放大器二 18、放大器一 19、带通放大器 20、放大器二 21、检波电路 22、A/D 转换器 23 和电子开关三 24 构成检波电路。

当与微处理器 30 相连接的引擎启动电路 29 输入给微处理器 30 引擎
15 启动信号后，微处理器 30 就会检测与之连接的车速信号源 28，检测到车速信号源 28 的车速等于或高于最低启动本发明的车辆速度时，微处理器 30 会指令超高频振荡电路 13 产生 24.125GHz 的固定频率，经过前置放大器一 14，作信号载波后输出至功率放大器 15，功率放大器 15 将功率放大后输出至电子开关一 16，同时，微处理器命令电子开关一 16 打
20 开，通过微波天线 12 将微波信号发射出去；电子开关一 16 打开的同时，电子开关二 17、电子开关三 24 在微处理器 30 的指令下关闭。

最低启动本发明的车辆速度可以在微处理器内预先设定，也可以通过与微处理器相连接的键盘 31 输入。

微波信号发射出去的同时，微处理器 30 内的计时器归零重新计时，并指令关闭电子开关一 16，同时停止超高频振荡电路 13 的运作及打开电子开关二 17 和电子开关三 24，准备接收发射波碰到障碍物而产生的回波检测信号。

- 5 当微波天线 12 接收到回波检测信号，经过电子开关二 17、前置放大器二 18、将小信号放大后输出至放大器一 19，放大器一 19 将信号再放大，同时放大器一 19 又受反馈电路 25 控制，作回授信号补偿后输出至带通放大器 20，带通放大器 20 设定只放大且通过频率为 24.125GHz $\pm$ 3db 的信号，并输出至放大器二 21，放大器二 21 为可调整灵敏度
10 的放大器，它将信号放大后，输出至检波电路 22，检波电路 22 将 24.125GHz 的混波信号过滤，只剩下所需要的低频回波信号通过，再将这些信号输入到 A/D 转换器 23，然后通过电子开关三 24 输入到微处理器 30 作运算处理。

- 微处理器接收到回波信号后，立即停止计时器的时间，再以接收到回波检测信号的时间总和，计算并转换成车辆与障碍物之间的距离，并以车辆的车速信号源 28 的实际速度为计算基础，计算、比较车辆与对应移动物所应保持的距离，如果检测到的距离小于或者等于所应保持的距离，则微处理器 30 输出信号，指令蜂鸣器的驱动电路输出音频信号，使蜂鸣器发出声音警示。
15

- 20 图二所示，微处理器 30 设定本发明的中断周期，中断周期可以预先设定，然后检测车速，当车速达到预定的最低值时，微处理器 30 就会产生相应的旗标符号，检测到该符号，微处理器 30 才指令微波发射电路发射微波信号，发射后马上计时，并检测是否接收到回波信号，检测电路

中有回波信号时，微处理器 30 就会产生回波的时间旗标，并停止计时，然后将车速资料换算成为车距距离，换算回波时间成为回波距离，并验证车距是否大于等于回波距离，大于等于就启动蜂鸣器，提供警示，警示后取消发射波旗标和接收回波旗标，重新开始检测发射波旗标；没有回波信号时间旗标，就检测是否有回波信号逾时旗标，有就取消旗标，重新开始检测发射波旗标。

图三所示，微处理器 30 先读取车速资料，读取完成后，换算车速资料成为移动速度，确定移动速度是否大于设定的最低速度，大于，则设定车速旗标，以使微处理器启动本发明，移动速度低于设定速度时，清除车速旗标，车速接收完成，如果读取资料没有完成，检查是否逾时，逾时也清除车速旗标，不逾时则重新读取车速资料。

图四所示，回波检测信号接收中断是微处理器先检测是否有传送发射波旗标，有则读取回波时间，读取完成后设定接收回波旗标，中断过程结束，没有则确认读取是否逾时，有逾时就清除接收回波时间旗标，没有逾时就重新读取回波时间。

图五所示，微处理器的时间中断控制过程为：先检测引擎是否启动，确认引擎启动再检测是否有车速旗标，有车速旗标，关闭车速及回波检测信号中断条件，引擎没有启动或没有车速旗标就直接取消传送发射波旗标，过程结束；关闭车速及回波检测信号中断条件后，关闭电子开关二、电子开关三，打开电子开关一，传送发射检测信号及清除回波时间，然后打开电子开关二、电子开关三，关闭电子开关一，启动车速及回波检测信号中断条件，再设定传送发射波旗标及发射时间中断周期，整个过程结束。

