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(54) **RAIL CAR TRACKING SYSTEM**

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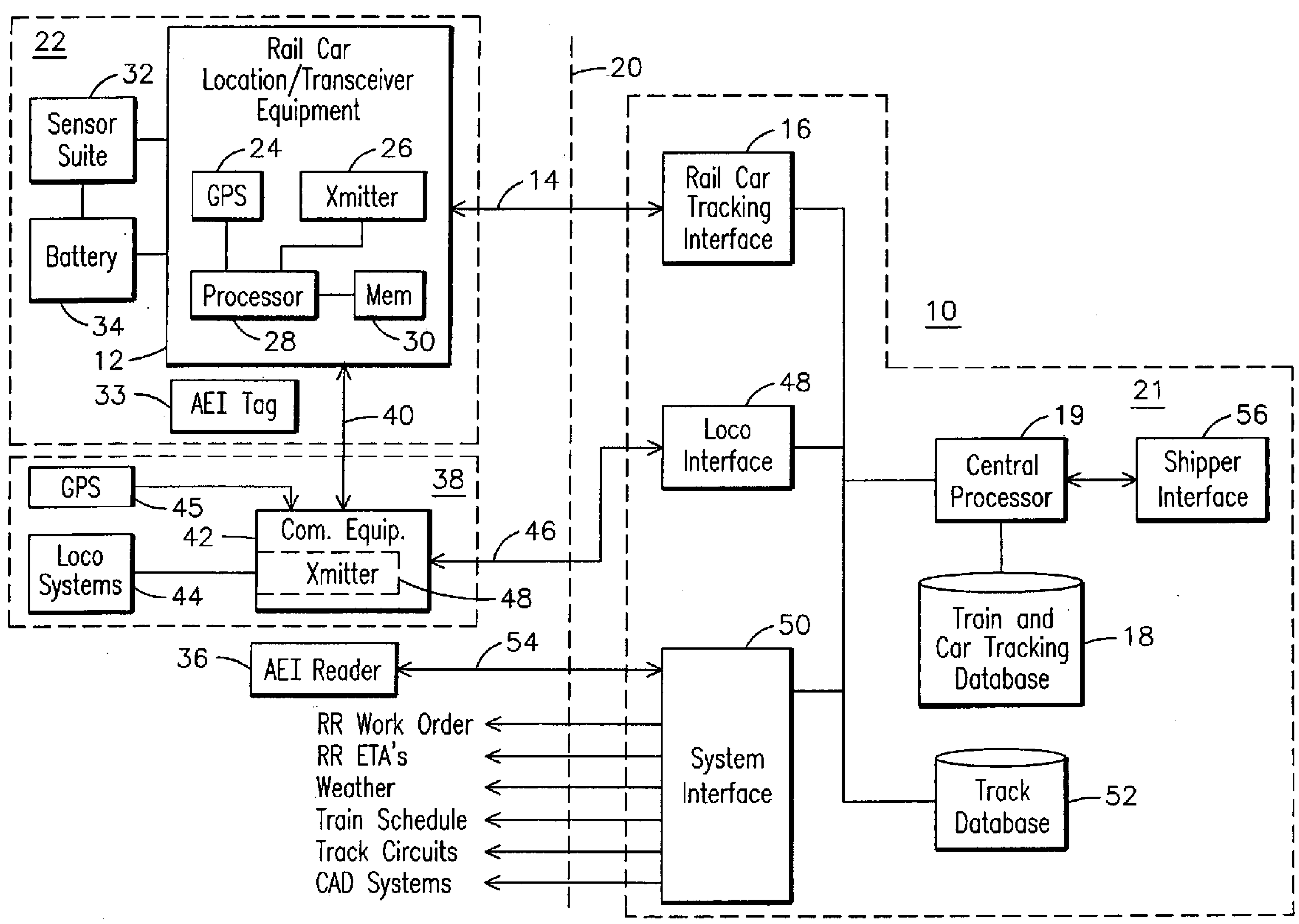
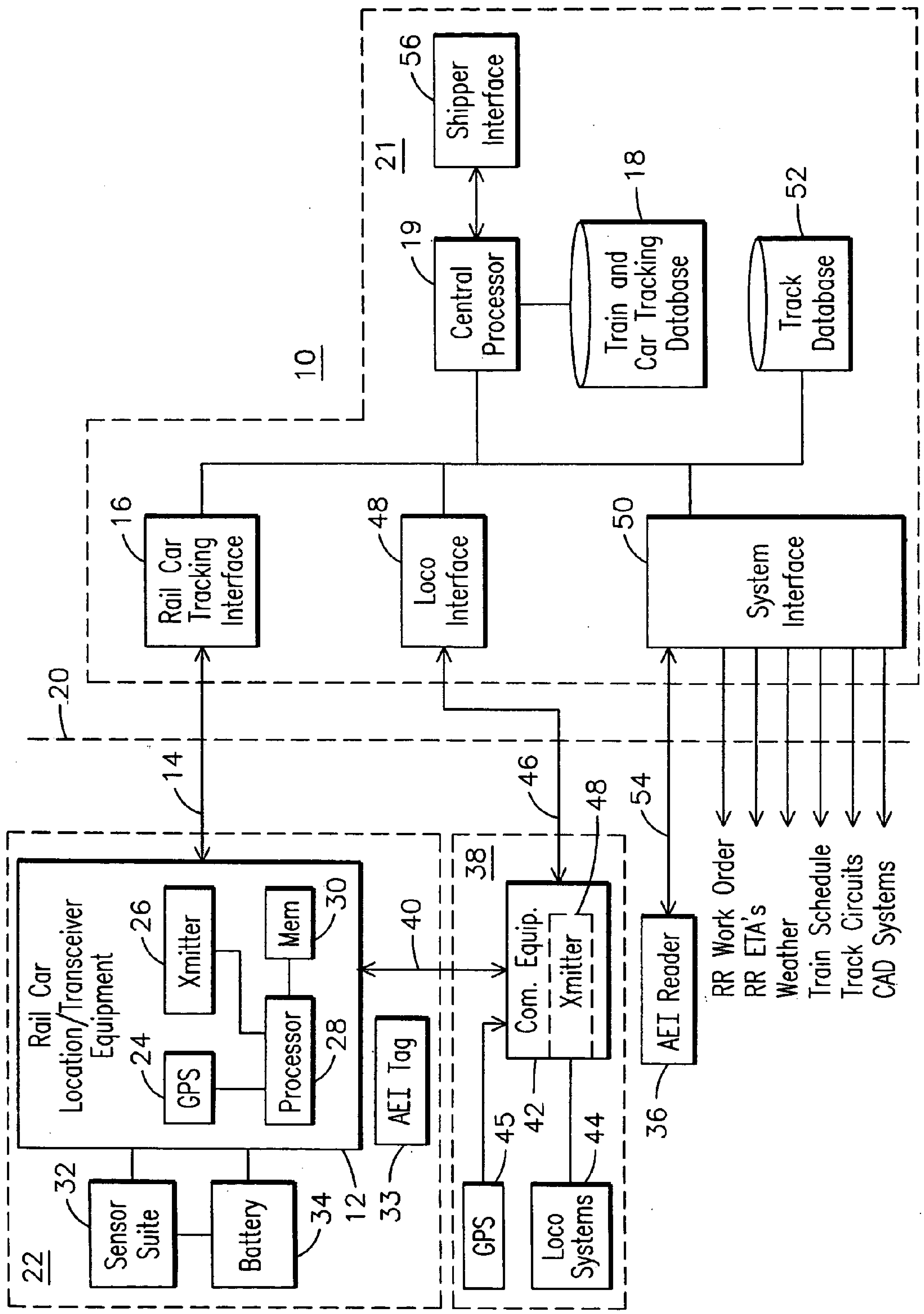
(57) **ABSTRACT**