图六所示，微处理器控制发射时间中断的流程为：先设定回波信号逾时旗标，然后取消传送发射波旗标，过程结束。

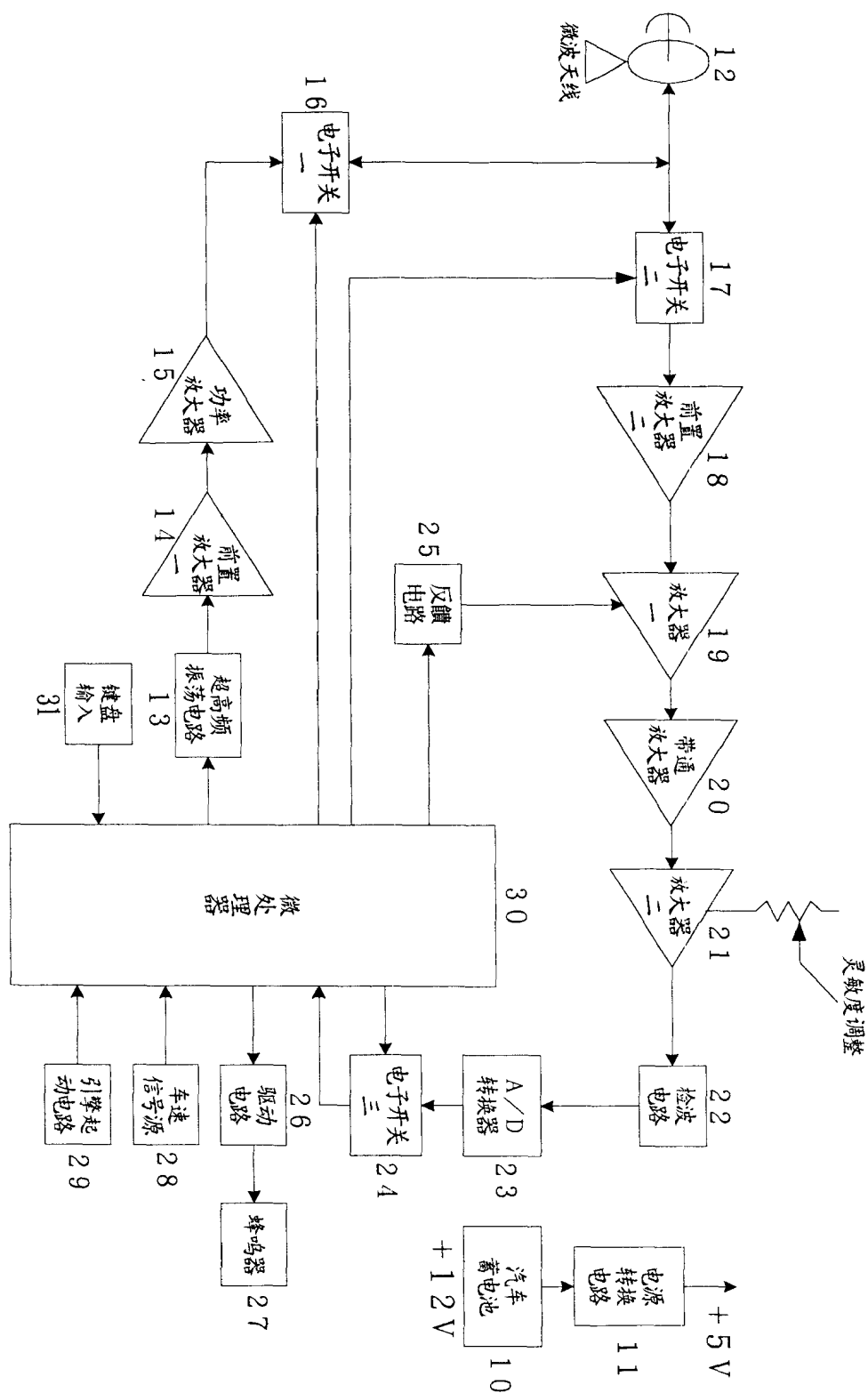


图 1

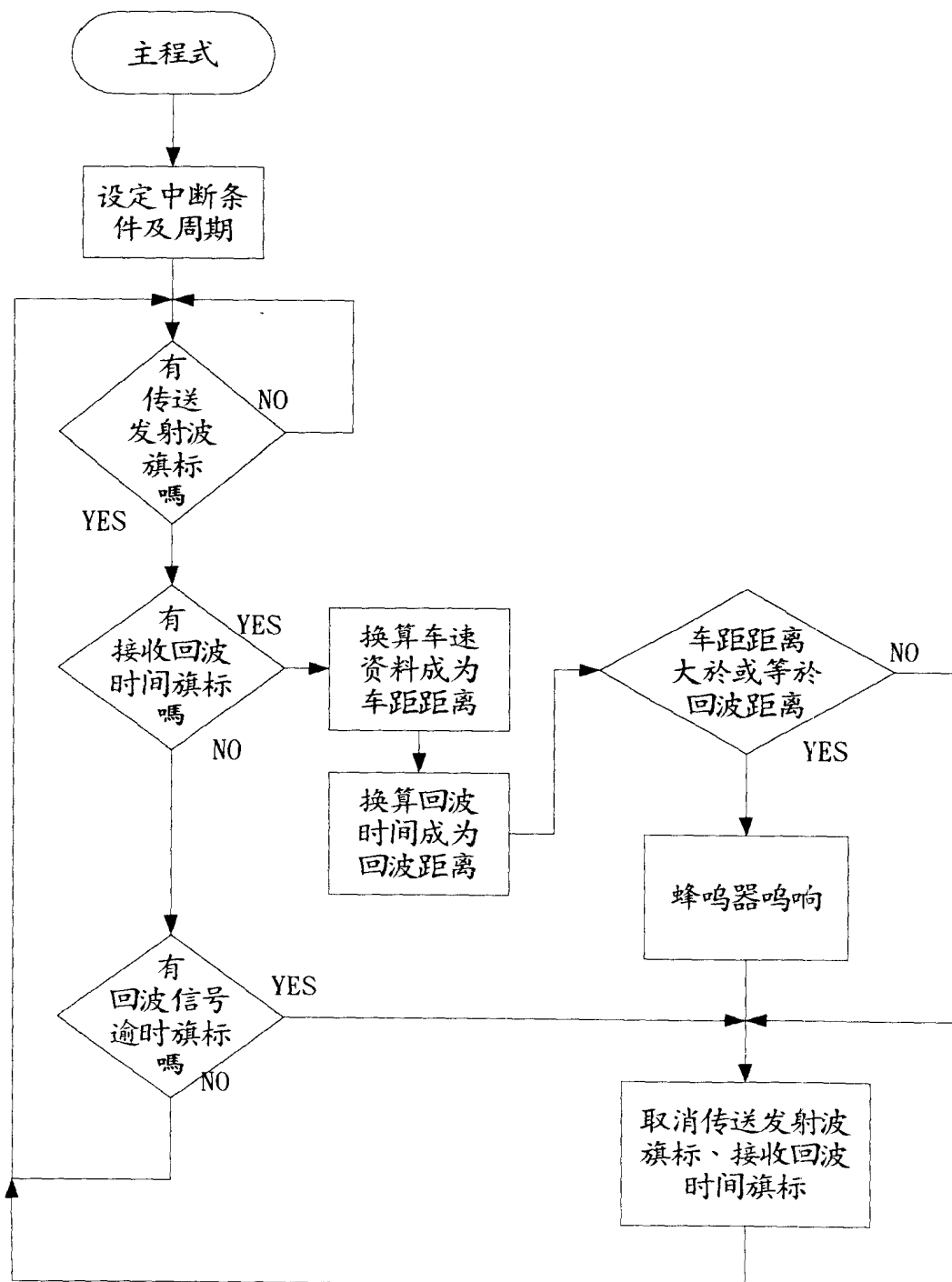


图 2

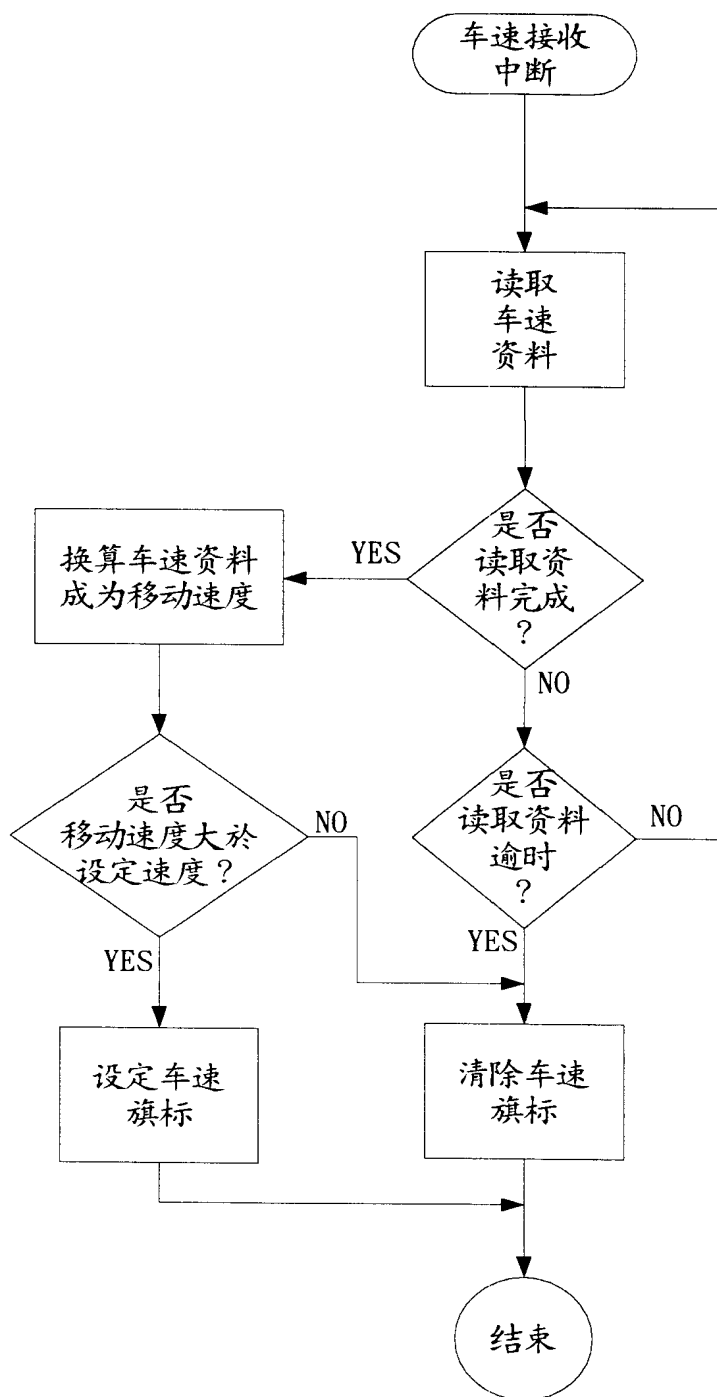


图 3

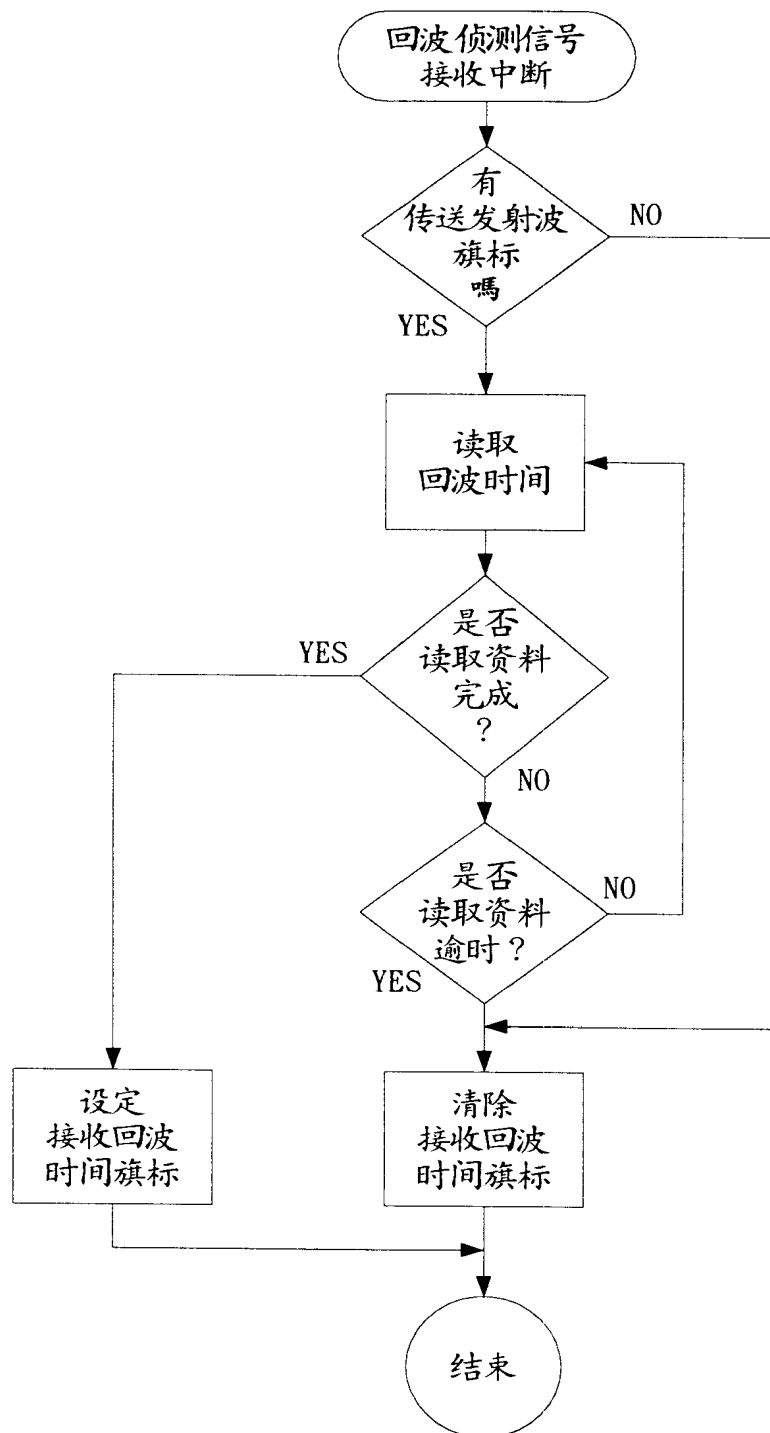


图 4

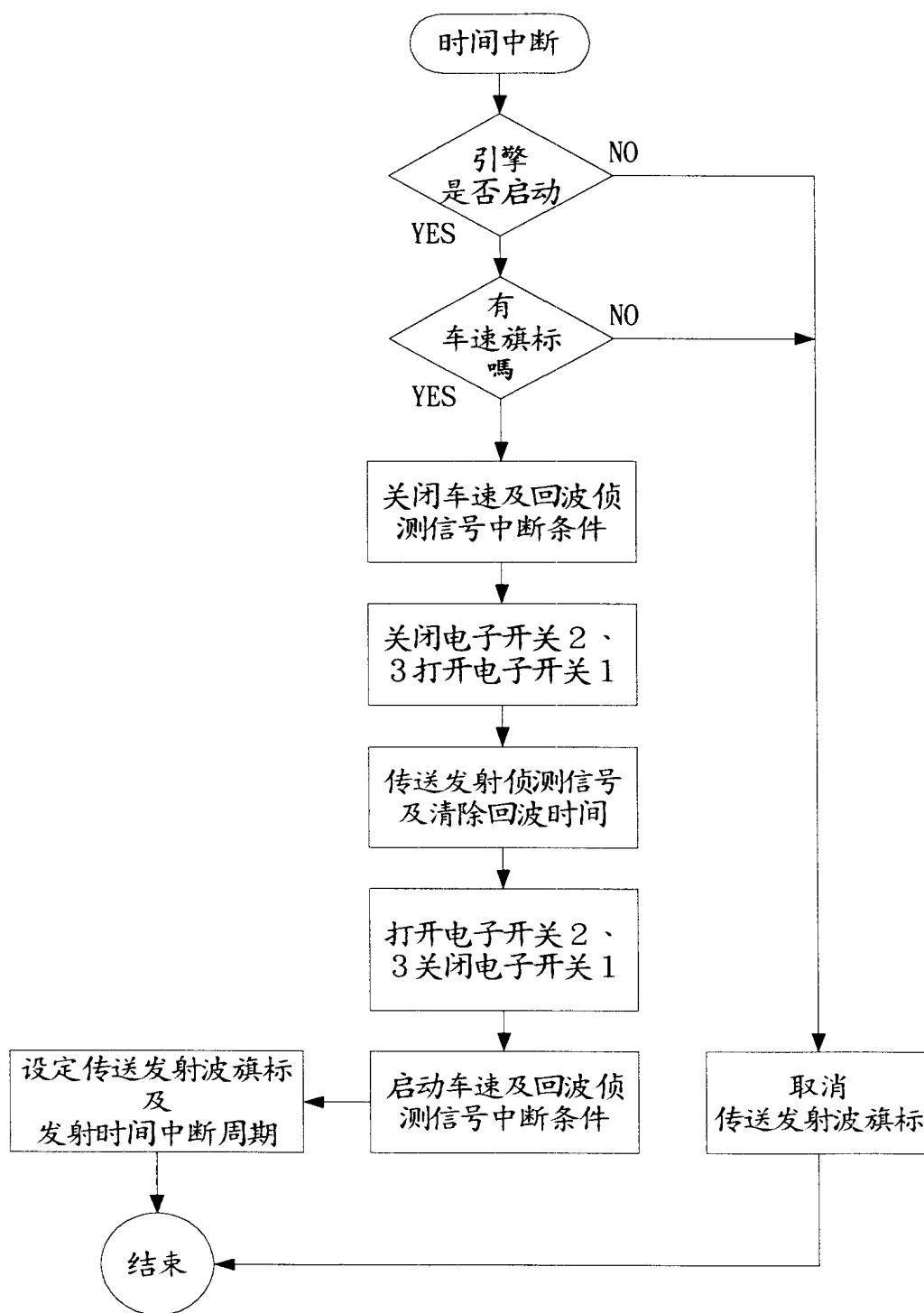


图 5

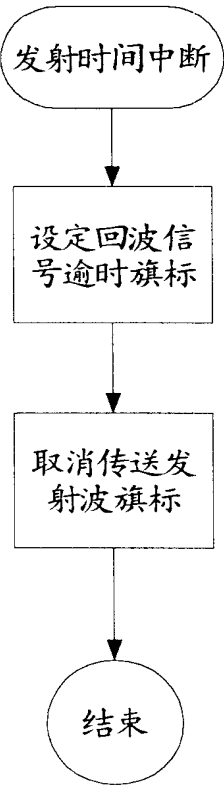


图 6



Espacenet

Bibliographic data: CN1676375 (A) — 2005-10-05

Automobile intelligent anticollision system

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Classification: - **international:** **B60R21/00; B60T7/12;** (IPC1-7): B60R21/00; B60T7/12
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Abstract of CN1676375 (A)

The present invention discloses an intelligent collision resisting system. Said system is formed from distance-measuring device, chip microprocessor, alarm subsystem and automatic brake device. Said invention is an all-weather traffic intelligent collision avoidance system applicable to general road condition.



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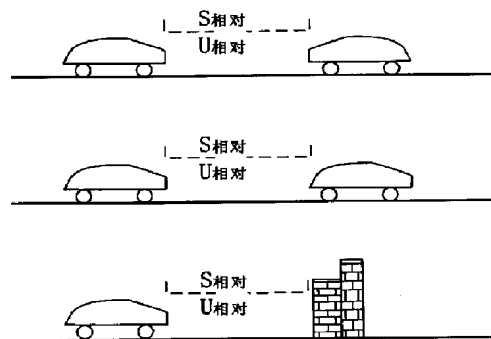
代理人 温 旭

权利要求书 1 页 说明书 6 页 附图 2 页

[54] 发明名称 一种汽车智能防撞系统

[57] 摘要

本发明公开的一种汽车智能防撞系统，由测距装置、单片机、报警子系统、自动刹车装置组成。该系统可依据实时测得的距离和相对速度自行推断行车是否安全，并在危险突发的情况下需急速刹车以保安全时可自动进行刹车，是一种全天候、适用于普遍路况的交通智能防撞系统，所用到的技术设施简单，可靠性高，且造价低，易推广。



1、一种汽车智能防撞系统，由测距装置、单片机、报警子系统、自动刹车装置组成，其特征在于：测距装置发射激光脉冲信号，单片机根据激光脉冲信号的发射与接收时间顺序实时地测出行车与前方机车或障碍物的相对距离和相对速度，并将所得的相对距离与安全行车所要求的安全距离相比较来判断行车是否处于安全行驶状态，当安全距离小于安全行车距离时，单片机发出指令给报警子系统提示司机，处于极度危险状态时，单片机直接将指令传给自动刹车装置，由自动刹车装置进行自动刹车。

2、根据权利要求 1 所述的汽车智能防撞系统，其特征在于：该系统由信号发生器 IC1 产生的信号，经编码器 IC2，功率放大器 IC3，红外发射二极管 D1 发射探测信号，由红外接收二极管 D2、IC4、电阻、电容组成的信号接收放大器 M 接收反射回的探测信号，经解码器 IC5 解码，由检测器 IC6 检测，并将实时检测到的信号传输到单片机 89C51 中，单片机 89C51 按设定好的程序推算出本车与前方机车或障碍物的相对距离 $s_{i\text{相对}}$ 和相对速度 $u_{i\text{相对}}$ ，将 $s_{i\text{相对}}$ 与事先内置于单片机 89C51 的安全行车函数 $s = f(u)$ 算出的 $s_{\text{安全}} = f(u_{i\text{相对}})$ 相比较，依据程序设定的逻辑，单片机 89C51 推断行车的安全情况，单片机 89C51 的输出一路信号与光电报警电路 IC10 连接，驱动光报警器 F、声报警器 G 报警；单片机 89C51 输出另一路信号与刹车电路 IC11 连接，控制刹车装置 D 刹车。

一种汽车智能防撞系统

所属技术领域

本发明涉及一种汽车智能防撞系统，属于汽车安全行驶领域、特别是涉及汽车行驶过程中自动避免与前方机车或障碍物相撞的一种智能防撞系统。

背景技术

汽车的安全行驶是大众日益关心的问题，一旦发生事故，其后果所造成的损失是难以估量的。然而在我国乃至全球因司机疏忽、疲劳、酒后开车或司机在紧急时刻反应不及，未能采取紧急刹车措施等情况所造成的车与车相撞、车与障碍物相撞的事件却时有发生。据官方统计，自二战后至今，因交通事故造成的人员伤亡不少于 20 世纪两次世界大战伤亡人员的总和。鉴于此，目前已有不少关于保证汽车安全行驶的技术，但能推广应用的并不多，主要是这些技术还存在诸多待解的问题。如申请号为 00101549.4 的中国专利，介绍一种“高速公路上的汽车防撞报警装置”，该装置面对的是于高速公路行驶的车辆，且只能显示前方车辆的距离并为司机提供可能的报警，却无法应对突发情况下，司机来不及操作的车车相撞。申请号为 02100762.4 的中国专利，介绍一种“智能化数字标尺高速公路汽车防撞系统”，该系统主要解决的是高速公路或类似场合避免汽车尾追的一种防撞，它要求在行驶路上每隔一定距离设无线收发数字标尺装

置，每一数字标尺设唯一的地址码，用以确定汽车的位置；而在垂直路面的方向上每间隔一段距离装红外或微波测距传感器，判断相应车道、进行数字通信和信号处理，它的应用要求对现有的公路进行大规模的改造，这决定了该系统难以推广应用。还有申请号为 02276471.2 的中国专利，介绍一种“红外激光全自动汽车防撞装置”，该装置的适用范围稍广，但在判断是否与前方机车或障碍物相撞的可能性时，它考虑的是以自身车辆的车速来评定行车的安全距离，没有考虑到两车相向行驶时其相对速度要大于自身的车速，此时相应的安全行车、刹车距离比只考虑自身车速而确定的安全行车、刹车距离要大得多。当然，亦有采用气囊保护、防护操作管装置等来保证行车安全的，但这些装置都是有碰撞发生之后才起作用，属于事后控制，只可以减缓碰撞所造成的损伤，而无法事先避免可能发生的碰撞。所以，现有的汽车自动防撞装置距离实际应用效果还不理想，还需要进行改进。

发明内容

本发明正是针对现有技术存在的问题而提出的一种汽车智能防撞系统。该系统可依据实时测得的距离和相对速度自行推断行车是否安全，并在危险突发情况下需急速刹车以保安全时可自动进行刹车。

一种汽车智能防撞系统，由测距装置、单片机、报警子系统、自动刹车装置组成，测距装置发射激光脉冲信号，单片机根据激光脉冲信号的发射与接收时间顺序实时地测出行车与前方机车或障碍物的相对距离和相对速度，并将所得的相对距离与安全行车所要求的安全距离相比较来判断行车是否处于安全行驶状态，当安全距离小于安全行车距离时，单片机发

出指令给报警子系统提示司机、或处于极度危险状态时，单片机直接将指令传给自动刹车装置，由自动刹车装置进行自动刹车。

本发明技术方案包括：由信号发生器 IC1 产生的信号，经编码器 IC2，功率放大器 IC3，红外发射二极管 D1 发射探测信号，由红外接收二极管 D2、IC4、电阻、电容组成的信号接收放大器 M 接收反射回的探测信号，经解码器 IC5 解码，由检测器 IC6 检测，并将实时检测到的信号传输到单片机 89C51 中，单片机 89C51 按设定好的程序推算出本车与前方机车或障碍物的相对距离 $s_{i\text{相对}}$ 和相对速度 $u_{i\text{相对}}$ ，将 $s_{i\text{相对}}$ 与事先内置于单片机 89C51 的安全行车函数 $s = f(u)$ 算出的 $s_{\text{安全}} = f(u_{i\text{相对}})$ 相比较，依据程序设定的逻辑，单片机 89C51 推断行车的安全情况，单片机 89C51 的输出一路信号与光电报警电路 IC10 连接，驱动光报警器 F、声报警器 G 报警；单片机 89C51 输出另一路信号与刹车电路 IC11 连接，控制刹车装置 D 刹车。

附图说明

下面结合附图和实施例对本实用新型进一步说明。

图 1 为本发明汽车行驶测距示意图；

图 2 为本发明电路输出控制图；

图 3 为本发明电路原理图。

图中：1、测距装置，2、4 红外激光发射器，3、红外激光接收器，5、单片机，6、自动刹车装置，7、报警器，8、10 灯光闪动，9、报警音。

具体实施方式

汽车在任一速度 u （ u 为汽车相对于地面的速度）下行驶时都有一对对应的安全刹车距离 s ，即有 $s = f(u)$ 。这一数据关系由汽车生产企业提供。

假设汽车与前方机车或障碍物的距离为 $s_{\text{相对}}$ ，相对速度为 $u_{\text{相对}}$ 。如图一所示。若两车同向行驶，一般有 $u_{\text{相对}} \leq u$ ，则 $f(u_{\text{相对}}) \leq f(u)$ ；若两车相向行驶，有 $u_{\text{相对}} \geq u$ ，则有 $f(u_{\text{相对}}) \geq f(u)$ ，因此选用相对速度 $u_{\text{相对}}$ 来确定安全刹车距离比选用汽车本身的车速 u 来确定安全刹车距离要合理、也保险得多。若汽车以 $u_{\text{相对}}$ 行驶时的安全刹车距离为 $s_{\text{安全}}$ ，即 $s_{\text{安全}} = f(u_{\text{相对}})$ （此时相当于假定前言机车或障碍物静止），为保证汽车的安全，应满足：

如果 1： $s_{\text{相对}} \geq s_{\text{安全}}$ 正常行驶；

如果 2： $s_{\text{相对}} \leq s_{\text{安全}}$ 紧急刹车否则危险。

但为了降低紧急刹车给车内人员带来的不适，建议在刹车阶段提供两种选择：人工制动和自动制动。

当 $s_{\text{安全}} < s_{\text{相对}} \leq \lambda \cdot s_{\text{安全}}$ ， $\lambda > 1$ ，报警提示司机进行人工刹车；当 $s_{\text{相对}} \leq s_{\text{安全}}$ ，人工刹车已来不及，此时由自动制动装置实行紧急刹车。

因此本汽车智能防撞系统处理以下三种情况：

对于： $u_{\text{相对}}$ 、 $s_{\text{相对}}$ ，

如果 1： $s_{\text{相对}} \geq \lambda \cdot s_{\text{安全}}$ 正常行驶；

如果 2： $s_{\text{安全}} < s_{\text{相对}} \leq \lambda \cdot s_{\text{安全}}$ ， $\lambda > 1$ 报警、人工制动；

如果 3： $s_{\text{相对}} \leq s_{\text{安全}}$ 自动制动装置紧急刹车。

下面结合附图对本发明的实施作详细描述。

图 1 为行车遇到的三种情况：两车相向行驶、两车同向行驶、行车前方有障碍物。如图 2 所示，测距装置 1 由红外激光发射器 2、4，红外激光接收器 3 等组成。红外激光发射器 2、4 周期性地向汽车前方发射脉冲

信号，该信号遇到障碍立即反射回来，由红外激光接收器 3 接收。假设红外激光信号的发射周期为 T ，传播速度为 $u_{\text{信}}$ 。单片机 5 依据第 i 个周期信号从发射到回收所经历的时间为 t_{is} 算得本车与前方机车或障碍物的相对距离： $s_{i\text{相对}} = u_{\text{信}} \cdot t_{\text{is}} / 2$ ，再依据测得的相邻两次距离： $s_{i-1\text{相对}}$ 、 $s_{i\text{相对}}$ 算得本车与前方机车或障碍物的相对速度为： $u_{i\text{相对}} = (s_{i-1\text{相对}} - s_{i\text{相对}}) / T$ ，其中 i 为自然数。将实时测得的 $s_{i\text{相对}}$ 与事先内置于单片机 5 的安全行车函数 $s = f(u)$ 算出的 $s_{\text{安全}} = f(u_{i\text{相对}})$ 相比较，依据程序设定的逻辑，单片机 5 自行推断行车的安全情况。若 $s_{\text{相对}} \geq \lambda \cdot s_{\text{安全}}$ ，说明汽车处于安全行驶状态；若 $s_{\text{安全}} < s_{\text{相对}} \leq \lambda \cdot s_{\text{安全}}$ ， $\lambda > 1$ ，说明汽车处于危险行驶状态，此时单片机 5 发出报警指令，报警器 7 便发出报警信号：灯光闪动 8、10 和报警音 9，提示司机避免安全事故；若 $s_{\text{相对}} \leq s_{\text{安全}}$ ，此时提示司机进行人为刹车已来不及，单片机 5 会立即将指令传到自动刹车装置 6，进行自动刹车，避免发生撞车事故。其中自动刹车装置 6 是通过添加诱发性的自动制动装置共用本车原有的制动系统。

图 3 是本发明的电路实施例图。如图 3 所示，由信号发生器 IC1 门生的信号，经编码器 IC2，功率放大器 IC3，红外发射二极管 D1 发射探测信号。由红外接收二极管 D2、IC4、电阻、电容组成的信号接收放大器 M 接收反射回的探测信号，经解码器 IC5 解码，由检测器 IC6 检测，并将实时检测到的信号传输到单片机 89C51 中，单片机 89C51 按设定好的程序推算出本车与前方机车或障碍物的相对距离 $s_{i\text{相对}}$ 和相对速度 $u_{i\text{相对}}$ ，将 $s_{i\text{相对}}$ 与事先内置于单片机 89C51 的安全行车函数 $s = f(u)$ 算出的 $s_{\text{安全}} = f(u_{i\text{相对}})$ 相比较，依据程序设定的逻辑，单片机 89C51 推断行车的安全情况。若

推断出汽车处于危险行驶状态，则单片机 89C51 将报警信号发给光电报警电路 IC10，光报警器 F、声报警器 G 报警；若推断出汽车处于极其危险的行驶状态，则单片机 89C51 将紧急刹车信号传给刹车电路 IC11，控制刹车装置 D 刹车。稳压电源 IC7、复位电路 IC8、时钟电路 IC9 与单片机 89C51 相接。

本发明可依据实时测得的距离和相对速度自行推断行车是否安全，并在危险突发情况下需急速刹车以保安全时可自动进行刹车，是一种全天候、适用于普遍路况的交通智能防撞系统，所用到的技术设施简单，可靠性高，且造价低，易推广。

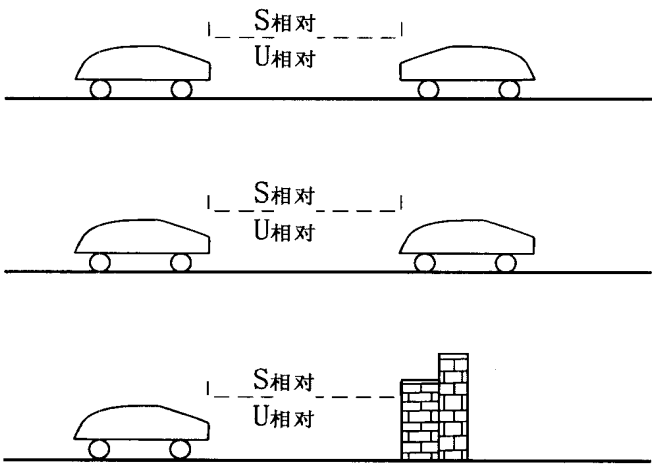


图1

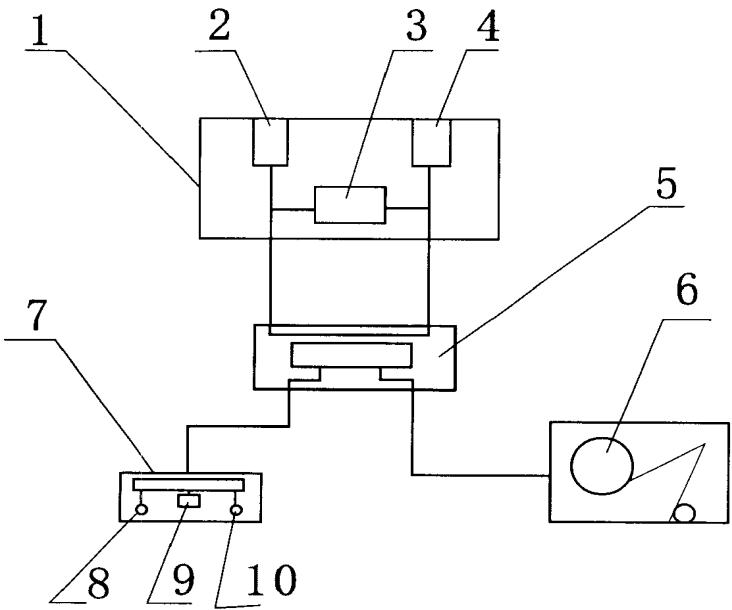


图2

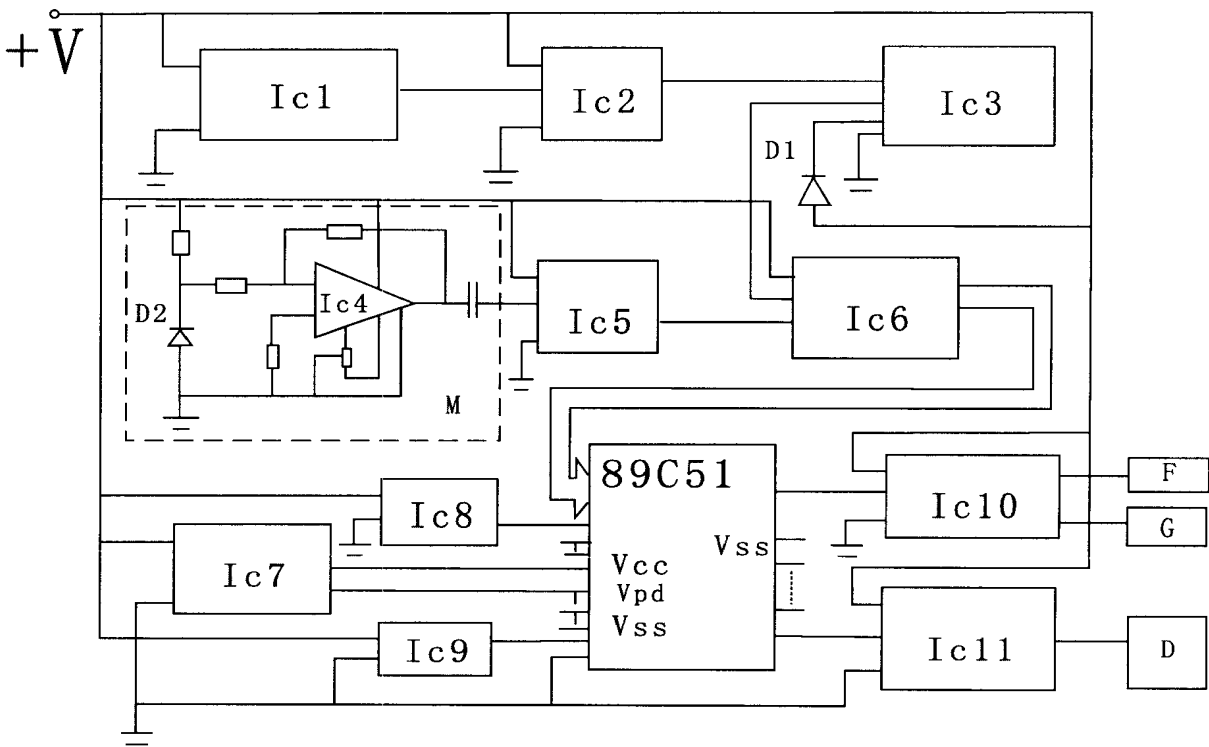


图3



Espacenet

Bibliographic data: CN102923158 (A) — 2013-02-13

Rail train emergency braking safety system

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Classification: - **international:** *B60T17/22; B61D25/00; B61H7/04; E05F15/692*
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Abstract of CN102923158 (A)

A rail train emergency braking safety system can issue a safety warning in emergency braking, is slow to brake and free from derailing, can automatically open all windows in necessary and can open more passages for life-saving and rescuing; and the rail train emergency braking safety system is characterized by consisting a main control system and five subsystems such as a brake warning system, a window automatic opening system, a derailing prevention device, an auxiliary acceleration device and a stable brake control system; the main control system consists of voltage E, a brake switch S, a time circuit IC1, an alarming circuit controller K1, a brake distribution circuit HC2, a deceleration umbrella controller K2, a window controller K3 and corresponding devices; and the time circuit IC1 is respectively connected with the alarming controller K1, the brake distribution circuit IC2, the deceleration umbrella controller K3 and the window automatic controller.



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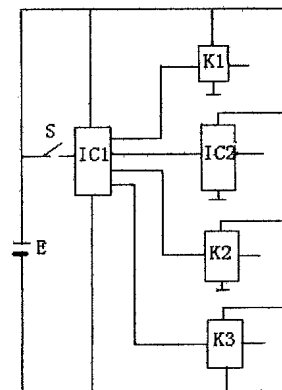
权利要求书 1 页 说明书 3 页 附图 1 页

(54) 发明名称

轨道列车紧急制动安全系统

(57) 摘要

一种轨道列车紧急制动安全系统,能够在紧急制动时发出避险预警,平缓制动,不会脱轨,能够在需要时自动打开全部车窗,给逃生和救援打开更多通道;特征在于:由一个总控制系统和制动预警,车窗自动控制,防脱轨装置,附加减速装置,平稳制动控制系统五个分系统组成;其中总控制系统由电压 E,制动开关 S,时间电路 IC1,报警电路控制器 K1,制动分配电路 IC2,减速伞控制器 K2,车窗控制器 K3 及相应的元器件组成;时间电路 IC1 的各路分别与报警控制器 K1,制动分配电路 IC2,减速伞控制器 K3,车窗自动控制器 K4 连接。



1. 轨道列车紧急制动安全系统的特征在于：由一个总控系统和制动预警，车窗自动控制，防脱轨装置，附加减速装置，平稳制动控制系统五个分系统组成。

2. 权利要求 1 所述的总控系统的特征在于：由电压 E，制动开关 S，时间电路 IC1，报警电路控制器 K1，制动分配电路 HC2，减速伞控制器 K2，车窗控制器 K3 及相应的元器件组成；电源 E 取自车载电源，其正负极分别与各电路器件的正负极对应连接，正极又通过开关 S 与 IC1 的触发端连接，时间电路 IC1 的 1 路输出与报警控制器 K1 的触发端连接，2 路输出与制动分配电路 IC2 的触发端连接，IC2 的输出与制动系统连接，3 路输出与减速伞控制器 K3 的控制端连接，4 路输出与车窗自动控制器 K4 连接；其中制动开关 S 接通后 1 路立即输出制动报警指令，二路适当延时输出制动指令，3 路再延时输出打开减速伞指令，列车停止后，4 路输出打开车窗指令。

3. 权利要求 1 所述的制动预警分系统的特征在于：是安装在各车厢的报警器，受控于 K1。

4. 权利要求 1 所述的附加减速装置的特征在于：是安装在车厢外的减速伞，受控于 K2，权利要求 1 所述的。

5. 权利要求 1 所述的所述的平稳制动控制系统的特征在于：是列车的制动系统，受控于 IC2，又 IC2 对制动力进行控制分配，避免突然制动。

6. 权利要求 1 所述的防脱轨分系统的特征在于：由防脱轨挂钩 (2) 紧固螺栓 (3) 组成；防脱轨挂钩 (2) 的上端扣在列车的底盘大梁 (1) 上，下端扣在轨道 (4) 上，并预留适量的间隙，以便行驶或转弯时不与轨道摩擦，然后用紧固螺栓 (3) 紧固，为增强抗拉力，挂钩 (2) 的两侧可以背加强筋，每节车厢安装数量根据需要确定。

7. 权利要求 1 所述的车窗自动控制分系统的特征在于：由车窗和控制装置两部分组成，车窗部分由玻璃 (5)，密封圈 (6)，扳手 (7)，合页 (9) 组成，密封圈 (6) 套在玻璃 (5) 外周，对车窗和窗口进行密封，用合页 (9) 对车窗和窗口进行连接，扳手 (7) 通过紧固件与车窗边沿连接，并可转动，将车窗关上，向内拉扳手，并转动使其卡在窗口上，使车窗压紧固定；控制部分由动力装置 M，电器开关 K3，拨叉 (1)，限位开关 (2)，牵引绳 (3)，滚轮 (4)，牵引件 (8) 组成；开关 K 的输出与动力装置 M 的线圈连接，M 通过拉线与拨叉 (1) 的主动臂连接，滚轮 (4) 固定在牵引绳 (3) 上，位置靠近卡紧车窗的拉手 (7) 旁边，牵引绳 (3) 的另一端与牵引件 (8) 的一端连接，牵引件 (8) 的另一端通过转轴固定在车后端的车窗旁；动力装置 M，开关 K3，固定在车前端的车窗旁，拨叉 (1) 通过转轴固定在合适位置，限位开关 (2) 固定在拨叉 (1) 旁，其输出与开关 K3 的控制端连接；遇到紧急情况，需要从车窗逃生，只要按一下开关 K，动力装置 M 便会通过拨叉 (1) 拉动牵引绳 (3)，并通过滚轮 (4) 带动扳手 (7) 转动，使车窗全部打开，也可手动转动扳手打开车窗。

轨道列车紧急制动安全系统

[0001] 技术领域 : 本发明涉及一种轨道列车制动系统, 尤其是一种轨道列车紧急制动安全系统

[0002] 背景技术 : 现有的轨道列车制动系统存在着五方面不足, 分别是 : 制动时, 仅靠车轮与轨道几乎是点接触的滑动摩擦力克服巨大的惯力进行制动, 导致制动距离很长, 增大了碰撞风险 ; 没有防脱轨装置, 增加了脱轨而导致旅客二次伤害的危险 ; 没有制动预警系统, 使旅客来不及采取防范措施, 巨大的惯力会将旅客向前进方向抛出, 导致旅客被伤害 ; 突然制动使车内的物品被巨大的惯力抛落, 导致旅客被砸伤 ; 车窗没有逃生自动控制装置, 旅客无法从车窗逃生, 救援人员也不能从车窗进入施救, 导致伤害进一步扩大 ; 总结 7. 23 中国温州特大列车追尾事故更暴露了原制动系统的不足, 如果具备了提前预警装置, 旅客及时采取防范措施, 就不会伤亡的那么惨 ; 如果有防脱轨装置, 后车就不会把前车压扁两节车厢后又摔到桥下, 导致被压的车厢内的大量旅客伤亡, 也不会使摔到桥下的旅客受到二次伤害。

[0003] 发明内容 : 为了解决上述问题, 本发明提供了一种轨道列车紧急制动安全系统, 能够在紧急制动时对旅客发出避险预警, 科学分配制动力, 将突然制动变为平缓制动, 缩短制动距离或虽然制动距离没有缩短, 但制动变得更为平缓, 即使发生撞击, 也不会脱轨, 大幅度降低紧急制动造成的伤害和损失, 能够在需要时自动打开全部车窗, 给逃生和救援打开更多通道 ; 从而大幅度降紧急制动所造成的损失 ; 实现上述发明所采取的技术方案特征在于 : 由一个总控系统和制动预警, 车窗自动控制, 防脱轨装置, 附加减速装置, 平稳制动控制系统五个分系统组成 ; 其中总控系统由电压 E, 制动开关 S, 时间电路 IC1, 报警电路控制器 K1, 制动分配电路 HC2, 减速伞控制器 K2, 车窗控制器 K3 及相应的元器件组成 ; 电源 E 取自车载电源, 其正负极分别与各电路器件的正负极对应连接, 正极又通过开关 S 与 IC1 的触发端连接, 时间电路 IC1 的 1 路输出与报警控制器 K1 的触发端连接, 2 路输出与制动分配电路 IC2 的触发端连接, IC2 的输出与制动系统连接, 3 路输出与减速伞控制器 K3 的控制端连接, 4 路输出与车窗自动控制器 K4 连接 ; 其中制动开关 S 接通后 1 路立即输出制动报警指令, 二路适当延时输出制动指令, 3 路再延时输出打开减速伞指令, 列车停止后, 4 路输出打开车窗指令 ; 所述的制动预警分系统是安装在各车厢的报警器, 受控于 K1 ; 所述的附加减速装置是安装在车厢外的减速伞, 受控于 K2, 所述的平稳制动控制系统是列车的制动系统, 受控于 IC2, 又 IC2 对制动力进行控制分配, 避免突然制动 ; 所述的防脱轨分系统由防脱轨挂钩 (2) 紧固螺栓 (3) 组成 ; 防脱轨挂钩 (2) 的上端扣在列车的底盘大梁 (1) 上, 下端扣在轨道 (4) 上, 并预留适量的间隙, 以使行驶或转弯时不与轨道摩擦, 然后用紧固螺栓 (3) 紧固, 为增强抗拉力, 挂钩 (2) 的两侧可以背加强筋, 每节车厢安装数量根据需要确定 ; 所述的车窗自动控制分系统由车窗和控制装置两部分组成, 车窗部分由玻璃 (5), 密封圈 (6), 扳手 (7), 合页 (9) 组成, 密封圈 (6) 套在玻璃 (5) 外周, 对车窗和窗口进行密封, 用合页 (9) 对车窗和窗口进行连接, 扳手 (7) 通过紧固件与车窗边沿连接, 并可转动, 将车窗关上, 向内拉扳手, 并转动使其卡在窗口上, 使车窗压紧固定 ; 控制部分由动力装置 M, 电器开关 K3, 拨叉 (1), 限位开关 (2), 牵引绳 (3), 滚轮 (4), 牵引件 (8) 组成 ; 开关 K 的输出与动力装置

M 的线圈连接, M 通过拉线与拨叉 (1) 的主动臂连接, 滚轮 (4) 固定在牵引绳 (3) 上, 位置靠近卡紧车窗的拉手 (7) 旁边, 牵引绳 (3) 的另一端与牵引件 (8) 的一端连接, 牵引件 (8) 的另一端通过转轴固定在车后端的车窗旁; 动力装置 M, 开关 K3, 固定在车前端的车窗旁, 拨叉 (1) 通过转轴固定在合适位置, 限位开关 (2) 固定在拨叉 (1) 旁, 其输出与开关 K3 的控制端连接; 遇到紧急情况, 需要从车窗逃生, 只要按一下开关 K, 动力装置 M 便会通过拨叉 (1) 拉动牵引绳 (3), 并通过滚轮 (4) 带动扳手 (7) 转动, 使车窗全部打开, 也可手动转动扳手打开车窗, 本发明的有益效果在于: 可把紧急制动对乘客造成的伤害降到最低限度, 下面结合附图和实施例进一步说明。

[0004] 附图 1 是总控系统原理框图

[0005] 附图 2 是防脱轨系统结构框图

[0006] 附图 3 是车窗自动控制电原理和结构图

[0007] 实施例 1. 附图 1 所示的特征在于: 由电压 E, 制动开关 S, 时间电路 IC1, 报警电路控制器 K1, 制动分配电路 HC2, 减速伞控制器 K2, 车窗控制器 K3 及相应的元器件组成; 电源 E 取自车载电源, 其正负极分别与各电路器件的正负极对应连接, 正极又通过开关 S 与 IC1 的触发端连接, 时间电路 IC1 的 1 路输出与报警控制器 K1 的触发端连接, 2 路输出与制动分配电路 IC2 的触发端连接, IC2 的输出与制动系统连接, 3 路输出与减速伞控制器 K3 的控制端连接, 4 路输出与车窗自动控制器 K4 连接; 其中制动开关 S 接通后 1 路立即输出制动报警指令, 二路适当延时输出制动指令, 3 路再延时输出打开减速伞指令, 列车停止后, 4 路输出打开车窗指令;

[0008] 实施例 2. 所述的平稳制动控制系统是列车的制动系统, 受控于 IC2, 又 IC2 对制动力进行控制分配, 避免突然制动;

[0009] 实施例 3. 所述的制动预警分系统的特征在于: 是安装在各车厢的报警器, 受控于 K1;

[0010] 实施例 4. 所述的附加减速装置是安装在车厢外的减速伞, 受控于 K2, 所述的平稳制动控制系统是列车的制动系统, 受控于 IC2, 又 IC2 对制动力进行控制分配, 避免突然制动;

[0011] 实施例 5. 附图 2 所示的特征在于: 由防脱轨挂钩 (2) 紧固螺栓 (3) 组成; 防脱轨挂钩 (2) 的上端扣在列车的底盘大梁 (1) 上, 下端扣在轨道 (4) 上, 并预留适量的间隙, 以便行驶或转弯时不与轨道摩擦, 然后用紧固螺栓 (3) 紧固, 为增强抗拉力, 挂钩 (2) 的两侧可以背加强筋, 每节车厢安装数量根据需要确定;

[0012] 实施例 6. 所示的特征在于: 车窗自动控制分系统由车窗和控制装置两部分组成, 车窗部分由玻璃 (5), 密封圈 (6), 扳手 (7), 合页 (9) 组成, 密封圈 (6) 套在玻璃 (5) 外周, 对车窗和窗口进行密封, 用合页 (9) 对车窗和窗口进行连接, 扳手 (7) 通过紧固件与车窗边沿连接, 并可转动, 将车窗关上, 向内拉扳手, 并转动使其卡在窗口上, 使车窗压紧固定; 控制部分由动力装置 M, 电器开关 K3, 拨叉 (1), 限位开关 (2), 牵引绳 (3), 滚轮 (4), 牵引件 (8) 组成; 开关 K 的输出与动力装置 M 的线圈连接, M 通过拉线与拨叉 (1) 的主动臂连接, 滚轮 (4) 固定在牵引绳 (3) 上, 位置靠近卡紧车窗的拉手 (7) 旁边, 牵引绳 (3) 的另一端与牵引件 (8) 的一端连接, 牵引件 (8) 的另一端通过转轴固定在车后端的车窗旁; 动力装置 M, 开关 K3, 固定在车前端的车窗旁, 拨叉 (1) 通过转轴固定在合适位置, 限位开关 (2) 固定

在拨叉 (1) 旁, 其输出与开关 K3 的控制端连接 ; 遇到紧急情况, 需要从车窗逃生, 只要按一下开关 K, 动力装置 M 便会通过拨叉 (1) 拉动牵引绳 (3), 并通过滚轮 (4) 带动扳手 (7) 转动, 使车窗全部打开, 也可手动转动扳手打开车窗 ; 虽然制动前先预警, 增加了制动时间, 但减速伞又缩短了制动时间和距离。

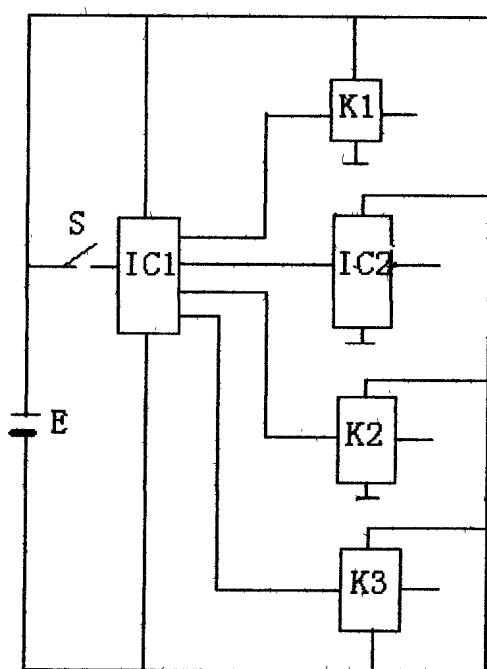


图 1

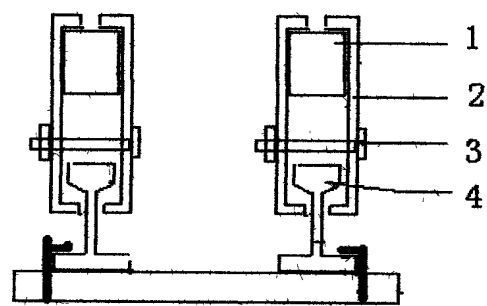


图 2

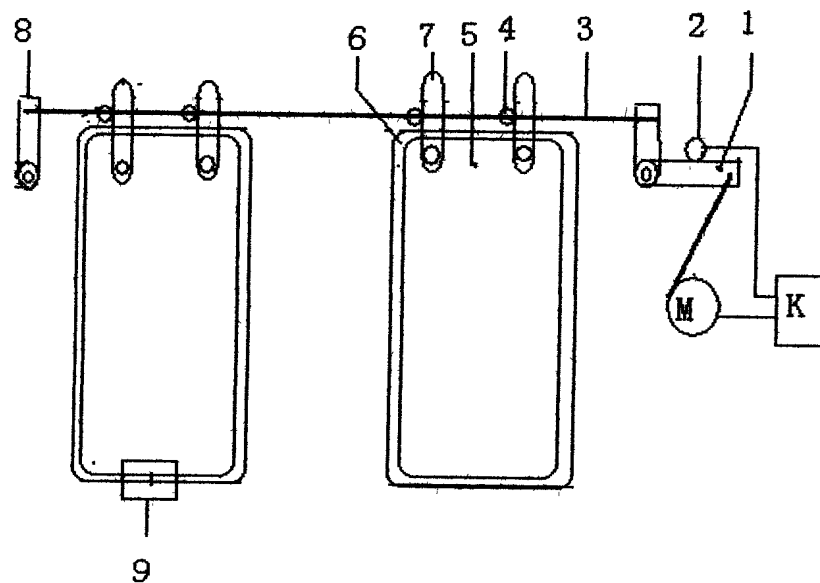


图 3

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 29153WO01	FOR FURTHER ACTION	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US2016/023754	International filing date <i>(day/month/year)</i> 23 March 2016	(Earliest) Priority Date <i>(day/month/year)</i> 23 March 2015
Applicant METROM RAIL, LLC		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ Certain claims were found **unsearchable** (see Box No. II).