A method and system for tracking a rail car having an on-board communication system including a location determining system and a transceiver for receiving and transmitting rail car data. The communication system including a processor responsive to an executable program for enabling operation of the transceiver to transmit rail car data during a reporting event and having a memory for storing data and instructions. The processor memory includes a remotely addressable software database accessible by the executable program for establishing a reporting event in response to at least one of a selected time, a change in geographical location, an extended time in a geographical location, an approach to a specified geographical location, a coupling/decoupling of the rail car with a particular locomotive and a command to report. The rail car includes an AEI reader attached to the rail car for reading AEI tags on other rail vehicles passing by the reader, the reader being in communication with the rail car message system for transmitting data indicating at least a location of the other rail vehicles.




10
21
Shipper Interface
56
Central Processor
19
Train and Car Tracking Database
18
Track Database
52
Rail Car Tracking Interface
16
Loco Interface
48
System Interface
50
20
14
46
48
54
22
Rail Car Location/Transceiver Equipment
GPS
24
Xmitter
26
Processor
28
Mem
30
Sensor Suite
32
Battery
34
12
AEI Tag
33
40
38
Com. Equip.
Xmitter
42
GPS
45
Loco Systems
44
AEI Reader
36
RR Work Order
RR ETA's
Weather
Train Schedule
Track Circuits
CAD Systems

RAIL CAR TRACKING SYSTEM

[0001] This application claims the benefit of U.S. provisional application No. 60/547,513 filed Feb. 24, 2004.

FIELD OF THE INVENTION

[0002] This invention relates generally to the field of rail transportation, and more particularly to tracking locations of rail cars within a rail transportation system.

BACKGROUND OF THE INVENTION

[0003] Railway shippers need to be able to track the location of rail cars within a rail transportation system. Supply chain management improvements and heightened security concerns have increased the need to track and pinpoint rail car locations at all times, whether the rail car is stationary in a rail yard or siding, or being moved through the rail system by a locomotive. Currently, rail cars may be equipped with radio frequency identification (RFID) tags such as Automatic Equipment Identification (AEI) tags that may be read by a wayside tag reader positioned at known locations within the rail system and configured to recognize and report when an AEI tagged railcar passes. Such reports are known as Car Location Messages (CLM's). Accordingly, a location and a time of passage of the rail car may be reported from the wayside tag reader to a centralized database that may be accessed by shippers or the railroad companies to track the last reported locations of their tagged rail cars. However, such an AEI system can only provide location information of the rail car at the time when the car passes the reader. Thus, the exact location of a railcar at times after it has passed an AEI tag reader, such as in an industrial plant, is not known through the use of the AEI tag system. Moreover, with only a relatively limited number of AEI tag readers available, a significant length of track (and thus a large number of possible railcar locations) may exist between adjacent AEI tag readers. Rail cars have also been equipped with locating equipment, such as a global positioning satellite (GPS) receiver, coupled to an on-board transmitter to transmit rail car location information to a central site for rail car tracking purposes. However, as described below, these systems typically transmit a large body of information in long messages so as to fully identify the location of the railcars and do so on regularly scheduled timed intervals, so that battery life has proven to be unacceptably short. On some trains known as dedicated "unit" trains, train-based local area networks (LAN's) have also been deployed to link cars in the train to the train locomotives.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] The invention will be more apparent from the following description in view of the sole FIGURE that shows a functional block diagram of an exemplary system for tracking rail cars in a rail transportation system.

DETAILED DESCRIPTION OF THE INVENTION

[0005] The present invention innovatively integrates information accumulated from multiple railway IT systems to provide a rail car tracking system operating on extended life intervals. The present invention enables a rail car tracking system that provides location-reporting accuracy that is improved over existing AEI tag systems that are limited by the spacing between wayside readers. The present invention also enables a rail car tracking system that provides high-value information transfer with low on-car power requirements by utilizing event-driven reporting and reduced message lengths. In one embodiment, the capabilities of AEI tag systems, locomotive communication systems and railcar GPS systems are integrated with railroad train, track and schedule databases to provide a cost effective and power effective solution to the problem of rail car tracking.