3. ☒ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the drawings to be published with the abstract is Figure No. 1A

☐ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☒ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2016/023754

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
See supplemental page

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-20

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2016/023754

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - B61L 23/06; B61L 23/34; B61L 25/02; G08B 1/08; G08B 21/02; G08B 21/18 (2016.01) CPC - B61L 23/06; B61L 23/34; B61L 25/02; G08B 1/08; G08B 13/2488; G08B 21/02 (2016.05) According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC - B61L 23/06; B61L 23/34; B61L 25/02; G08B 1/08; G08B 21/02; G08B 21/18; G08G 1/123; G08G 1/16; G08G 7/02 CPC - B61L 23/06; B61L 23/34; B61L 25/02; G08B 1/08; G08B 13/2488; G08B 21/02; G08B 21/18; G08G 1/123; G08G 1/16; G08G 1/163; G08G 1/166; G08G 7/02; G08G 9/02 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC - 246/15; 246/122R; 246/124; 340/540; 340/901; 340/903; 340/933; 340/944; 701/301 (keyword delimited) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Orbit, Google Patents, Google Scholar Search terms used: alarm, alert, protect, safety, worker, personnel, train, rail, wearable, circuitry, antenna, diverse, polarize, motion sensor		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/0006912 A1 (SHEARDOWN et al) 13 January 2011 (13.01.2011) entire document	1, 7, 8, 11, 12, 15, 20
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Y		2-6, 9, 10, 13, 14, 16-19
Y	US 2014/0045547 A1 (SILVERPLUS, INC.) 13 February 2014 (13.02.2014) entire document	2-5
Y	US 2011/0152971 A1 (NGHIEM et al) 23 June 2011 (23.06.2011) entire document	6, 13, 14, 18
Y	US 2012/0296562 A1 (CARLSON et al) 22 November 2012 (22.11.2012) entire document	9, 10, 16, 17, 19
A	US 5,727,758 A (PENZA et al) 17 March 1998 (17.03.1998) entire document	1-20
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 06 July 2016		Date of mailing of the international search report 08 AUG 2016
Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300		Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)

Continued from Box No. III Observations where unity of invention is lacking

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-20, drawn to a system for worker protection, the system comprises: a compact wearable personal alert device.

Group II, claims 21-26, drawn to a system for worker protection, the system comprises: a vehicle-mounted alert device.

Group III, claims 27-30, drawn to a system for worker protection, the system comprises: a wayside detection unit.

The inventions listed as Groups I, II and III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: a compact wearable personal alert device, configured for use by a worker, the personal alert device comprising an attachment structure for attaching the personal alert device to the worker or an item used by the worker; generate, in response to signals received from a companion alert device, a safety alert; and output, via the one or more indicator components, one or more alert indications to the worker based on the safety alert as claimed therein is not present in the invention of Groups II and III. The special technical feature of the Group II invention: broadcast alert triggering signals; and generate, in response to triggering of alerts, data relating to alerts and/or to other devices or objects in path of the vehicle; and output based on the data, via the one or more I/O components, feedback information to the operator as claimed therein is not present in the invention of Groups I or III. The special technical feature of the Group III invention: a wayside detection unit, configured for placement on or near path of a vehicle; determine, based on sensory data obtained from the one or more sensors, when the vehicle is approaching the wayside detection unit as claimed therein is not present in the invention of Groups I or II.

Groups I, II and III lack unity of invention because even though the inventions of these groups require the technical feature of a system for worker protection; a housing; one or more antennas, configured for transmitting and/or receiving wireless signals; one or more circuits operable to process signals and data, and to perform one or more applications or functions, this technical feature is not a special technical feature as it does not make a contribution over the prior art.

Specifically, US 2012/0296562 A1 (CARLSON et al) 22 November 2012 (22.11.2012) teaches a system for worker protection (Para. 25); a housing (Para. 40); one or more antennas, configured for transmitting and/or receiving wireless signals (Para. 28); one or more circuits operable to process signals and data, and to perform one or more applications or functions (Para. 49).

Since none of the special technical features of the Group I, II or III inventions are found in more than one of the inventions, unity of invention is lacking.

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To: RAMI N. MOUSSA
MCANDREWS, HELD & MALLOY LTD.
500 WEST MADISON STREET
34TH FLOOR
CHICAGO, IL 60661

Date of mailing
(day/month/year)

08 AUG 2016

Applicant's or agent's file reference
29153WO01

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US2016/023754

International filing date (day/month/year)

23 March 2016

Priority date (day/month/year)

23 March 2015

International Patent Classification (IPC) or both national classification and IPC

IPC(8) - B61L 23/06; B61L 23/34; B61L 25/02; G08B 1/08; G08B 21/02; G08B 21/18 (2016.01)

CPC - B61L 23/06; B61L 23/34; B61L 25/02; G08B 1/08; G08B 13/2488; G08B 21/02 (2016.05)

Applicant
METROM RAIL, LLC

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450
Facsimile No. 571-273-8300

Date of completion of this opinion

06 July 2016

Authorized officer

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (January 2015)

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2016/023754

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).
3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. ☐ forming part of the international application as filed:
 - ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in the form of an image file.
 - b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
 - ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2016/023754

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time limit:
- ☐ paid additional fees.
 - ☐ paid additional fees under protest and, where applicable, the protest fee.
 - ☐ paid additional fees under protest but the applicable protest fee was not paid.
 - ☒ not paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

- ☐ complied with.
- ☒ not complied with for the following reasons:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-20, drawn to a system for worker protection, the system comprises: a compact wearable personal alert device.

Group II, claims 21-26, drawn to a system for worker protection, the system comprises: a vehicle-mounted alert device.

Group III, claims 27-30, drawn to a system for worker protection, the system comprises: a wayside detection unit.

The inventions listed as Groups I, II and III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: a compact wearable personal alert device, configured for use by a worker, the personal alert device comprising an attachment structure for attaching the personal alert device to the worker or an item used by the worker; generate, in response to signals received from a companion alert device, a safety alert; and output, via the one or more indicator components, one or more alert indications to the worker based on the safety alert as claimed therein is not present in the invention of Groups II and III. The special technical feature of the Group II invention: broadcast alert triggering signals; and generate, in response to triggering of alerts, data relating to alerts and/or to other devices or objects in path of the vehicle; and output based on the data, via the one or more I/O components, feedback information to the operator as claimed therein is not present in the invention of Groups I or III. The special technical feature of the Group III invention: a wayside detection unit, configured for placement on or near path of a vehicle; determine, based on sensory data obtained from the one or more sensors, when the vehicle is approaching the wayside detection unit as claimed therein is not present in the invention of Groups I or II.

Groups I, II and III lack unity of invention because even though the inventions of these groups require the technical feature of a system for worker protection; a housing; one or more antennas, configured for transmitting and/or receiving wireless signals; one or more circuits operable to process signals and data, and to perform one or more applications or functions, this technical feature is not a special technical feature as it does not make a contribution over the prior art.

Specifically, US 2012/0296562 A1 (CARLSON et al) 22 November 2012 (22.11.2012) teaches a system for worker protection (Para. 25); a housing (Para. 40); one or more antennas, configured for transmitting and/or receiving wireless signals (Para. 28); one or more circuits operable to process signals and data, and to perform one or more applications or functions (Para. 49).

Since none of the special technical features of the Group I, II or III inventions are found in more than one of the inventions, unity of invention is lacking.

4. Consequently, this opinion has been established in respect of the following parts of the international application:

- ☐ all parts.
- ☒ the parts relating to claims Nos. 1-20

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2016/023754

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	2-6, 9, 10, 13, 14, 16-19	YES
	Claims	1, 7, 8, 11, 12, 15, 20	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-20	NO
Industrial applicability (IA)	Claims	1-20	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1, 7, 8, 11, 12, 15, and 20 lack novelty under PCT Article 33(2) as being anticipated by Sheardown et al. (hereinafter Sheardown).

Regarding Claim 1, Sheardown discloses a system for worker protection (abstract), the system comprises: a compact wearable personal alert device (paragraph 28, 70, track worker 40 wears on his/her person a device 70 that is capable of transmitting signals that may constitute part or entirety of track worker information; paragraph 29, the device 70 may also be configured to receive notifications from the CIPC 50, such as when a safety warning notification is sent by the safety system 10 through the CIPC 50 that will alert the track worker 40 to move to a point of safety; claim 12, as a watch, therefore compact); configured for use by a worker (track worker 40, paragraph 28), the personal alert device comprising: a housing for enclosing components of the personal alert device (claim 12, a watch inherently comprises a housing); an attachment structure for attaching the personal alert device to the worker or an item used by the worker (claim 12, a watch inherently has an attachment structure for the worker); a power supply for powering components of the personal alert device (paragraph 28, has its own power source, such as a battery); a communication component, comprising one or more antennas, configured for transmitting and/or receiving wireless signals (paragraph 28, an RFID tag inherently comprises an antenna for transmitting and/or receiving wireless signals); one or more indicator components, for outputting alert indications (paragraph 66, beeps); and one or more circuits operable to process signals and data (paragraphs 28, 66, circuitry inherent for the RFID tag to process the data and signals to provide the output), and to perform one or more applications or functions relating to operations of the personal alert device (paragraph 67, inherent circuitry for GPS monitoring); wherein the personal alert device is operable to: process signals received from a companion alert device (CIPC, 50, paragraphs 26-28); and generate, in response to signals received from a companion alert device, a safety alert (paragraph 66, see figure 15); and output, via the one or more indicator components, one or more alert indications to the worker based on the safety alert (beeps, paragraph 66).

Regarding Claims 7-8, Sheardown discloses the system of claim 1, wherein triggering of alerts and/or broadcast of signals triggering of the alerts is based on one or more types of alert thresholds, the one or more types of alert thresholds comprise time-to-arrival (TTA), distance-from-train (DFT), and low-speed close proximity distance alert (CPD) (see figure 11, calculating if a collision is possible and sending alerts to the work if yes, therefore the threshold alert is distance from train for the collision).

Regarding Claim 11, Sheardown discloses the system of claim 1, wherein the companion alert device comprises a vehicle-mounted alert device, a wayside detection unit, or another personal alert device (see figure 15, CIPC is a wayside detection unit, paragraph 26).

Regarding Claim 12, Sheardown discloses the system of claim 1, wherein the one or more indicator components comprise at least one of visual indicator, audio indicator, and a tactile indicator (paragraph 66, beeps, audio).

Regarding Claim 15, Sheardown discloses the system of claim 1, wherein the attachment structure comprises a clip structure or a strap structure (claim 12, a watch inherently has a strap structure).

Regarding Claim 20, Sheardown discloses the system of claim 1, wherein the personal alert device is operable to: receive Global Navigation Satellite System (GNSS) signals; determine location information based on the received GNSS signals; and utilize the location information in conjunction with at least one of the operations of the personal alert device (using GPS data, which is a GNSS, to configure alarm data, paragraph 67).

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2016/023754

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Claims 2-5 lack an inventive step under PCT Article 33(3) as being obvious over Sheardown et al. (hereinafter Sheardown) in view of Silverplus, Inc. (hereinafter Silverplus).

Regarding Claims 2-5, Sheardown fails to explicitly disclose the personal alert device is operable to implement a power management scheme for optimizing power consumption in the personal alert device (claim 2); the power management scheme comprises transitioning the personal alert device from a full operation mode to a powersaving mode, the power-saving mode comprising at least one of shut-down mode and low-function mode (claim 3); the personal alert device comprises at least one control component for generating control data applicable to the power management scheme (claim 4); the at least one control component comprises a movement sensor for sensing movement of the worker, configured to generate indications when the personal alert device is moving or not (claim 5). In the same field of endeavor, Silverplus teaches a wearable communications alert device (abstract, paragraph 7) comprising the device is operable to implement a power management scheme for optimizing power consumption in the personal alert device (paragraph 77, optimizing the power in the device); the power management scheme comprises transitioning the personal alert device from a full operation mode to a powersaving mode, the power-saving mode comprising at least one of shut-down mode and low-function mode (paragraph 70, the parameters to reduce power consumption; claim 80, detecting user interface for low power consumption); the personal alert device comprises at least one control component for generating control data applicable to the power management scheme (paragraph 70, claim 80, detecting user interface for low power consumption); the at least one control component comprises a movement sensor for sensing movement of the worker, configured to generate indications when the personal alert device is moving or not (paragraph 17, motion sensors for personal input).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Sheardown with the teaching of Silverplus for the purpose of using a hands-free communication device with optimal power saving configurations (Silverplus, paragraphs 5, 11).

Claims 6, 13, 14, and 18 lack an inventive step under PCT Article 33(3) as being obvious over Sheardown et al. (hereinafter Sheardown) in view of Nghiem et al. (hereinafter Nghiem).

Regarding Claims 6, 13-14, 18, Sheardown fails to explicitly disclose wherein the one or more antennas comprise diversity antennas of identical or differing polarity, and the personal alert device is operable to support use of diversity during the transmitting and/or receiving of wireless signals (claim 6); the power supply comprises a rechargeable power supply (claim 13); the rechargeable power supply is operable to recharge without direct connection (claim 14); the housing completely seals internal space enclosing components of the personal alert device, and wherein charging the power supply and/or communication of data to and/or from the portable alert device is done without direct connection (claim 18).

In the same field of endeavor, Nghiem teaches a wearable alert device (abstract, implantable therefore a type of wearable; paragraph 67, for transmitting patient data; paragraph 63, how the patient reacted to the therapy, therefore a bad reaction acts as an alarm), comprising one or more antennas comprise diversity antennas of identical or differing polarity (paragraph 68, providing diversified antennae within the implantable device, paragraph 130, polarization diversity therefore different), and the personal alert device is operable to support use of diversity during the transmitting and/or receiving of wireless signals (paragraph 130, for the signals therefore during transmitting and/or receiving, see figure 2); the power supply comprises a rechargeable power supply (paragraph 126, a rechargeable power source); the rechargeable power supply is operable to recharge without direct connection (paragraph 97, via the RF antenna, therefore no direct connection); the housing completely seals internal space enclosing components of the personal alert device (paragraph 49), and wherein charging the power supply and/or communication of data to and/or from the portable alert device is done without direct connection (paragraph 97, via the RF antenna, therefore no direct connection).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Sheardown with the teaching of Nghiem for the purpose of tailoring the device to the specific need of the user (Nghiem, paragraphs 68, 62).

Claims 9, 10, 16, 17, and 19 lack an inventive step under PCT Article 33(3) as being obvious over Sheardown et al. (hereinafter Sheardown) in view of Carlson et al. (hereinafter Carlson).

Regarding Claims 9-10, 16-17, 19, Sheardown fails to explicitly disclose the personal alert device is operable to communicate with one or more nearby alert devices, to forward received signals and/or alerts generated in response to the received signals among the personal alert device and the one or more nearby alert devices (claim 9); the personal alert device is operable to log data relating to alerts triggered and/or handled by the personal alert device (claim 10); the personal alert device comprises one or more acknowledgment components, configured for receiving input from the worker, to indicate acknowledgment of the safety alert (claim 16); the personal alert device is operable to communicate a signal to the companion alert device to indicate the acknowledgment of the safety alert by the worker (claim 17); the personal alert device is operable to implement configurable alarm management for allowing setting and/or adjusting of rules controlling triggering and/or handling of alerts (claim 19).

In the same field of endeavor, Carlson teaches a device to alert a person (abstract, generating a warning for a user, figure 6) comprising the personal alert device is operable to communicate with one or more nearby alert devices (see figure 5, communicating with multiple devices; paragraph 42), to forward received signals and/or alerts generated in response to the received signals among the personal alert device and the one or more nearby alert devices (paragraph 96, each vehicle comprising a VMM, paragraph 37, paragraphs 78-79, passing along warnings to other VMMs); the personal alert device is operable to log data relating to alerts triggered and/or handled by the personal alert device (paragraph 120, saving the logs formed by the VMMs); the personal alert device comprises one or more acknowledgment components, configured for receiving input from the worker, to indicate acknowledgment of the safety alert (paragraph 108); the personal alert device is operable to communicate a signal to the companion alert device to indicate the acknowledgment of the safety alert by the worker (paragraph 111, an acknowledgment button); the personal alert device is operable to implement configurable alarm management for allowing setting and/or adjusting of rules controlling triggering and/or handling of alerts (paragraph 60, adjusting settings for each VMM, paragraph 119, the settings trigger the alarms).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Sheardown with the teaching of Carlson to better monitor the location of and separation distance between rail line vehicles (Carlson, paragraph 2).

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2016/023754

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Claims 1-20 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: Andrew B. Karp
McAndrews, Held & Malloy, Ltd.
500 W. Madison, 34th Floor
Chicago, Illinois 60661
United States of America

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing
(day/month/year) **18 FEB 2015**

Applicant's or agent's file reference
27735WO01

FOR FURTHER ACTION - See paragraphs 1 and 4 below

International application No.
PCT/US14/53900

International filing date
(day/month/year) **03 September 2014 (03.09.2014)**

Applicant **METROM RAIL, LLC**

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 - 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ With regard to any protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
 - ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise, the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices. In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Within 19 months from the priority date, the applicant may request that a supplementary international search be carried out by a different International Searching Authority that offers this service (Rule 45bis.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3201

Authorized officer

Shane Thomas

Telephone No. PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

Form PCT/ISA/220 (July 2014)

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: Andrew B. Karp
McAndrews, Held & Malloy, Ltd.
500 W. Madison, 34th Floor
Chicago, Illinois 60661
United States of America

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference 27735W001	Date of mailing (day/month/year)
International application No. PCT/US14/53900	International filing date (day/month/year) 03 September 2014 (03.09.2014)
Applicant METROM RAIL, LLC	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.
Filing of amendments and statement under Article 19:
 The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):
When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.
How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes
 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70
For more detailed instructions, see PCT Applicant's Guide, International Phase, paragraphs 9.004 – 9.011.
2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3. ☐ With regard to any protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
 - ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
 - ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise, the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices. In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the PCT Applicant's Guide, National Chapters.