[0006] In the past, rail cars were not typically equipped with an independent electrical power generating means to power onboard electrical equipment. While techniques such as air powered, or axle rotation-powered generators have been proposed, such systems only work when the rail car is coupled to a compressed air source, such as a locomotive, or when the rail car is moving. Consequently, batteries are typically used as the primary source of power for rail car onboard electrical equipment. However, batteries, if not recharged, cannot power equipment indefinitely. Furthermore, the higher the power usage of the battery, the shorter the life of the battery. While batteries may be convenient for limited rail car equipment powering needs, battery maintenance and replacement increases operating costs for the railway.

[0007] In rail car tracking applications using a GPS receiver and transmitter, transmission of information from the rail car, and, in particular, transmission of messages containing relatively large amounts of information, may quickly deplete a battery, especially if such messages are transmitted on a relatively frequent periodic basis. Accordingly, it is desired to reduce the power requirement needed by onboard rail car electrical equipment, such as rail car locating equipment, while still providing improved rail car tracing and reporting capability. The inventors have recognized that by innovatively combining different rail car tracking techniques and assimilating railway information acquired from a variety of pre-existing sources, improved rail car tracking may be achieved by the inventors unique presentation of more comprehensive tracking and scheduling information in a single user-friendly form, together with reduced power consumption by the rail car onboard tracking and reporting equipment. Advantageously, rail car battery life may be extended, and battery maintenance and replacement intervals may be reduced compared to conventional techniques of providing rail car location information.

[0008] The FIGURE is a functional block diagram of an exemplary system **10** for tracking rail cars in a rail transportation system. The system **10** generally includes rail car location/transceiver equipment **12** forming a wireless message system mounted on a rail car **22**. The rail car location/transceiver equipment **12** may include a location determination device, such as a GPS receiver **24**, a transceiver **26**, a processor **28**, and a memory **30** for storing processor instructions. The rail car **22** may also be equipped with a sensor suite **32** for sensing operating conditions of the rail car **22**, and a power source, such as a battery **34**, for powering the sensor suite **32** and the rail car location/transceiver equipment **12**. The sensor suite **32** may include sensors such as an accelerometer for detecting movement of the rail car **22**, a temperature sensor, a pressure sensor, a door position sensor, a cargo identification sensor, and a cargo seal condition sensor. The rail car **22** may also be equipped with an AEI tag **33** to uniquely identify the car **22** to a wayside AEI tag reader **36** that the car **22** passes. The AEI tag is preferably an active tag including a processor that allows the tag to read as well as being read and to communicate the results of the reading of external tags such as those on wayside markers or on other rail vehicles (rail cars and locomotives, for example) to the equipment **12** so that the location of the external tags can be communicated to a remote rail system monitoring and tracking operation. This enables comparison of different AEI data for determining location of rail assets. The railcar may also sense attributes of the cargo contained within the railcar. For example, an RFID reader (not shown) may be in communication with the processor **28** for sensing RFID tagged cargo in the railcar **22**. Such information may be provided to customers of the railroad via the shipper interface **56**.

[0009] In an aspect of the invention, the rail car location/transceiver equipment **12** may be in communication with a rail car tracking interface **16** controlled by a central processor **19** having access to a centralized train and car tracking database **18**. The rail car tracking interface **16** is off-board of the railcar and remote from the rail car location transceiver equipment **12** as indicated by dotted line **20**. The rail car tracking interface **16** may include a transceiver for communication to and from one or more rail cars, a processor, a memory, and a communication interface, such as a LAN or Internet interface, for communication with the central processor **19**. The rail car location/transceiver equipment **12** may communicate with the rail car tracking interface **16** over a suitable wireless rail car radio link **14**, such as a satellite or cellular network. The rail car transceiver **26** may be configured for bidirectional operation so that the rail car **22** may transmit rail car data and receive instructions, for example, from the rail car tracking interface **16**. Information, such as railcar location data, speed data, heading data, sensor data, and battery power data, may be transmitted from the rail car **22** in accordance with programmed instructions, upon request from the rail car tracking interface **16**, and/or upon occurrence of an exceptional event. In addition, dwell alert information, indicating, for example, that the rail car has remained motionless for a certain period of time, may also be transmitted from the rail car **22** on a periodic basis or upon request. Dwell alert data may be obtained by the processor **28** monitoring timing and GPS position from GPS **24**. In yet another aspect, "geo-fencing" information, such as a time when the rail car **22** has traversed a predetermined geographic boundary, may be transmitted by the rail car **22** when the rail car **22** crosses the this virtual boundary. Accordingly, the configurable geo-fences may be used to simulate AEI readers by providing CLM messages when the rail car passes a certain location.

[0010] In an embodiment of invention, the rail car location/transceiver equipment **12** may be configured to communicate with a locomotive **38** over a locomotive communication link **40** such as a wireless local area network (LAN), for example, when the rail car **22** is connected in a train powered by the locomotive **38**. The locomotive **38** may include locomotive communication equipment **42** for communicating with the rail car **22** over the LAN, and for communicating with a locomotive interface **48** over a wireless locomotive radio link **14**. The locomotive communication equipment **42** may sense and report the status of onboard locomotive systems **44**. The locomotive communication equipment **42** may be configured to transmit locomotive location from various sources such as an AEI reader and GPS receiver **45**, speed, heading, dwell alert information, geo-fencing information, and train handling information to the locomotive interface **48**. In an aspect of the invention, locomotive operation indicative of a decoupling maneuver may be transmitted to the locomotive interface **48** to alert a possible decoupling of rail cars **22** from a train pulled by the locomotive **38**. The locomotive interface **48** may include a transceiver for communication with one or more locomotives, a processor, a memory, and a communication interface, such as a LAN or Internet interface, for communication with the central processor **19**.

[0011] The system **10** may further include a system interface **50** for receiving other inputs that may be useful for tracking rail cars in the system **10**. The system interface **50** may include input communication interfaces appropriate for receiving these other inputs, such as a wireless communications interface, a wide area network (WAN) interface, or an Internet interface; a processor; a memory; and an output communication interface; such as a LAN or Internet interface, for communication with the central processor **19**. In an aspect of the invention, the system **10** may be configured to receive data from one or more AEI readers **36**. Through communication with a track database **52** that contains, for example, locations of AEI readers **36** throughout a railway system, the system interface **50**, upon receiving an indication of a sensed rail car from one of the AEI readers, such as over an AEI wireless link **54**, may be configured to provide a location of a rail car **22** at certain point in time when the rail car **22** passes the reader **36**. The present system **10** may utilize AEI reader data to recognize an assemblage of rail cars as a train and to associate that train with one or more locomotives. In this manner, locomotive position data received from the locomotive interface **48** may be applied to all of the rail cars in the train to update rail car position information without the need for any car-specific data transmission.

[0012] The system interface **50** may also include inputs for railroad (RR) work order information, RR estimated time of arrival (ETA) information, weather information, train schedule information, track circuit information and computer aided dispatch (CAD) information. Such information acquired from various sources may be assimilated and used to provide more comprehensive data associated with rail car **22** locations in a single user-friendly presentation and in a more power efficient manner. In an aspect of the invention, the rail car tracking interface **16**, the locomotive interface **48**, the system interface **50** and the track database **52** may be in communication with each other and the central processor **19** and train and car tracking database **18**, such as over a suitable network, such as a LAN or Internet connection, to allow integration of information from among these sources. The train and car tracking database **18**, or portion of the database **18**, may also be provided, for example, via the central processor **19**, to a shipper interface **56** or railroad (RR) company interface **60** that may be accessible by shippers, such as over a secure communication link, to allow shippers to locate their rail cars within the railway system.

[0013] The information gathered from the input sources via the interfaces **16**, **48**, **50** may be used to provide real-time rail car location, car speed, car heading, notifications when a car arrives at a predetermined location, notification when cargo conditions changes, such as a seal opening or closing, temperature or pressure readings exceeding predetermined values, and ETA at a destination. In an embodiment, operating instructions based on input parameters such as rail car destination, train schedules, and cargo carried by the rail car **22** and generated by the train and car tracking database **18** may be provided to a rail car **22** via, for example, wireless transmission of instructions from the rail car tracking interface **16**. The rail car receives the operating information and may store the information in memory **30** as processor instructions to control operation of the rail car location/transceiver equipment **12** to conserve battery power. Such information may be provided to the rail car **22** at any time, or in response to a change in condition of the rail car, such as when the rail car is connected to or disconnected from a train, or in response to changing parameters within the railway system, such as a change in weather or track conditions. One may appreciate that if rail car position information is being updated on the basis of a car-assemblage train definition and train locomotive position data, it is important for system **10** to recognize when a rail car is being associated with or disassociated from a particular train.