Within 19 months from the priority date, the applicant may request that a supplementary international search be carried out by a different International Searching Authority that offers this service (Rule 45bis.1). The procedure for requesting supplementary international search is described in the PCT Applicant's Guide, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer Shane Thomas PCT Helpdesk: 571-272-4300 Telephone No. PCT OSP: 571-272-7774
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Form PCT/ISA/220 (July 2014)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 27735WO01	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/US14/53900	International filing date (<i>day/month/year</i>) 03 September 2014 (03.09.2014)	(Earliest) Priority Date (<i>day/month/year</i>) 03 September 2013 (03.09.2013)
Applicant METROM RAIL, LLC		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed.
☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ Certain claims were found unsearchable (see Box No. II).

3. ☒ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**:

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 1
☒ as suggested by the applicant.
☐ as selected by this Authority, because the applicant failed to suggest a figure.
☐ as selected by this Authority, because this figure better characterizes the invention.
 b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US14/53900

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Group I: Claims 1-12; Group II: Claims 13-15; Group III: Claims 16-20

****-Please see Supplemental Page-****

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US14/53900

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B60T 7/12; G08G 1/16 (2015.01)

CPC - B60T 7/12; G08G 1/161

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) Classification(s): G08G 1/16; B61L 27/00; B61L 25/02; B61L 23/00; B60T 7/12 (2015.01)

CPC Classification(s): G08G 1/161; B61L 27/00; 27/0022; 2205/04; 25/025; 15/0027; 23/34; USPC Classification(s): 701/301, 19, 117

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, INPADOC); ProQuest; IEEE/IEEEExplore; Google/Google Scholar; rail, train, vehicle, signal, length, distance, crash, collision, disaster, accident, alert, warning, stop, brake, ultra wideband, UWB, mount, install, radio frequency, RFID

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ----- Y	US 2012/0296562 A1 (CARLSON, R et al.) 22 November 2012: abstract; figures 4, 6, 7; paragraphs [0028], [0030], [0041], [0045], [0047], [0064], [0072], [0110], [0121].	1-12 ----- 18-20
X ----- Y	US 2011/0046845 A1 (KOZLAY, D.) February 24, 2011; figures 1, 5; paragraphs [0017], [0034]-[0036], [0089], [0093], [0094].	16, 17 ----- 18-20
Y	US 5675190 A (MORITA, H.) October 07, 1997; abstract; figures 1, 6, 7, column 1, lines 7-14; column 4, lines 1-14; column 6, line 55 through column 7, line 28.	13-15
Y	US 2008/0114519 A1 (DUFAUX, D., et al.) May 15, 2008; paragraphs [0015], [0132], [0144].	13-15
A	US 2006/0151672 A1 (HEDDEBAUT, M et al.) 13 July 2006: entire document.	1-12
A	US 2010/0225527 A1 (TALTY, T et al.) 09 September 2010: entire document.	1-12
A	US 2004/0155760 A1 (GRISHAM, W et al.) 12 August 2004: entire document.	1-12

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

07 January 2015 (07.01.2015)

Date of mailing of the international search report

18 FEB 2015

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Shane Thomas

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774

-Continued from Box No. III - Observations where unity of invention is lacking--

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fee must be paid.

Group I: Claims 1-12 are directed toward a system for vehicle management.

Group II: Claims 13-15 are directed toward a vehicle-mounted system for interfacing with a brake loop of a vehicle.

Group III: Claims 16-20 are directed toward a system for vehicle speed management.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical features of Group I include an ultra-wideband communication component; and determining a distance between a vehicle-mounted subsystem and a control signal interface subsystem based on time-of-flight of at least one communication, which are not present in Groups II-III.

The special technical features of Group II include a switch including a first contact configured to connect to a first side of a brake loop and a second contact configured to connect to a second side of the brake loop; automatically determining a braking event without receiving information about a status of an operator-controlled actuator; opening and closing the switch to electrically disconnect and connect the first contact from the second contact, which are not present in Groups I and III.

The special technical features of Group III include determining a rule for behavior of the vehicle according to information corresponding to a status of a control signal; and observe operation of the vehicle to evaluate compliance with the rule, which are not present in Groups I-II.

The common technical feature shared by Groups I-III is a vehicle-mounted system, comprising: a control signal interface subsystem; a vehicle-mounted subsystem configured to: communicate with the control signal interface subsystem to receive information corresponding to a status of the control signal.

However, these common features are previously disclosed by US 2003/0132666 A1 to BOND, III et al. (hereinafter "Bond"). Bond discloses a vehicle-mounted system (vehicle 12 comprises a brake control system 10; Abstract, Figure 1, paragraph [0020]), comprising: a control signal interface subsystem (collision controller 17; Figure 1 and paragraph [0020]); a vehicle-mounted subsystem (object detection system 14; Figure 1, paragraph [0038]) configured to: communicate with the control signal interface subsystem to receive information corresponding to a status of the control signal (object detection system 14 monitors the current situation and communicates with the collision controller 17 to obtain an object status signal; Figure 1, paragraphs [0038]-[0039]).

Since the common technical features are previously disclosed by the Bond reference, these common features are not special and so Groups I-III lack unity.

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: Andrew B. Karp
McAndrews, Held & Malloy, Ltd.
500 W. Madison, 34th Floor
Chicago, Illinois 60661
United States of America

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year) **18 FEB 2015**

Applicant's or agent's file reference
27735WO01

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US14/53900

International filing date (day/month/year)

03 September 2014 (03.09.2014)

Priority date (day/month/year)

03 September 2013 (03.09.2013)

International Patent Classification (IPC) or both national classification and IPC

IPC(8) - B60T 7/12; G08G 1/16 (2015.01)

CPC - B60T 7/12; G08G 1/161

Applicant **METROM RAIL, LLC**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No 571-273-3201

Date of completion of this opinion

07 January 2015 (07.01.2015)

Authorized officer:

Shane Thomas

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (July 2011)

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/53900

Box No. 1 Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
 - a. (means)
 - ☐ on paper
 - ☐ in electronic form
 - b. (time)
 - ☐ in the international application as filed
 - ☐ together with the international application in electronic form
 - ☐ subsequently to this Authority for the purposes of search
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/53900

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time limit:
- ☒ paid additional fees.
 - ☐ paid additional fees under protest and, where applicable, the protest fee.
 - ☐ paid additional fees under protest but the applicable protest fee was not paid.
 - ☐ not paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

- ☐ complied with.
- ☒ not complied with for the following reasons:

Group I: Claims 1-12; Group II: Claims 13-15; Group III: Claims 16-20

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fee must be paid.

Group I: Claims 1-12 are directed toward a system for vehicle management.

Group II: Claims 13-15 are directed toward a vehicle-mounted system for interfacing with a brake loop of a vehicle.

Group III: Claims 16-20 are directed toward a system for vehicle speed management.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical features of Group I include an ultra-wideband communication component; and determining a distance between a vehicle-mounted subsystem and a control signal interface subsystem based on time-of-flight of at least one communication, which are not present in Groups II-III.

The special technical features of Group II include a switch including a first contact configured to connect to a first side of a brake loop and a second contact configured to connect to a second side of the brake loop; automatically determining a braking event without receiving information about a status of an operator-controlled actuator; opening and closing the switch to electrically disconnect and connect the first contact from the second contact, which are not present in Groups I and III.

The special technical features of Group III include determining a rule for behavior of the vehicle according to information corresponding to a status of a control signal; and observe operation of the vehicle to evaluate compliance with the rule, which are not present in Groups I-II.

The common technical feature shared by Groups I-III is a vehicle-mounted system, comprising: a control signal interface subsystem; a vehicle-mounted subsystem configured to: communicate with the control signal interface subsystem to receive information corresponding to a status of the control signal.

However, these common features are previously disclosed by US 2003/0132666 A1 to BOND, III et al. (hereinafter "Bond"). Bond discloses a vehicle-mounted system (vehicle 12 comprises a brake control system 10; Abstract, Figure 1, paragraph [0020]), comprising: a control signal interface subsystem (collision controller 17; Figure 1 and paragraph [0020]); a vehicle-mounted subsystem (object detection system 14; Figure 1, paragraph [0038]) configured to: communicate with the control signal interface subsystem to receive information corresponding to a status of the control signal (object detection system 14 monitors the current situation and communicates with the collision controller 17 to obtain an object status signal; Figure 1, paragraphs [0038]-[0039]).

Since the common technical features are previously disclosed by the Bond reference, these common features are not special and so Groups I-III lack unity.

4. Consequently, this opinion has been established in respect of the following parts of the international application:

- ☒ all parts.
- ☐ the parts relating to claims Nos. _____

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US14/53900

Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement			
1. Statement				
Novelty (N)	Claims	13-15, 18-20	YES	
	Claims	1-12, 16, 17	NO	
Inventive step (IS)	Claims	NONE	YES	
	Claims	1-20	NO	
Industrial applicability (IA)	Claims	1-20	YES	
	Claims	NONE	NO	
2. Citations and explanations:				
Claims 1-12 lack novelty under PCT Article 33(2) as being anticipated by US 2012/0296562 A1 to CARLSON et al. (hereinafter 'Carlson'). As per claim 1, Carlson discloses a system for vehicle management, wherein the system comprises: a control signal interface subsystem including an ultra-wideband (UWB) communications component (collision avoidance system transmits and receive signals (control signal interface subsystem), using an Ultra Wideband (UWB) sensing unit to reliably track vehicles (vehicle management); abstract; paragraph [0030]); and a vehicle-mounted subsystem including a UWB communications component (a vehicle mounted module (vehicle-mounted subsystem) includes an ultra wideband (UWB) communications unit; paragraph [0028]), wherein the vehicle-mounted subsystem is configured to: interface with a braking system of the vehicle (the vehicle mounted module (vehicle-mounted subsystem) includes a vehicular interface for a braking system; figure 7; paragraphs [0028], [0047]); communicate with the UWB communications component of the control signal interface subsystem via the UWB communications component of the vehicle-mounted subsystem (a collision avoidance system transmits and receive signals (control signal interface subsystem) and communicates with a vehicle mounted module (vehicle-mounted subsystem), using an Ultra Wideband (UWB) sensing unit; abstract; figure 6; paragraphs [0028], [0030], [0045]); and determine a distance between the vehicle-mounted subsystem and the control signal interface subsystem based on a time-of-flight of at least one communication between the UWB communications component of the control signal interface subsystem and the UWB communications component of the vehicle-mounted subsystem (a collision avoidance system transmits and receive signals (control signal interface subsystem) and communicates with a vehicle mounted module (vehicle-mounted subsystem), using an Ultra Wideband (UWB) sensing unit to determine Time of Flight, TOF, distance, by measuring the distance between the UWB units; abstract; figure 6; paragraphs [0028], [0030], [0045], [0064]). As per claim 2, Carlson discloses the system of claim 1, additionally, Carlson discloses wherein the vehicle-mounted subsystem is further configured to generate an alert if the distance between the vehicle-mounted subsystem and the control signal interface subsystem is less than a threshold (a warning system (alert) if certain distance/speed measurements violate certain thresholds (less than a threshold); abstract; figures 6, 15; paragraphs [0028], [0030], [0045], [0110]). As per claim 3, Carlson discloses the system of claim 1, additionally, Carlson discloses wherein the vehicle-mounted subsystem is further configured to cause the braking system of the vehicle to activate if the distance between the vehicle-mounted subsystem and the control signal interface subsystem is less than a threshold (if certain distance/speed measurements violate certain thresholds (less than a threshold), the brakes are activated; abstract; figure 4; paragraphs [0030], [0041], [0110], [0121]). As per claim 4, Carlson discloses the system of claim 1, additionally, Carlson discloses wherein the vehicle-mounted subsystem further comprises: a radio-frequency identification (RFID) subsystem configured to scan at least one RFID tag external to the vehicle to retrieve information stored on the at least one RFID tag (a vehicle mounted module (vehicle-mounted subsystem) includes an RFID communication device uses a sensor to scan a field and may be attached to a worker's badge, while worker is standing on the tracks (RFID tag external to the vehicle) to monitor the workers (retrieve information); paragraphs [0024], [0028], [0121]); and wherein the vehicle-mounted subsystem is further configured to determine a distance between the vehicle-mounted subsystem and the control signal interface subsystem based on the information stored on the at least one RFID tag (an RF radio is used, and the separation distance between vehicles is monitored by utilizing RFID sensors stored information; paragraphs [0039], [0044], [0047], [0121]). As per claim 5, Carlson discloses the system of claim 4, additionally, Carlson discloses wherein: the vehicle-mounted subsystem is further configured to substantially continuously receive information relating to speed of the vehicle (a vehicle mounted module (vehicle-mounted subsystem) continuously calculates distances and vehicle speed information; abstract; paragraphs [0024], [0028], [0099], [0100]); and the vehicle-mounted subsystem determines a changing distance between the vehicle-mounted subsystem and the control signal interface subsystem based on the information stored on the at least one RFID tag and the information relating to speed of the vehicle (monitor the separation distance between vehicles by utilizing mounted sensors on each vehicle, an RFID communication device (RFID tag), and the location information that is stored related to vehicle speed; abstract; paragraphs [0039], [0044], [0100], [0121]). ***-Continued Within the Next Supplemental Box-***				

Form PCT/ISA/237 (Box No. V) (July 2011)

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/53900

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Continued from Box V: Citations and Explanations-

As per claim 6, Carlson discloses the system of claim 1, further comprising: an access point external to the vehicle (a data link (access point) transmits data, and saved logs may be downloadable by an authorized person via a laptop computer (external to the vehicle); paragraphs [0067], [0120]); and wherein the vehicle-mounted subsystem is further configured to: store data relating to prior behavior of the vehicle (a vehicle mounted module (vehicle-mounted subsystem) logs and stores data related to the vehicle positioning over time (prior behavior of the vehicle); abstract; paragraphs [0028], [0120], [0128]); and communicate the data relating to prior behavior of the vehicle with the access point (a data link (access point) transmits data, and log information includes data related to the vehicle positioning over time (prior behavior of the vehicle); paragraphs [0067], [0120]).

As per claim 7, Carlson discloses a system for vehicle management, wherein the system comprises: a control signal interface subsystem including an ultra-wideband (UWB) communications component (collision avoidance system transmits and receive signals (control signal interface subsystem), using an Ultra Wideband (UWB) sensing unit to reliably track vehicles (vehicle management); abstract; paragraph [0030]); a first vehicle-mounted subsystem including a UWB communications component (a vehicle mounted module 402 (first vehicle-mounted subsystem) includes an ultra wideband (UWB) communications unit; figure 4; paragraphs [0028], [0041]), wherein the first vehicle-mounted subsystem is configured to interface with a braking system of the vehicle (the vehicle mounted module 402 (first vehicle-mounted subsystem) includes a vehicular interface for a braking system; figures 4, 7; paragraphs [0028], [0041], [0047]); a second vehicle-mounted subsystem including a UWB communications component, wherein the second vehicle-mounted subsystem is configured to be mounted on another vehicle (a plurality of vehicle mounted modules 404 (second vehicle-mounted subsystem) use multiple Ultra Wideband (UWB) sensing units, which track the location of the rail line vehicle and at least one other vehicle (another vehicle); abstract; figure 4; paragraphs [0025], [0028], [0041], [0064]), and wherein the first vehicle-mounted subsystem is configured to: communicate with the UWB communications component of the control signal interface subsystem via the UWB communications component of the first vehicle-mounted subsystem (a vehicle mounted module 402 (first vehicle-mounted subsystem) communicates using a Ultra Wideband (UWB) sensing unit of the collision avoidance system, which transmits and receive signals (control signal interface subsystem); abstract; figure 4; paragraphs [0028], [0030], [0041], [0045], [0064]); communicate with the UWB communications component of the second vehicle-mounted subsystem via the UWB communications component of the first vehicle-mounted subsystem (a vehicle mounted module 402 (first vehicle-mounted subsystem) communicates with a plurality of vehicle mounted modules 404 (second vehicle-mounted subsystem), where multiple Ultra Wideband (UWB) sensing units are used; abstract; figures 4, 6; paragraphs [0025], [0028], [0041], [0064]); determine a distance between the first vehicle-mounted subsystem and the control signal interface subsystem based on a time-of-flight of at least one communication between the UWB communications component of the control signal interface subsystem and the UWB communications component of the first vehicle-mounted subsystem (a collision avoidance system transmits and receive signals (control signal interface subsystem) and communicates with a vehicle mounted module 402 (first vehicle-mounted subsystem), where an Ultra Wideband (UWB) sensing unit determines Time of Flight, TOF, distance, by measuring the distance between the UWB units; abstract; figures 4, 6; paragraphs [0028], [0030], [0041], [0045], [0064]); and determine a distance between the first vehicle-mounted subsystem and the second vehicle-mounted subsystem based on a time-of-flight of at least one communication between the UWB communications component of the second vehicle-mounted subsystem and the UWB communications component of the first vehicle-mounted subsystem (a vehicle mounted module 402 (first vehicle-mounted subsystem) communicates with a plurality of vehicle mounted modules 404 (second vehicle-mounted subsystem), where multiple Ultra Wideband (UWB) sensing units are used to determine Time of Flight, TOF, distance, by measuring the distance between the UWB units; abstract; figures 4, 6; paragraphs [0025], [0028], [0041], [0045], [0064], [0072]).

As per claim 8, Carlson discloses the system of claim 7, additionally, Carlson discloses wherein the first vehicle-mounted subsystem is further configured to: generate an alert if the distance between the first vehicle-mounted subsystem and the control signal interface subsystem is less than a first threshold (a collision avoidance system communicates with a vehicle mounted module 402 (first vehicle-mounted subsystem), and if there is a violation of a predetermined separation criteria (first threshold), an alert is generated; abstract; figure 4; paragraphs [0028], [0030], [0041], [0112], [0121]); and generate an alert if the distance between the first vehicle-mounted subsystem and the second vehicle-mounted subsystem is less than a second threshold (a vehicle mounted module 402 (first vehicle-mounted subsystem) communicates with a plurality of vehicle mounted modules 404 (second vehicle-mounted subsystem), and if there is a violation of a predetermined separation criteria, or a hard threshold (second threshold) was reached, and a hard alarm is generated; abstract; figure 4; paragraphs [0025], [0028], [0041], [0106], [0112], [0121]).

As per claim 9, Carlson discloses the system of claim 7, additionally, Carlson discloses wherein the first vehicle-mounted subsystem is further configured to: cause the braking system of the vehicle to activate if the distance between the first vehicle-mounted subsystem and the control signal interface subsystem is less than a first threshold (a collision avoidance system communicates with a vehicle mounted module 402 (first vehicle-mounted subsystem), and if there is a violation of a predetermined separation criteria (first threshold), and brakes are activated; abstract; figure 4; paragraphs [0041], [0112], [0121]); and cause the braking system of the vehicle to activate if the distance between the first vehicle-mounted subsystem and the second vehicle-mounted subsystem is less than a second threshold (a vehicle mounted module 402 (first vehicle-mounted subsystem) communicates with a plurality of vehicle mounted modules 404 (second vehicle-mounted subsystem), and if there is a violation of a predetermined separation criteria, or a hard threshold (second threshold) was reached, and brakes are activated; abstract; figure 4; paragraphs [0041], [0106], [0112], [0121]).