[**0014**] In order to reduce power usage on-board the rail car, the system **10** may be configured to transmit as little data as possible from the rail car, while at the same time ensuring that high value information is transmitted in a timely manner. Data that can be obtained directly or indirectly from other sources need not be generated at the railcar (and thus need not be transmitted from the rail car), such as the example described above of car location being derived from train location that is reported as locomotive location. The central processor **19**, based on input information provided by the interfaces **16**, **48**, **50**, and information stored in the train and car tracking database **18**, may generate instructions for transmission to a rail car **22** for reducing a transmission frequency and/or amount of information transmitted by the rail car **22** to conserve battery power. Data transmitting frequency may be a function of variables other than time, such as distance from a destination, initiation of movement, location, etc. Typically, only data that is new or revised (or otherwise not available from another source) would be transmitted. An innovative method of achieving reduced power consumption by a rail car may include limiting transmission of information to occurrences of an exception to an expected operation profile, instead of transmitting, at a fixed periodic rate, information that may not be changing or is not varying within a predetermined range of desired values. The rail car location/transceiver equipment **12** and sensor suite **32** may be configured to remain in a minimum power state until an exception occurs, such as when a condition detected by a sensor changes or exceeds a predetermined value. The processor **28** may then transmit an exception signal to the rail car tracking interface **16**. Such an exception signal may be formatted as a message having a limited length to contain only the minimum amount of information needed to report the exception condition. In an aspect of the invention, the rail car tracking interface **16** may be configured to send a response signal to the rail car **22** from which an exception signal was received. The response signal may contain new instructions for the rail car location/transceiver equipment **12** based on the nature of the exception, or the response may contain an acknowledgement indication verifying that the exception signal was received. The rail car location/transceiver equipment **12** may be configured to transmit exception signals at a periodic rate when an exception occurs until a response is received from the rail car tracking interface **16** to verify that the exception signal is received.

[**0015**] The processor **28** may be programmed with instructions allowing it to recognize conditions indicative of not being attached to a locomotive. When a rail car is on a siding and is not moving, processor **28** may be programmed to report that it is parked and then to provide no further report until it is moved, or until it is moved past a known location such as an AEI location. During such dormant periods, programmed messages may be prepared via the system interface **50** and may be stored in a virtual in-box for the rail car. The rail car equipment may be programmed to awaken periodically to check its in-box for messages, such as revised reporting schedule instructions.

[**0016**] For example, if a temperature exceeds a predetermined value, an exception signal reporting a sensed temperature extreme may be transmitted to the rail car tracking interface **16** and reported to the train and car tracking database **18**. If the rail car **22** has onboard refrigeration capability, the train and car tracking data base **18** may recognize this and provide an instruction to be sent to the rail car **22** via the rail car tracking interface **16** to remedy the exception condition, such as by controlling the onboard refrigeration unit to provide additional cooling. Once an exception has occurred, exception reporting parameters may be changed, for example, by providing new parameters via the rail car tracking interface **16**, to more closely monitor the exception condition. In another example, if a door sensor detects that a door on the rail car **22** has been opened, an exception signal may be transmitted reporting an open door condition. Location information may be provided in the exception signal to allow maintenance personnel to locate the rail car **22** and correct the sensed condition, such as by closing the open door. In yet another example, if an accelerometer sensor on the rail car senses a pattern of movement indicative of decoupling rail cars, an exception signal identifying the condition, including location information, may be transmitted.

[**0017**] In yet another aspect, an accelerometer exception signal may be generated if a change from a moving condition to a stopped condition, or vice versa, is sensed. For example, if a rail car **22** has been disconnected from a train and left stationary in a siding or train yard, and the accelerometer detects movement of the rail car **22**, an exception signal, which may include location information, may be generated to indicate the rail car **22** has moved. Similarly, if a rail car **22** has been moving, such as in a train, and a stopped condition is detected, an exception signal, which may include location information, may be transmitted to indicate an unexpected stop. In another embodiment, a mercury switch may be used to sense acceleration or deceleration. Other exception signals may be generated to report the health of the tracking equipment onboard the railcar, such as when a low power battery condition exists, if a GPS link fails, or if any of the rail car onboard equipment fails or is not operating within desired specifications. In still another aspect, if a rail car **22** has remained stationary for a certain amount of time, the rail car location/transceiver equipment **12** may be scheduled to "wake up" periodically to identify its location and/or accept new information from the rail car tracking interface **16**.

[0018] In still another aspect of the invention, instead of sending location data on a fixed periodic basis as such information is conventionally sent, power conservation on the rail car 22 may be achieved by limiting frequency of rail car transmissions, such as location information, depending on a distance from an intended destination. For example, a shipper may only want to know the location of a rail car 22 as the car 22 nears its destination. If a rail car 22 is traveling on a trip of a known distance, such as a one thousand mile trip, and an average speed of the rail car is known, such as may be inferred from locomotive information or estimated as an average speed for the trip based on historical data and current railway conditions, the rail car 22 may be instructed to transmit its location when it is projected to be at predetermined time, such as 10 hours, away from its destination, seen as a geo-fence, and may increase its frequency of transmitting location information after reaching this point. The central processor 19 may perform speed, time and distance calculations to project when a rail car needs to report its location. The lack of such an expected may stimulate an inquiry being sent to the rail car's "in box" to prompt the rail car to report its present location/condition.

[0019] In another aspect, power conservation on the rail car 22 may be achieved by limiting frequency of rail car transmissions using the concept of geo-fences, or electronically bounded areas of railway operation. For example, an electronic boundary may be defined around the outskirts of a city to indicate to a train crossing the boundary that the train has left or entered the outskirts, depending on its direction of travel. The direction of travel may be determined from train schedule data or locomotive data available in the system 10. Direction of travel may also be provided by heading information developed from GPS data. This concept may be implemented by defining a geographic location of the boundary so that when a train having self-locating equipment traverses the boundary, the train may be configured to recognize that it has crossed the boundary by correlating its current location with the defined geographic location of the boundary. For example, a rail car 22 may be provided with appropriate geo-fence locations by the rail car tracking interface 16 at the beginning of a trip, such as when the rail car 22 is coupled to train, based on the destination of the rail car 22. Then, instead of transmitting location information on a periodic basis, the rail car 22 may be instructed to limit sending of location information to an occurrence of the rail car traversing a geo-fence boundary. For example, the rail car may compare its current location, such as derived from received GPS position data, to geo-fence boundary information stored in memory 30 to determine if the rail car has crossed a geo-fence boundary, and, if a boundary crossing has occurred, the rail car 22 may transmit an indication that it has crossed the boundary.

[0020] Another innovative method of reducing power consumption may include decreasing a frequency of transmission of data when location information may be inferred using other means, such as by using locomotive or AEI position information to infer a rail car location when the rail car 22 is in a train attached to the locomotive 38. Typically locomotive information may be provided on a relatively frequent basis because power consumption by the locomotive communication equipment 42 is not a concern. Consequently, when the rail car 22 is attached to a train pulled by a locomotive 38 that is in communication with the locomotive interface 48, rail car location information may be inferred from a locomotive 38 location instead of requiring the rail car to independently report its location. Furthermore, rail car status information may be inferred from locomotive action, such as when locomotive information provided to the locomotive interface 48 indicates that the locomotive is performing make/brake maneuvers, indicative of decoupling rail cars. If such locomotive maneuvers are detected, the rails car tracking interface 16 may instruct the rail car 22 to identify its location to determine if the car 22 has been decoupled or is still traveling with the train.