As per claim 10, Carlson discloses the system of claim 7, additionally, Carlson discloses wherein the first vehicle-mounted subsystem further comprises: a radio-frequency identification (RFID) subsystem configured to scan at least one RFID tag external to the vehicle to retrieve information stored on the at least one RFID tag (a vehicle mounted module (vehicle-mounted subsystem) includes an RFID communication device uses a sensor to scan a field and may be attached to a worker's badge, while worker is standing on the tracks (RFID tag external to the vehicle) to monitor the workers (retrieve information); paragraphs [0024], [0028], [0121]); and wherein the first vehicle-mounted subsystem is further configured to determine a distance between the first vehicle-mounted subsystem and the control signal interface subsystem based on the information stored on the at least one RFID tag (a collision avoidance system communicates a vehicle mounted module 402 (first vehicle-mounted subsystem), and an RF radio is used, and the separation distance between vehicles is monitored by utilizing RFID sensors stored information; abstract; figure 4; paragraphs [0039], [0041], [0044], [0047], [0121]).

Continued Within the Next Supplemental Box-

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/53900

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-Continued from Previous Supplemental Box-

As per claim 11, Carlson discloses the system of claim 10, additionally, Carlson discloses wherein: the first vehicle-mounted subsystem is further configured to substantially continuously receive information relating to speed of the first vehicle (a vehicle mounted module 402 (first vehicle-mounted subsystem) continuously calculates distances and information regarding the host speed (speed of the first vehicle); abstract; figure 4; paragraphs [0024], [0028], [0041], [0099], [0100]); and the first vehicle-mounted subsystem determines a changing distance between the first vehicle-mounted subsystem and the control signal interface subsystem based on the information stored on the at least one RFID tag and the information relating to speed of the first vehicle (a collision avoidance system communicates with a vehicle mounted module 402 (first vehicle-mounted subsystem), to monitor the separation distance between vehicles by utilizing mounted sensors, an RFID communication device (RFID tag), and the location information that is stored related to host speed (speed of the first vehicle); abstract; figure 4; paragraphs [0039], [0041] [0044], [0100], [0121]).

As per claim 12, Carlson discloses the system of claim 7, additionally, Carlson discloses further comprising: an access point external to the vehicle (a data link (access point) transmits data, and saved logs may be downloadable by an authorized person via a laptop computer (external to the vehicle); paragraphs [0067], [0120]); and wherein the first vehicle-mounted subsystem is further configured to: store data relating to prior behavior of the vehicle (a vehicle mounted module 402 (first vehicle-mounted subsystem) logs and stores data related to the vehicle positioning over time (prior behavior of the vehicle); abstract; figure 4; paragraphs [0028], [0041], [0120], [0128]); and communicate the data relating to prior behavior of the vehicle with the access point (a data link (access point) transmits data, and log information includes data related to the vehicle positioning over time (prior behavior of the vehicle), paragraphs [0067], [0120]).

Claims 16 and 17 lack novelty under PCT Article 33(2) as being anticipated by US 2011/0046845 A1 (KOZLAY).

As per claim 16, Kozlay discloses a system for vehicle speed management (a system for tracking and managing a vehicle's speed; abstract; paragraphs [0017], [0069]), wherein the system comprises: a control signal interface subsystem (a transportation safety system transmits control signals and information (control signal interface subsystem); paragraph [0034]); and a vehicle-mounted subsystem configured to: communicate with the control signal interface subsystem to receive information corresponding to a status of the control signal (a vehicle mounted transportation safety apparatus (subsystem) is configured to communicate wirelessly with the transportation safety system (control signal interface subsystem) to transmit (receive) information corresponding to the vehicles operation and control (status of the control signal); figures 1, 5; paragraphs [0017], [0036], [0093]); determine a rule for behavior of the vehicle according to the information corresponding to the status of the control signal (the apparatus determines whether the predefined transportation safety policies (rule for behavior of the vehicle) are being followed, based on (according to) the information transmitted to and from (status of the control signal) the transportation safety system; paragraphs [0034], [0035]); and observe operation of the vehicle to evaluate compliance with the rule (the apparatus monitors the train's operator (operation of the vehicle) to determine (evaluate) compliance or non-compliance with the restrictions (rule); paragraphs [0034], [0094]).

As per claim 17, Kozlay discloses the system of claim 16. Kozlay additionally discloses wherein the rule corresponds to the status of the control signal being at least one of red, double red, yellow, or double yellow (based on compliance to operation restrictions (rule), based on (corresponds to) signals received (status of the control signal) the mounted transportation safety apparatus may indicate non compliance using a red LED; figures 6A, 6B; paragraphs [0114], [0115]).

Claims 13-15 lack an inventive step under PCT Article 33(3) as being obvious over US 5675190 A (MORITA) in view of US 2008/0114519 A1 to DUFAUX et al. (hereinafter "DuFaux").

As per claim 13, Morita discloses a vehicle-mounted system for interfacing with a brake loop of a vehicle (a vehicle mounted automatic brake system for engaging (interfacing) with the brake system (loop) of the vehicle; abstract; column 1, lines 7-14), wherein the vehicle-mounted system comprises: a switch including a first contact configured to connect to a first side of the brake loop and a second contact configured to connect to a second side of the brake loop (the automatic braking system (vehicle-mounted system) comprises a parking brake switch, including a first contact point, 1A, connected to the brake system (a first side of the brake loop) and second contact point, 1D, also connected to the brake system (a second side of the brake loop); figure 1; column 4, lines 1-14; column 7, lines 6-28); and at least one processor in electrical communication with the switch and configured to (a CPU (processor) may be used control (in electrical communication) the parking brake switch; figure 6; column 6, lines 55-66): open the switch upon an occurrence of the braking event, thereby electrically disconnecting the first contact from the second contact (the CPU may be configured to open the parking brake switch, when the engine is powered off (upon an occurrence of the braking event), thereby disconnecting the electrical contacts (first contact from the second contact), to engage the parking brake; column 6, line 64 through column 7, line 5); and close the switch upon an expiration of the braking event, thereby electrically connecting the first contact with the second contact (the CPU may close the switch, when a release flag is set (upon an expiration of the braking event), thereby electrically connecting contact points 1A (first contact) and 1D (second contact); figures 1 and 7; column 7, lines 6-28). Morita does not disclose a system configured to, automatically determine a braking event without receiving information about a status of an operator-controlled actuator. DuFaux discloses a system configured to automatically determine a braking event without receiving information about a status of an operator-controlled actuator (the processor is configured to automatically detect (determine) an actuation signal indicating that the vehicles is operating outside a designated parameters (a braking event), the system is completely independent of any operator actuated braking systems (without receiving information about a status of an operator-controlled actuator); paragraphs [0015], [0132]). It would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the method of Morita, with the teaching of DuFaux, because by doing so, the method of Morita would provide an automatic brake actuator system for a wheeled vehicle, thereby providing a more efficient and a more robust braking system.

-Continued Within the Next Supplemental Box-

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US14/53900

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-Continued from Previous Supplemental Box-

As per claim 14, Morita and DuFaux, in combination, disclose the vehicle-mounted system of claim 13. Morita does not disclose the system wherein the at least one processor is further configured to cause an alert to be generated upon occurrence of the braking event. DuFaux discloses the system wherein the at least one processor is further configured to cause an alert to be generated upon occurrence of the braking event (the processor is configured to generate an alert action, to alert the operator of an impending braking action, upon a detected braking event; paragraphs [0015], [0144]). It would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the method of Morita, with the teaching of DuFaux, because by doing so, the method of Morita would provide an automatic brake actuator system for a wheeled vehicle, thereby providing a more efficient and a more robust braking system.

As per claim 15, Morita and DuFaux, in combination, disclose the vehicle-mounted system of claim 13. Morita additionally discloses the system wherein the at least one processor is configured to determine the expiration of the braking event based on a change in status of an operator-controlled input (the CPU (processor) is configured to determine when the release flag has been set (expiration of the braking event), when the (based on) parking brake switch has been operated to the reset position (change in status of an operator-controlled input); column 7, lines 19-28).

Claims 18-20 lack an inventive step under PCT Article 33(3) as being obvious over Kozlay in view of Carlson.

As per claim 18, Kozlay discloses the system of claim 16. Kozlay does not disclose the system wherein the rule specifies a stop-time duration for the vehicle. Carlson discloses the system wherein the rule specifies a stop-time duration for the vehicle (a threshold (rule) that specifies how quickly the rail line vehicle can stop under the current conditions (a stop-time duration for the vehicle); paragraph [0033]). It would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the method of Kozlay, with the teaching of Carlson, because by doing so, the method of Kozlay would provide a collision avoidance system using sensor technologies, thereby providing a more reliable and a more robust braking system.

As per claim 19, Kozlay and Carlson, in combination, disclose the system of claim 18. Kozlay does not disclose the system wherein the rule specifies a speed for the vehicle. Carlson discloses the system wherein the rule specifies a speed for the vehicle (a preliminary threshold (rule) that specifies a speed for the rail line vehicle; figure 15; paragraph [0111]). It would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the method of Kozlay, with the teaching of Carlson, because by doing so, the method of Kozlay would provide a collision avoidance system using sensor technologies, thereby providing a more reliable and a more robust braking system.

As per claim 20, Kozlay and Carlson, in combination, disclose the system of claim 19. Kozlay does not disclose the system wherein the rule specifies a maximum speed for the vehicle after an expiration of the stop-time. Carlson discloses the system wherein the rule specifies a maximum speed for the vehicle after an expiration of the stop-time (the thresholds (rule) may be dynamic and may indicate that the speed threshold (maximum speed for the vehicle) may change as the vehicle stopping distance threshold changes based on the current conditions (after an expiration of the stop-time); figure 15, paragraphs [0107], [0110], and [0111]). It would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the method of Kozlay, with the teaching of Carlson, because by doing so, the method of Kozlay would provide a collision avoidance system using sensor technologies, thereby providing a more reliable and a more robust braking system.

Claims 1-20 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

PCT Recordation of Search History

Case/PCT Application Number: PCT/US14/53900

CLIN Number/Technical Field of PCT Application: 3

Date(s) during which the search was conducted: 5 January 2015 – 28 January 2015

Date of Completion of Recordation of Search History Form: 28 January 2015

Research Analyst Initials: RAH, TWM

Search Approval Official (SAO) Initials: HKP

Field of Search/Classification Information:

IPC(8) Classification(s): G08G 1/16; B61L 27/00, B61L 25/02, B61L 23/00; B60T 7/12 (2015.01)

CPC Classification(s): G08G 1/161; B61L 27/00, 27/0022, 2205/04, 25/025, 15/0027, 23/34; B60T 7/12

USPC Classification(s): 701/301, 19, 117

Database(s) Searched (Patent and Non-Patent Literature (NPL), Including Sub-Databases and Files Searched) and Search Terms Used:

PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, INPADOC);
ProQuest; IEEE/IEEEExplore; Google/Google Scholar:

rail, train, vehicle, signal, length, distance, crash, collision, disaster, accident, alert, warning, stop, brake, ultra wideband, UWB, mount, install, radio frequency, RFID

Database Search String Recordation, Including Dates of Searches):

Patent Database Search Strategy/Results:

PatSeer (28 January 2015):

<u>ID</u>	<u>Search String</u>	<u>Records</u>	<u>Created Date</u>
L13	TACD :(automatic* AND (brake w2 (switch* OR loop* OR emergenc*)) AND (electric* w3 contact*) AND (processor* OR CPU* OR computer*) AND (detect* w15 event*) AND (vehicle* OR truck* OR train*) AND (open w4 circuit*))	50	28-Jan-15
L12	TACD :(automatic* AND (brake w2 (switch* OR loop* OR emergenc*)) AND (electric* w3 contact*) AND (processor* OR CPU* OR computer*) AND (detect* w15 event*) AND (vehicle* OR truck* OR train*))	92	28-Jan-15
L11	TACD :(automatic* AND (brake w2 (switch* OR loop* OR emergenc*)) AND (electric* w3 contact*) AND (processor* OR CPU* OR computer*) AND (detect* w5 event*))	40	28-Jan-15
L10	TACD :(automatic* AND (brake w2 (switch* OR loop* OR emergenc*)) AND (electric* w3 contact*) AND (processor* OR CPU* OR computer*) AND detect*)	1129	28-Jan-15
L9	TACD :(automatic* AND (brake w2 (switch* OR loop* OR emergenc*)) AND (electric* w3 contact*))	3743	28-Jan-15
L8	TAC :(automatic* AND (brake w2 (switch* OR loop* OR emergenc*)) AND (electric* w2 contact*))	141	28-Jan-15
L7	TA :(automatic* AND (brake w2 (switch* OR loop* OR emergenc*)) AND (electric* w2 contact*))	15	28-Jan-15
L6	ASNN :(Metrom w2 Rail) TACD :(automatic* AND brake*)	3	28-Jan-15
L5	ASNN :(Metrom w2 Rail)	8	28-Jan-15
L4	INV :(Delia w2 Domínguez)	0	28-Jan-15
L3	INV :(Andrew w2 Bernard w2 Karp)	0	28-Jan-15

PatSeer (7 January 2015):

ID	Search String	Records	Created Date
L28	TACD : ((rail* OR train* OR vehic*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB))) IC : (G08G1/16 OR B61L27/00 OR B61L25/02 OR B61L23/00)	102	7-Jan-15
L27	TACD : ((rail* OR train* OR vehic*) AND (length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB))) IC : (G08G1/16 OR B61L27/00 OR B61L25/02 OR B61L23/00)	100	7-Jan-15
L26	TACD : ((rail* OR train* OR vehic*) AND (length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB))) CPC : (G06G1/161 OR B61L27/0022 OR B61L2205/04 OR B61L25/025 OR B61L15/0027 OR B61L23/34)	4	7-Jan-15
L25	TACD : (((radio*frequenc*) OR (radio* w2 frequenc*) OR (RFID) OR barcod* OR (bar w2 code*)) AND (rail* OR train* OR vehic*) AND (length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB))) CPC : (G06G1/161 OR B61L27/0022 OR B61L2205/04 OR B61L25/025 OR B61L15/0027 OR B61L23/34)	4	7-Jan-15

L24	TAC : ((rail* OR train* OR vehic*)) TACD : (((radio*frequenc*) OR (radio* w2 frequenc*) OR (RFID) OR barcod* OR (bar w2 code*)) AND (rail* OR train* OR vehic*) AND (length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB))) CPC : (B60T7/12 OR G06G1/161 OR B61L27/0022 OR B61L2205/04 OR B61L25/025 OR B61L15/0027 OR B61L23/34)	4	7-Jan-15
L23	TACD : (((radio*frequenc*) OR (radio* w2 frequenc*) OR (RFID) OR barcod* OR (bar w2 code*)) AND (rail* OR train* OR vehic*) AND (length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB))) UC : (701/301 OR 701/19 OR 701/117)	34	7-Jan-15
L22	TACD : (((radio*frequenc*) OR (radio* w2 frequenc*) OR (RFID) OR barcod* OR (bar w2 code*)) AND (rail* OR train* OR vehic*) AND (length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB))) IC : (G08G1/16 OR B61L27/00 OR B61L25/02 OR B61L23/00)	47	7-Jan-15
L21	TAC : (((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (rail* OR train* OR vehic*)) TACD : (((radio*frequenc*) OR (radio* w2 frequenc*) OR (RFID) OR barcod* OR (bar w2 code*)) AND (rail* OR train* OR vehic*) AND (length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB))) IC : (G08G 1/16 OR B61L 27/00 OR B61L 25/02 OR B61L 23/00 OR B60T7/12)	6	7-Jan-15

L20	TAC :(((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (rail* OR train* OR vehic*)) TACD :(((length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (mount* OR install*) AND ((radio*frequenc*) OR (radio* w2 frequenc*) OR (RFID) OR barcod* OR (bar w2 code**)))	54	7-Jan-15
L19	TACD :(((length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (mount* OR install*) AND ((radio*frequenc*) OR (radio* w2 frequenc*) OR (RFID) OR barcod* OR (bar w2 code**))) TA :(((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (rail* OR train* OR vehic*))	8	7-Jan-15
L18	TACD :(((rail* OR train* OR vehic*) AND (length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (mount* OR install*) AND ((radio*frequenc*) OR (radio* w2 frequenc*) OR (RFID) OR barcod* OR (bar w2 code**))) TA :(((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (rail* OR train* OR vehic*))	8	7-Jan-15
L17	TAC :(((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (rail* OR train* OR vehic*)) TACD :(((rail* OR train* OR vehic*) AND (length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (mount* OR install*) AND ((radio*frequenc*) OR (radio* w2 frequenc*) OR (RFID) OR barcod* OR (bar w2 code**)))	54	7-Jan-15

L16	TAC : (((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (rail* OR train* OR vehic*)) TACD : ((rail* OR train* OR vehic*) AND ((signal* w3 enforce*) OR (signal* w3 control*)) AND (length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (mount* OR install*) AND ((radio*frequenc*) OR (radio* w2 frequenc*) OR (RFID) OR barcod* OR (bar w2 code*)))	21	7-Jan-15
L15	TAC : (((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (rail* OR train* OR vehic*)) TACD : ((length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)))	87	7-Jan-15
L14	TAC : (((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB))) TACD : ((length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)))	343	7-Jan-15
L13	TACD : ((length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)))	3168	7-Jan-15
L12	TACD : ((length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB))) ASN : (METROM)	3	7-Jan-15

L11	TACD : ((rail* OR train* OR vehic*) AND (length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB))) ASN : (METROM)	3	7-Jan-15
L10	TACD : ((rail* OR train* OR vehic*) AND ((signal* w3 enforce*) OR (signal* w3 control*)) AND (length* OR distance*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB))) ASN : (METROM)	0	7-Jan-15
L9	TAC : ((rail* OR train* OR vehic*)) ASN : (METROM)	8	7-Jan-15
L8	TAC : (((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB))) ASN : (METROM)	3	7-Jan-15
L6	INV : ((Andrew Karp) OR (Delia Dominguez))	0	7-Jan-15
L5	TAC : ((rail* OR train* OR vehic*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (length* OR distance*)) INV : ((Andrew w2 Karp) OR (Delia W2 Dominguez))	0	7-Jan-15
L4	TAC : ((rail* OR train* OR vehic*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (length* OR distance*))	314	7-Jan-15
L3	TAC : ((rail* OR train* OR vehic*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (length* OR distance*) AND (stop* OR brak*))	38	7-Jan-15
L2	TA : ((rail* OR train* OR vehic*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (length* OR distance*) AND (stop* OR brak*))	0	7-Jan-15
L1	TA : (rail* OR train* OR vehic*) AND ((ultra*wideband*) OR (ultra 2W wideband*) OR (UWB)) AND (length* OR distance*)	47	7-Jan-15

Non-Patent Literature (NPL) Search Strategy/Results:

ProQuest (6 January 2015):

- (rail? OR train? OR vehic?) AND ((ultra?(4W) wideband?) OR (UWB)) AND (length? OR distanc?)
- (rail? OR train? OR vehic?) AND ((ultra?(4W) wideband?) OR (UWB)) AND (length? OR distanc?) AND (crash? OR collision? OR collide? OR disast? OR accident?) AND (alert? OR warn? OR notif?) AND (stop? OR brak?)
- (rail? OR train? OR vehic?) AND ((ultra?(4W) wideband?) OR (UWB)) AND (length? OR distanc?) AND (crash? OR collision? OR collide? OR disast? OR accident?) AND (alert? OR warn? OR notif?) AND (stop? OR brak?) AND (mount? OR install?) AND ((radio?(4W) frequenc?) OR (RFID) OR barcod? OR (bar?(4W) code?))

Google/Google Scholar (6 January 2015):

- Rail vehicle signal enforcement and separation control
- Vehicle collision avoidance UWB signal
- Vehicle management using UWB communications
- automatic "brake switch", contacts, processor

IEEE/IEEEXplore (6 January 2015):

- (rail* OR train* OR vehic*) AND ((ultra NEAR/4 wideband) OR (UWB)) AND (length* OR distanc*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra NEAR/2 wideband) OR (UWB))
- (rail* OR train* OR vehic*) AND ((ultra NEAR/4 wideband) OR (UWB)) AND (length* OR distanc*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND ((ultra NEAR/2 wideband) OR (UWB))
- (rail* OR train* OR vehic*) AND ((ultra NEAR/4 wideband) OR (UWB)) AND (length* OR distanc*) AND (crash* OR collision* OR collide* OR disast* OR accident*) AND (alert* OR warn* OR notif*) AND (stop* OR brak*) AND (mount* OR install*) AND ((radio NEAR/2 frequency) OR (RFID) OR barcod* OR (bar NEAR/2 code))

Electronic Acknowledgement Receipt

EFS ID:	36266825
Application Number:	16246940
International Application Number:	
Confirmation Number:	8489
Title of Invention:	WORKER PROTECTION SYSTEM
First Named Inventor/Applicant Name:	Richard Carlson
Customer Number:	23446
Filer:	Rami Naim Moussa/Elaine Maxson
Filer Authorized By:	Rami Naim Moussa
Attorney Docket Number:	29153US03
Receipt Date:	11-JUN-2019
Filing Date:	14-JAN-2019
Time Stamp:	15:30:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	29153US03_IDS_transmittal_letter.pdf	27013 4e17af8cd7cb885e10c2fea09fe27633e3aed38b	no	2

Warnings:

SIEMENS et al. EXHIBIT 1002

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	29153US03_SB08a.pdf	1037566	no	10
			16a7343119ff8644f4c91013aad4347314a60246		
Warnings:					
Information:					
3	Other Reference-Patent/App/Search documents	Chinese_Office_Action_2017100744496.pdf	3138249	no	22
			c9b151e7c78243f3e16ece0c7954c19a5e1ae8f9		
Warnings:					
Information:					
4	Foreign Reference	CN1417071A.pdf	872342	no	22
			a46249280d356b9c05d6287aeae92154c190e656		
Warnings:					
Information:					
5	Foreign Reference	CN1676375A.pdf	466012	no	11
			04942107c349d8b6cc240a063e0d287704efb8b7		
Warnings:					
Information:					
6	Foreign Reference	CN102923158A.pdf	414225	no	7
			1043bb8c08c5c26aab9b0237940dc987178e82b4		
Warnings:					
Information:					
7	Other Reference-Patent/App/Search documents	ISR_for_PCTUS2016023754.pdf	196762	no	10
			ff3527e4cad70cb4180b4218efd3bcd9ce7be57		
Warnings:					
Information:					
8	Other Reference-Patent/App/Search documents	PCTUS2014053900_ISR-WO_150218.pdf	3992379	no	21
			911699838584cd0c41f615d8acd6c66eb435e40e		
Warnings:					
Information:					
Total Files Size (in bytes):			10144548		
SIEMENS et al EXHIBIT 1002					

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE
Attorney Docket No. 29153US03

In the Application of:

Richard Carlson, et al.

Serial No. : 16/246,940

Filed: January 14, 2019

For: WORKER PROTECTION SYSTEM

Examiner: Not yet assigned

Group Art Unit No.: 3617

Confirmation No.: 8489

CERTIFICATION OF ELECTRONIC FILING

I hereby certify that this correspondence is being electronically filed with the Patent and Trademark Office on June 11, 2019.

*Rami N. Moussa
Reg. No. 69,528*

*____/Rami N. Moussa/_____
Signature*

**TRANSMITTAL OF INFORMATION DISCLOSURE
STATEMENT AFTER APPLICATION FILING DATE**

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Examiner:

Enclosed are the following:

- (1) A completed PTO Form SB/08a which has 10 page(s).

This IDS is being submitted prior to receipt of a first Office Action. This submission is in no way intended as an admission that the above-cited references constitute prior art under any subsection of 35 U.S.C. § 102. Applicant expressly retains the right to take any actions

Attorney Docket No. 29153US03

necessary to remove the above-cited references from the available prior art. Consideration of the above-identified references in the examination of the present patent application is respectfully requested.

The Commissioner is hereby authorized to charge any additional fees which may be required or credit any overpayment to Account No. 13-0017.

Respectfully submitted,

/Rami N. Moussa/
Rami N. Moussa
Registration No. 69,528
Attorney for Applicant

Date: June 11, 2019

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Telephone: (312) 775-8000
Facsimile: (312) 775-8100

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 16/246,940		Filing Date 01/14/2019		☐ To be Mailed		
ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO										
APPLICATION AS FILED - PART I										
		(Column 1)	(Column 2)							
FOR		NUMBER FILED	NUMBER EXTRA	RATE (\$)		FEE (\$)				
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A	N/A						
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))		N/A	N/A	N/A						
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A	N/A						
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 =	*	x \$50 =						
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =	*	x \$230 =						
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).								
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))										
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL						
APPLICATION AS AMENDED - PART II										
		(Column 1)		(Column 2)	(Column 3)					
AMENDMENT	06/26/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)		
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	x \$50 =		0		
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0	x \$230 =		0		
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE		0		
		(Column 1)		(Column 2)	(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)		
	Total (37 CFR 1.16(i))	*	Minus	**	=	x \$0 =				
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$0 =				
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE				
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						LIE				
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/BRUCE D HARRISON/				
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This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Attorney Docket № 29153US03)

In the Application of:

Richard CARLSON et al.

Serial No. 16/246,940

Filed: Jan. 14, 2019

For: WORKER PROTECTION SYSTEM

Examiner: Unassigned

Group Art Unit: 3617

Confirmation No.: 8489

Customer No.: 23446

CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being transmitted via EFS-Web to the United States Patent and Trademark Office on: Jun. 26, 2019.

/Rami N. Moussa/

Rami N. Moussa

Reg. No. 69,528

PRELIMINARY AMENDMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

The Applicant respectfully submits this preliminary amendment in connection with the above-identified application ("Application"). Kindly amend this Application as follows:

A general statement on amendments begins on page 2 of this paper.

Amendment to the Abstract begins on page 3 of this paper.

Amendments to the Claims begin on page 4 of this paper.

Remarks begin on page 9 of this paper.

GENERAL STATEMENT ON FILING OF AMENDMENTS

Title 37 U.S.C. §1.125(a) states that “If the number or nature of the amendments or the legibility of the application papers renders it difficult to consider the application, or to arrange the papers for printing or copying, the Office may require the entire specification, including the claims, or any part thereof, be rewritten.”

The Applicant submits that this does not apply in the present situation because the preliminary amendment submitted was in the proper format, does not include an excessive number of amendments, and is perfectly legible.

Accordingly, the Applicant respectfully submits that, in general, a preliminary amendment is a proper vehicle for effecting changes to (1) the claims, (2) the priority claim, and (3) the abstract.

AMENDMENTS TO THE ABSTRACT

Please replace the “ABSTRACT” Section with the following paragraph:

ABSTRACT

A worker protection system may include a train-mounted unit for use on a train, and one or more wayside units, configured for placement on or near a track traversed by the train. Each of the train-mounted unit and the one or more wayside units may include a corresponding communication component, with one or more antennas, configured to transmit and/or receive wireless signals, with the signals comprise ultra-wideband (UWB) signals, and one or more circuits configured for processing signals and data, and for performing applications or functions relating to operations of the corresponding unit. The train-mounted unit may operate cooperatively with the one or more wayside units, to provide alerts to one or more workers operating on or near the track, based on communication of the UWB signals with at least one of the one or more wayside units.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1-20. (Canceled)

21. (New) A system for worker protection, the system comprises:

a train-mounted unit for use on a train, wherein the train-mounted unit comprises:

a communication component, comprising one or more antennas, configured to transmit and/or receive wireless signals, wherein the signals comprise ultra-wideband (UWB) signals; and

one or more circuits configured to process signals and data, and perform one or more applications or functions relating to operations of the train-mounted unit; and

wherein the train-mounted unit is configured to operate cooperatively with one or more wayside units, configured for placement on or near a track traversed by the train, to provide alerts to one or more workers operating on or near the track, based on communication of the UWB signals with at least one of the one or more wayside units.

22. (New) The system of claim 21, wherein the train-mounted unit is configured to broadcast alert triggering signals.

23. (New) The system of claim 21, wherein the train-mounted unit is configured to generate data relating to alerts and/or to other devices or objects in a path of the train, based on the communication of the UWB signals with at least one of the one or more wayside units.

24. (New) The system of claim 21, wherein the train-mounted unit is configured to generate feedback information for outputting to an operator of the train, based on the communication of the UWB signals with at least one of the one or more wayside units.

25. (New) The system of claim 21, wherein the train-mounted unit is configured to:
receive a signal indicating an acknowledgment of a safety alert by a worker of the
one or more workers, in response to broadcasted alert triggering signals; and
provide an indication of the acknowledgement to an operator of the train.
26. (New) The system of claim 21, wherein the train-mounted unit is configured to log
data relating to alerts triggered in response to movement of the train.
27. (New) The system of claim 21, wherein the train-mounted unit comprises one or
more input/output (I/O) components, for receiving input from an operator of the train
and/or for providing output to the operator of the train
28. The system of claim 21, wherein the train-mounted unit comprises housing for
enclosing components of the train-mounted unit.
29. (New) The system of claim 21, wherein the train-mounted unit is configured, at
least in part, as portable, detachable and moveable from the train.
30. (New) The system of claim 21, wherein the train-mounted unit is arranged into a
plurality of separate physical units that comprises at least a broadcast unit comprising at
least the communication component, and wherein the broadcast unit is configured for
deployment external to the train.
31. (New) The system of claim 30, wherein the plurality of separate physical units
comprises an operator unit comprising at least the one or more I/O components, and
wherein the operator unit is configured for use by an operator of the train.
32. (New) A system for worker protection, the system comprises:
one or more wayside units configured for placement on or near a track; wherein
each wayside unit comprises:

a communication component, comprising one or more antennas, configured to transmit and/or receive wireless signals, wherein the signals comprise ultra-wideband (UWB) signals; and

one or more circuits configured to process signals and data, and perform one or more applications or functions relating to operations of the wayside detection unit; and

wherein the one or more wayside units are configured to operate cooperatively with any train-mounted unit deployed on a train traversing the track, to provide alerts to one or more workers operating on or near the track, based on communication of the UWB signals between at least one of the one or more wayside units and the train-mounted unit.

33. (New) The system of claim 32, wherein each wayside unit comprises a power supply for powering components of the wayside unit.

34. (New) The system of claim 32, wherein each wayside unit comprises a housing for enclosing components of the wayside unit.

35. (New) The system of claim 32, wherein each wayside unit comprises a support structure for holding and supporting the wayside unit when placed on or near the track.

36. (New) The system of claim 32, wherein at least one wayside unit is configured to broadcast alert related signals, relating to the train when approaching the wayside unit.

37. (New) The system of claim 32, wherein at least one wayside unit is configured to forward alerts and/or alert related signals received from the train-mounted unit.

38. (New) The system of claim 32, wherein at least one wayside unit is configured to log data relating to alerts triggered in response to broadcasted alert related signals.

39. (New) The system of claim 32, wherein at least one wayside unit comprises one or more sensory components, for detecting, monitoring, and/or tracking trains, and wherein the at least one wayside unit configured to determine, based on sensory data obtained from the one or more sensors, when the train is approaching the wayside unit.

40. (New) A system for protecting workers near railroad tracks, comprising:
one or more UWB radios at pre-determined locations along the railroad tracks;
one or more worker UWB radios associated with one or more workers on or near the railroad tracks;

a vehicle UWB radio associated with a vehicle on the railroad track;

wherein:

the vehicle UWB radio is in communication with a processor, wherein:

the processor determines a position of the vehicle based on time of flight measurements obtained based on communication between the vehicle UWB radio and at least one of the one or more UWB radios that are located at pre-determined locations;

the processor determines a location in which the one or more workers are working based on time of flight information obtained based on communication with at least one of the one or more worker UWB radios;
and

the processor generates an alert to an operator of the vehicle based on the determined location of the one or more workers; and

at least one worker UWB radio communicates time of flight information between the at least one worker UWB radio and the vehicle UWB radio to a processor in communication with the at least one worker UWB radio, wherein the processor generates alerts to a worker associated with the at least one worker UWB radio based on one or more of: a determined distance to the vehicle UWB radio, an estimated time of closest approach of the vehicle UWB radio to a

location of the at least one worker UWB radio, and an approach speed of the vehicle UWB radio.

REMARKS

Claims 1-20 are pending in this Application. By this amendment, claims 1-20 have been canceled, and new claims 21-40 are added, of which claims 21, 32 and 40 are independent claims, and claims 22-31 and 33-39 are dependent claims, depending from independent claims 21 and 32. Each of claims 21-40 is respectfully submitted to define an allowable subject matter.

With respect to this Application, the Applicant hereby rescinds any disclaimer of claim scope made in the parent application or any predecessor or related application. The Examiner is advised that any previous disclaimer of claim scope, if any, and the alleged prior art that it was made to allegedly avoid, may need to be revisited. Nor should a disclaimer of claim scope, if any, in this Application be read back into any predecessor or related application.

CONCLUSION

The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to the deposit account of McAndrews, Held & Malloy, Ltd., Account No. 13-0017.

A Notice of Allowability is courteously solicited.

Date: Jun. 26, 2019

Respectfully submitted,

/Rami N. Moussa/
Rami N. Moussa
Registration No. 69,528
Attorney for Applicant

MCANDREWS, HELD & MALLOY, LTD.
500 WEST MADISON STREET, 34TH FLOOR
CHICAGO, ILLINOIS 60661
(312) 775-8000

Electronic Acknowledgement Receipt

EFS ID:	36415684
Application Number:	16246940
International Application Number:	
Confirmation Number:	8489
Title of Invention:	WORKER PROTECTION SYSTEM
First Named Inventor/Applicant Name:	Richard Carlson
Customer Number:	23446
Filer:	Rami Naim Moussa/Elaine Maxson
Filer Authorized By:	Rami Naim Moussa
Attorney Docket Number:	29153US03
Receipt Date:	26-JUN-2019
Filing Date:	14-JAN-2019
Time Stamp:	13:29:22
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		29153US03_Prel_Amendment. pdf	52340	yes	10
			ca07210bd3a3f3482a2bc99a479f2086ffb0e744		

Multipart Description/PDF files in .zip description			
Document Description	Start	End	
Preliminary Amendment	1	2	
Abstract	3	3	
Claims	4	8	
Applicant Arguments/Remarks Made in an Amendment	9	10	

Warnings:

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/246,940	01/14/2019	Richard Carlson	29153US03

CONFIRMATION NO. 8489

PUBLICATION NOTICE



OC000000111247189

23446
MCANDREWS HELD & MALLOY, LTD
500 WEST MADISON STREET
SUITE 3400
CHICAGO, IL 60661

Title:WORKER PROTECTION SYSTEM

Publication No.US-2019-0283787-A1

Publication Date:09/19/2019

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

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NOTICE OF ALLOWANCE AND FEE(S) DUE

23446 7590 03/31/2020
MCANDREWS HELD & MALLOY, LTD
500 WEST MADISON STREET
SUITE 3400
CHICAGO, IL 60661

EXAMINER

SMITH, JASON C

ART UNIT

PAPER NUMBER

3617

DATE MAILED: 03/31/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/246,940	01/14/2019	Richard Carlson	29153US03	8489

TITLE OF INVENTION: WORKER PROTECTION SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	06/30/2020

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

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By fax, send to: (571)-273-2885

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CHICAGO, IL 60661

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(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/246,940	01/14/2019	Richard Carlson	29153US03	8489

TITLE OF INVENTION: WORKER PROTECTION SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	06/30/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
SMITH, JASON C	3617	246-124000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

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3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

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☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

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Date _____

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/246,940	01/14/2019	Richard Carlson	29153US03	8489
23446	7590	03/31/2020	EXAMINER	
MCANDREWS HELD & MALLOY, LTD 500 WEST MADISON STREET SUITE 3400 CHICAGO, IL 60661			SMITH, JASON C	
			ART UNIT	PAPER NUMBER
			3617	

DATE MAILED: 03/31/2020

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

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The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law of the United States.

Notice of Allowability	Application No. 16/246,940	Applicant(s) Carlson et al.	
	Examiner JASON C SMITH	Art Unit 3617	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 01/14/2019.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 21-40. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☐ All b) ☐ Some *c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892) 2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date <u>06/11/2019</u> . 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	5. ☐ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
---	--

/Jason C Smith/
Primary Examiner, Art Unit 3617

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Reasons for Allowance

The following is an examiner's statement of reasons for allowance: the one or more circuits configured to process signals and data, and perform one or more applications or functions relating to operations of the train-mounted unit; and wherein the train-mounted unit is configured to operate cooperatively with one or more wayside units, configured for placement on or near a track traversed by the train, to provide alerts to one or more workers operating on or near the track, based on communication of the UWB signals with at least one of the one or more wayside units is seen as an unobvious improvement over the art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JASON C SMITH whose telephone number is (571)270-5225. The examiner can normally be reached on Monday - Friday 8:30 AM - 5:00 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Morano can be reached on (571) 272-6684. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <https://ppair-my.uspto.gov/pair/PrivatePair>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jason C Smith/
Primary Examiner, Art Unit 3617

<i>Notice of References Cited</i>	Application/Control No. 16/246,940		Applicant(s)/Patent Under Reexamination Carlson et al.	
	Examiner JASON C SMITH		Art Unit 3617	Page 1 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20170282944-A1	10-2017	Carlson; Richard	B61L15/0027	1/1
*	B	US-20160280240-A1	09-2016	Carlson; Richard	G01S19/17	1/1
*	C	US-20140045547-A1	02-2014	Singamsetty; Suresh	G06F1/1643	455/552.1
*	D	US-20130166114-A1	06-2013	Baines; Stephen	B61L23/06	701/20
*	E	US-20120296562-A1	11-2012	Carlson; Richard C.	B61L15/0027	701/301
*	F	US-20110152971-A1	06-2011	Nghiem; David	A61N1/37229	607/60
*	G	US-20110006912-A1	01-2011	Sheardown; Keith Burton	B61L23/06	340/901
*	H	US-20100102954-A1	04-2010	Radivojevic; Zoran	G01S11/06	340/539.11
*	I	US-8952805-B2	02-2015	Baines; Stephen	G08B21/02	340/539.12
*	J	US-8786428-B2	07-2014	Sheardown; Keith Burton	B61L23/06	246/122R
*	K	US-8248263-B2	08-2012	Shervey; Richard Clayton	F16P3/147	340/539.1
*	L	US-8109474-B2	02-2012	Bartek; Peter M.	B61L1/02	246/124
*	M	US-7624952-B1	12-2009	Bartek; Peter M.	B61L23/06	246/124

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<i>Notice of References Cited</i>	Application/Control No. 16/246,940		Applicant(s)/Patent Under Reexamination Carlson et al.	
	Examiner JASON C SMITH		Art Unit 3617	Page 2 of 3

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*	A	US-7167082-B2	01-2007	Stigall; Robert E.	A41D13/00	340/407.1
*	B	US-6650242-B2	11-2003	Clerk; Frederick George	F16P3/144	340/425.5
*	C	US-6232887-B1	05-2001	Carson; Joseph E.	B61L23/06	340/4.21
*	D	US-6208260-B1	03-2001	West; Jill	B66C15/06	340/5.1
*	E	US-6145792-A	11-2000	Penza; George Gregory	B61L3/125	246/122R
*	F	US-6113037-A	09-2000	Pace; Joseph A.	B61L23/06	246/124
*	G	US-5939986-A	08-1999	Schiffbauer; William H.	B66C15/045	299/12
*	H	US-5924651-A	07-1999	Penza; George Gregory	B61L23/06	246/124
*	I	US-5727758-A	03-1998	Penza; George Gregory	B61L23/06	246/124
*	J	US-5652570-A	07-1997	Lepkofker; Robert	A61B5/1112	340/407.1
*	K	US-5620155-A	04-1997	Michalek; Jan K.	B61L29/24	246/121
*	L	US-5554982-A	09-1996	Shirkey; Keith L.	B61L3/004	246/122R
*	M	US-5198800-A	03-1993	Tozawa; Shoji	E02F9/2033	212/276

FOREIGN PATENT DOCUMENTS

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	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
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<i>Notice of References Cited</i>	Application/Control No. 16/246,940		Applicant(s)/Patent Under Reexamination Carlson et al.	
	Examiner JASON C SMITH		Art Unit 3617	Page 3 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2762913-A	09-1956	JEPSON WILLIAM L	B61L23/34	246/124
*	B	US-2475578-A	07-1949	HALSTEAD WILLIAM S	B61L23/00	362/88
	C					
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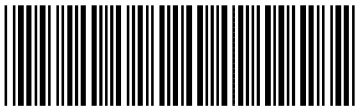
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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Issue Classification 	Application/Control No. 16/246,940	Applicant(s)/Patent Under Reexamination Carlson et al.	
	Examiner JASON C SMITH	Art Unit 3617	

CPC						
Symbol					Type	Version
B61L	/	23	/	06	F	2013-01-01
B61L	/	25	/	025	I	2013-01-01
B61L	/	25	/	021	I	2013-01-01
G01S	/	19	/	17	I	2013-01-01
B61L	/	15	/	0027	I	2013-01-01
B61L	/	2205	/	02	A	2013-01-01
B61L	/	2205	/	04	A	2013-01-01

CPC Combination Sets					
Symbol				Type	Version
	/		/		

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/Jason C Smith/ Primary Examiner, Art Unit 3617	19 March 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	21	1a

Issue Classification 	Application/Control No. 16/246,940	Applicant(s)/Patent Under Reexamination Carlson et al.
	Examiner JASON C SMITH	Art Unit 3617

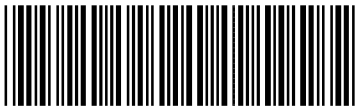
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CLAIMED			
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B61L25/02	/	25	/ 02
G01S19/17	/	19	/ 17
B61L15/00	/	15	/ 00
CPCONLY	/	NLY	/

NON-CLAIMED			
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US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

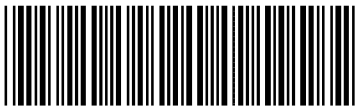
CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/Jason C Smith/ Primary Examiner, Art Unit 3617 (Primary Examiner)	19 March 2020 (Date)	O.G. Print Claim(s) 21	O.G. Print Figure 1a

Issue Classification 	Application/Control No. 16/246,940	Applicant(s)/Patent Under Reexamination Carlson et al.
	Examiner JASON C SMITH	Art Unit 3617

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		10		19	8	28	17	37						
	2		11		20	9	29	18	38						
	3		12	1	21	10	30	19	39						
	4		13	2	22	11	31	20	40						
	5		14	3	23	12	32								
	6		15	4	24	13	33								
	7		16	5	25	14	34								
	8		17	6	26	15	35								
	9		18	7	27	16	36								

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/Jason C Smith/ Primary Examiner, Art Unit 3617 (Primary Examiner) _____ (Date) 19 March 2020		O.G. Print Claim(s) 21	O.G. Print Figure 1a

<i>Search Notes</i> 	Application/Control No. 16/246,940	Applicant(s)/Patent Under Reexamination Carlson et al.
	Examiner JASON C SMITH	Art Unit 3617

CPC - Searched*		
Symbol	Date	Examiner
B61L 23/06, 23/34, 25/02	03/19/2020	jcs
G08B 1/08, 13/2488, 21/02, 18	03/19/2020	jcs
G08F 1/123, 16, 163, 166	03/19/2020	jcs

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
east text search	03/19/2020	jcs

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
B61L	23/06, 34, 25/02	03/19/2020	jcs
G08B	1/08, 13/2488, 21/02, 18	03/19/2020	jcs

/Jason C Smith/ Primary Examiner, Art Unit 3617	
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Doc code: IDS

PTO/SB/08a (03-15)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2016. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	16246940
Filing Date	2019-01-14
First Named Inventor	Richard Carlson
Art Unit	3617
Examiner Name	Not yet assigned
Attorney Docket Number	29153US03

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5727758		1998-03-17	Penza et al.	
	2	5924651		1999-07-20	Penza et al.	
	3	5939986		1999-08-17	Schiffbauer et al.	
	4	6113037		2000-09-05	Pace	
	5	6145792		2000-11-14	Penza et al.	
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	7	7167082		2007-01-23	Stigall	
	8	7624952		2009-12-01	Bartek	

**INFORMATION DISCLOSURE
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9	8109474	2012-02-07	Bartek
10	8248263	2012-08-21	Shervey et al.
11	8344877	2013-01-01	Sheardown et al.
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15	2762913	1956-09-11	Jepson
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18	5620155	1997-04-15	Michalek
19	5554982	1996-09-10	Shirkey et al.

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21	5198800		1993-03-30	Tozawa et al.	
22	5675190		1997-10-07	Morita	
23	4302811		1981-11-24	McElhenny	
24	4327415		1982-04-27	Rush et al.	
25	4459668		1984-07-10	Inoue et al.	
26	4495578		1985-01-22	Sibley et al.	
27	4538228		1985-08-27	Brearey et al.	
28	4869557		1989-09-26	Gerum et al.	
29	8200380		2012-06-12	Ghaly	
30	8478463		2013-07-02	Knott et al.	

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31	8651433	2014-02-18	Ghaly
32	9134411	2015-09-15	Soderi et al.

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	1	20100102954		2010-04-29	Radivojevic et al.	
	2	20130166114		2013-06-27	Baines et al.	
	3	20110006912		2011-01-13	Sheardown et al.	
	4	20110152971		2011-06-23	Nghiem et al.	
	5	20120296562		2012-11-22	Carlson et al.	
	6	20140045547		2014-02-13	Singamsetty et al.	
	7	20160280240		2016-09-29	Calson et al.	

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Art Unit	3617	
Examiner Name	Not yet assigned	
Attorney Docket Number	29153US03	

8	20170282944		2017-10-05	Carlson et al.	
9	20140229096		2014-08-14	Carlson	
10	20110046845		2011-02-24	Kozlay	
11	20080114519		2008-05-15	Defaux	
12	20060151672		2006-07-13	Heddebaut	
13	20100225527		2010-09-09	Talty	
14	20040155760		2004-08-12	Grisham	
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16	20120286563		2012-11-15	Lichterfield et al.	
17	20140046514		2014-02-13	Jennek et al.	
18	20140214247		2014-07-31	Myokei	

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Art Unit		3617
Examiner Name	Not yet assigned	
Attorney Docket Number		29153US03

19	20150032302		2015-01-29	Foerster et al.	
20	20150329130		2015-11-19	Carlson et al.	
21	20150367822		2015-12-24	Jennek et al.	
22	20050010338		2005-01-13	Kraeling et al.	
23	20050110628		2005-05-26	Kernwein et al.	
24	20060015224		2006-01-19	Hilleary	
25	20080040023		2008-02-14	Breed et al	
26	20100063656		2010-03-11	Knott et al.	
27	20100268466		2010-10-21	Amutham	
28	20110184621		2011-07-28	Bock et al.	
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Art Unit	3617
Examiner Name	Not yet assigned
Attorney Docket Number	29153US03

30	20120029740	2012-02-02	Bock et al.
31	20130138276	2013-05-30	Soderi et al.
32	20150060608	2015-03-05	Carlson et al.

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FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	102923158	CN		2013-02-13	Chen Gengtian	English Language Abstract provided	×
	2	1417071	CN		2003-05-14	Shenzhen Maishiwei Sci-Tech Co., Ltd.	English Language Abstract provided	☒
	3	1676375	CN		2005-10-05	Shantou Univ.	English Language Abstract provided	☒

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NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	International Search Report and Written Opinion for PCT/US2016/023754, mailed August 8, 2016. (10 pages)	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16246940
Filing Date	2019-01-14
First Named Inventor	Richard Carlson
Art Unit	3617
Examiner Name	Not yet assigned
Attorney Docket Number	29153US03

2	Chinese Office Action for Application No. 201710074449.6, dated January 17, 2019 (22 pages).
3	PCT, Notification of Transmittal of the International Search Report and the Written Opinion of the International Searching Authority, or the Declaration, in International application no. PCT/US2014/053900, dated February 18, 2015 (21 pages).

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/Jason C Smith/	Date Considered	03/19/2020
--------------------	-----------------	-----------------	------------

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16246940
Filing Date	2019-01-14
First Named Inventor	Richard Carlson
Art Unit	3617
Examiner Name	Not yet assigned
Attorney Docket Number	29153US03

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Rami N. Moussa/	Date (YYYY-MM-DD)	2019-06-11
Name/Print	Rami N. Moussa	Registration Number	69528

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	478	((("CARLSON") near3 ("Richard")) OR ((("GUNTHER") near3 ("Kurt")) OR ((("WOITEL") near3 ("Sara")) OR ((("CYGNUS") near3 ("Marc")) OR ((("STREZEV") near3 ("Peter")) OR ((("PLUTT") near3 ("John")))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/19 20:34
L2	66	("20030214417" "20040155760" "20050010338" "20050110628" "20060015224" "20060151672" "20080040023" "20080114519" "20100063656" "20100102954" "20100225527" "20100268466" "20110006912" "20110046845" "20110152971" "20110184621" "20110234451" "20120029740" "20120286563" "20120296562" "20130138276" "20130166114" "20140045547" "20140046514" "20140214247" "20140229096" "20150032302" "20150060608" "20150329130" "20150367822" "20160280240" "20170282944" "2475578" "2762913" "4302811" "4327415" "4459668" "4495578" "4538228" "4869557" "5198800" "5554982" "5620155" "5652570" "5675190" "5727758" "5924651" "5939986" "6113037" "6145792" "6208260" "6232887" "6650242" "7167082" "7624952" "8109474" "8200380" "8248263" "8344877" "8478463" "8651433" "8786428" "8952805" "9134411").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/19 20:35
L3	2	"20110006912"	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/19 20:35
L4	6	"20140045547"	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/19 20:35
L5	2	"20110152971"	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/19 20:36
L6	2	"20120296562"	US-PGPUB; USPAT; USOCR	OR	ON	2020/03/19 20:36
L7	29	"5727758"	US-PGPUB;	OR	ON	2020/03/19 20:36

			USPAT; USOCR			
S1	2	"15078427"	US- PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:40
S2	29	("20130166114" "2475578" "2762913" "6113037" "5727758" "5924651" "5620155" "6208260" "20110152971" "5198800" "5939986" "6145792" "6232887" "6650242" "8109474" "8344877" "20100102954" "5554982" "5652570" "8952805" "20110006912" "20140045547" "7624952" "8248263" "8786428" "20120296562" "7167082").PN.	US- PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:41
S3	104	b61l23/06.cpc.	US- PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:44
S4	159	b61l23/34.cpc.	US- PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:44
S5	160	b61l25/02.cpc.	US- PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:44
S6	896	G08b1/08.cpc.	US- PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:44
S7	1709	G08b21/02.cpc.	US- PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:44
S8	1417	G08b21/18.cpc.	US- PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:44
S9	707	g08g1/123.cpc.	US- PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:45
S10	1254	g08g1/16.cpc.	US- PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:45
S11	988	g08g1/163.cpc.	US- PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:45
S12	3459	g08g1/166.cpc.	US- PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:45
S13	16	g08g7/02.cpc.	US- PGPUB; USPAT;	OR	ON	2018/03/09 08:45

			USOCR			
S14	93	g08g9/02.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:45
S15	262	carlson adj richard.in.	US-PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:46
S16	22	gunther adj kurt.in.	US-PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:46
S17	2	woitel adj sara.in.	US-PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:46
S18	13	cygnus adj marc.in.	US-PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:46
S19	5	strezev adj peter.in.	US-PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:46
S20	0	plutt adj john.in.	US-PGPUB; USPAT; USOCR	OR	ON	2018/03/09 08:47

3/19/2020 8:39:30 PM
C:\Users\jsmith8\Documents\EAST\Workspaces\16246940.wsp

Bibliographic Data

Application No: 16/246,940

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☒ No ☐ Met After Allowance

Verified and Acknowledged:

/Jason C Smith/

Examiner's Signature

Initials

Title:

WORKER PROTECTION SYSTEM

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/14/2019	246	3617	29153US03
RULE			

APPLICANTS

Metrom Rail, LLC, Crystal Lake, IL, UNITED STATES

INVENTORS

Richard Carlson Woodstock, IL, UNITED STATES

Kurt Gunther Leland, IL, UNITED STATES

Sara Jo Woitel Lake Zurich, IL, UNITED STATES

Marc Wayne Cygnus Mundelein, IL, UNITED STATES

Peter Strezev Apollo Beach, FL, UNITED STATES

John Albert Plutt JR., Chicago, IL, UNITED STATES

CONTINUING DATA

This application is a CON of 15078427 03/23/2016 PAT 10179595

15078427 has PRO of 62177683 03/23/2015

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/05/2019

** SMALL ENTITY **

STATE OR COUNTRY

UNITED STATES

ADDRESS

MCANDREWS HELD & MALLOY, LTD

500 WEST MADISON STREET

SUITE 3400

CHICAGO, IL 60661

UNITED STATES

FILING FEE RECEIVED

\$1,165

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

23446 7590 03/31/2020
MCANDREWS HELD & MALLOY, LTD
500 WEST MADISON STREET
SUITE 3400
CHICAGO, IL 60661

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

Rami N. Moussa	(Typed or printed name)
/Rami N. Moussa	(Signature)
June 29, 2020	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/246,940	01/14/2019	Richard Carlson	29153US03	8489

TITLE OF INVENTION: WORKER PROTECTION SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	06/30/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
SMITH, JASON C	3617	246-124000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 McAndrews, Held & Malloy, Ltd.

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Metrom Rail, LLC

Crystal Lake, IL

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 13-0017

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Rami N. Moussa/

Date June 29, 2020

Typed or printed name Rami N. Moussa

Registration No. 69,528

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Attorney Docket № 29153US03)

In the Application of:

Richard CARLSON et al.

Serial No. 16/246,940

Filed: Jan. 14, 2019

For: WORKER PROTECTION SYSTEM

Examiner: Jason C. Smith

Group Art Unit: 3617

Confirmation No.: 8489

Customer No.: 23446

CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being transmitted via EFS-Web to the United States Patent and Trademark Office on: Jun. 29, 2020.

/Rami N. Moussa/

Rami N. Moussa

Reg. No. 69,528

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

Mail Stop Issue Fee
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This paper responds to the notice of allowance of Mar. 31, 2020 ("Notice") in the above-identified application ("Application"). Applicant respectfully requests entry of the following remarks in the record.

REMARKS

Claims 21-40 are pending in this Application, of which claims 21, 32 and 40 are independent claims, and claims 22-31 and 33-39 are dependent claims, depending from independent claims 21 and 32. Claims 1-20 were previously canceled.

As indicated in the Notice, all of claims 21-40 are allowed. In this regard, the Notice indicates that the allowance is responsive to the initial submission of the Application on Jan. 14, 2019, and additionally provide reasons for allowing the claims. Notice at 2. Further, various statements and/or arguments regarding the claims and/or the disclosure in general (e.g., made during examination of the Application and/or any other related application(s)) may also be construed as reasons for allowing the claims.

Applicant thanks the Examiner for the positive consideration of the claims. However, with respect to the reasons for allowing the claims, Applicant does not agree or disagree with any reasons the United States Patent and Trademark Office ("Patent Office") may have had for allowing the claims, including the specific reasons set forth in the Notice, and respectfully submits that the allowability of the claims is based upon the features of the claims and the totality of the record. Further, with respect to the dependent claims, Applicant submits that each dependent claim stands on its own and is allowable based on its own elements and/or in combination with one or more elements recited in its base claim(s).

Applicant also reserves the right to traverse the stated reasons and/or to argue other reasons to support allowance of the claims, should the need arise in the future.

CONCLUSION

The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to the deposit account of McAndrews, Held & Malloy, Ltd., Account No. 13-0017.

Date: Jun. 29, 2020

Respectfully submitted,
/Rami N. Moussa/
Rami N. Moussa
Attorney for Applicant
Registration No. 69,528

McANDREWS, HELD & MALLOY, LTD.
500 WEST MADISON STREET, 34TH FLOOR
CHICAGO, ILLINOIS 60661
(312) 775-8000

Electronic Patent Application Fee Transmittal				
Application Number:		16246940		
Filing Date:		14-Jan-2019		
Title of Invention:		WORKER PROTECTION SYSTEM		
First Named Inventor/Applicant Name:		Richard Carlson		
Filer:		Rami Naim Moussa/Maggie Daly		
Attorney Docket Number:		29153US03		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	500	500

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				500

Electronic Acknowledgement Receipt

EFS ID:	39854047
Application Number:	16246940
International Application Number:	
Confirmation Number:	8489
Title of Invention:	WORKER PROTECTION SYSTEM
First Named Inventor/Applicant Name:	Richard Carlson
Customer Number:	23446
Filer:	Rami Naim Moussa/Maggie Daly
Filer Authorized By:	Rami Naim Moussa
Attorney Docket Number:	29153US03
Receipt Date:	29-JUN-2020
Filing Date:	14-JAN-2019
Time Stamp:	14:07:02
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 500
RAM confirmation Number	E20206SE07264465
Deposit Account	130017
Authorized User	Maggie Daly

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

SIEMENS et al. EXHIBIT 1002

37 CFR 1.19 (Document supply fees)
 37 CFR 1.20 (Post Issuance fees)
 37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	29153US03_Issue_Fee_Transmittal.pdf	1240021	no	1
			84b412d0b3ecd5eed2a1e035c735db4167fd6340		
Warnings:					
Information:					
2	Post Allowance Communication - Incoming	29153US03_Allowance_Comments.pdf	29105	no	3
			2d26ecddd8008025585facd90ae35e7bb69946ee		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30117	no	2
			09d0acbbba5a5da7812c486104562401250044a16		
Warnings:					
Information:					
Total Files Size (in bytes):			1299243		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/246,940	08/11/2020	10737709	29153US03	8489

23446 7590 07/22/2020

MCANDREWS HELD & MALLOY, LTD
500 WEST MADISON STREET
SUITE 3400
CHICAGO, IL 60661

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Metrom Rail, LLC, Crystal Lake, IL;
Richard Carlson, Woodstock, IL;
Kurt Gunther, Leland, IL;
Sara Jo Woitel, Lake Zurich, IL;
Marc Wayne Cygnus, Mundelein, IL;
Peter Strezev, Apollo Beach, FL;
John Albert Plutt JR., Chicago, IL;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been
filed in the U.S. District Court District of Delaware on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED 1/13/2022	U.S. DISTRICT COURT District of Delaware
PLAINTIFF Metrom Rail, LLC		DEFENDANT Siemens Mobility, Inc., Thales Transport & Security, Inc., Thales USA., Inc., Humatics Corp., and Piper Networks, Inc,
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 US 10,778,363 B2	9/15/2020	Metrom Rail, LLC
2 US 8,812,227 B2	8/19/2014	Metrom Rail, LLC
3 US 9,043,131 B2	5/26/2015	Metrom Rail, LLC
4 US 10,737,709 B2	8/11/2020	Metrom Rail, LLC
5 US 10,179,595 B2	1/15/2019	Metrom Rail, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
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Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

SIEMENS et al. EXHIBIT 1002

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