[0021] In yet another aspect, the rail car 22 may be monitored to determine remaining battery life based on past usage by the rail car location/transceiver equipment 12. For example, remaining battery life may be modeled based on the number and/or length of messages transmitted by the rail car location/transceiver equipment 12. If a cumulative number and/or cumulative length of messages transmitted by the rail car 22 exceeds a predetermined total number and total length indicating the battery power may soon be exhausted, the rail car 22 may be instructed to transmit its location and then refrain from transmitting until the battery 34 is replaced or recharged. Service personnel may also be alerted at the same time of the need to replace or recharge the battery onboard the railcar. The rail car location/transceiver equipment 12 may be configured to perform this battery monitoring function, or the function may be performed remotely, such as by the rail car tracking interface 16, based on the number and length of transmissions received for the rail car 22.

[0022] In yet another embodiment, the locomotive may be equipped with an AEI reader and may function as a roaming locator of rail cars. The locomotive may be configured to identify cars within its train. The locomotive may also be configured to locate other cars that it passes, such as cars stationary on a siding, by reading the AEI tags of those cars and by providing the corresponding tag and location information to the locomotive interface 28 for processing by the central processor 19.

[0023] While the preferred embodiments of the present invention have been shown and described herein, it will be obvious that such embodiments are provided by way of example only. Numerous variations, changes and substitutions will occur to those of skill in the art without departing from the invention herein.

1. A rail car tracking system comprising:

rail car location equipment mounted to a rail car, the equipment including a transmitter for transmitting rail car location data to a remote receiver and further including an electronically readable tag attached to the rail car for identifying the rail car to a wayside tag reader; and

locomotive communication equipment mounted in a locomotive and adapted for communication with the rail car location equipment when the rail car and locomotive are coupled into a common train, the locomotive communication equipment being operative to identify the coupled rail car and including a transmitter for transmitting data to the remote receiver, the data including rail car data so that the required data transmission from the rail car transmission equipment is reduced.

2. The rail car tracking system of claim 1 and including a LAN for data transmission between the rail car and the locomotive.

3. The rail car tracking system of claim 2 and including a plurality of status sensors coupled to the rail car, each of the sensors providing data to the car location equipment transmitter for transmission via the LAN to the locomotive transmitter.

4. The rail car system of claim 3 and including locomotive systems monitoring equipment coupled in communication with the locomotive communication equipment for transmitting locomotive data to the remote receiver.

5. The rail car system of claim 4 wherein the remote receiver includes a rail car tracking interface for receiving data transmission from the rail car communication equipment, a locomotive tracking interface for receiving data transmitted from the locomotive communication equipment, a system interface for identifying railcars passing the reader and a central processing unit for extracting data from all the interfaces for identifying location of a rail car.

6. An integrated rail car tracking system comprising;

a plurality of fixed wayside automatic equipment identification (AEI) readers spaced at predetermined locations along a railway for reading identification data from a AEI tags on rail cars passing along the railway;

a locomotive tracking system including an on-board GPS system for providing data indicative of the location of the locomotive and a transmitter for transmitting the location data to a remote receiver;

a rail car wireless message system attached to a rail car for sending periodic messages indicative of the location of the rail car, the message system including a GPS system for generating data indicative of rail car location; and

a local area network (LAN) established between the rail car and an associated locomotive whereby the rail car location data is transmitted to the locomotive tracking system for transmission to the remote receiver.

7. The integrated rail car tracking system of claim 6 and including a remote data processor for processing data received by the remote receiver and for extracting from the data information identifying the location, speed and direction of travel of the associated rail car.

8. The integrated rail car tracking system of claim 7 and including a plurality of status sensors mounted on the rail car, the sensors providing status data to the rail car message system for transmission to the remote receiver.

9. The integrated rail car tracking system of claim 8 wherein the status sensors include one or more of door opening/closing sensors, pressure sensors, temperature sensors and cargo identification sensors.

10. The integrated rail car tracking system of claim 8 and including programming operable in an on-board processor **28** for reading time and location from GPS for indicating dwell time without substantial movement.

11. The integrated rail car tracking system of claim 7 and including data storage at the remote processor for storing data representing rail car scheduling, the processor comparing rail car data to rail car scheduling for providing data indicative of deviations from scheduling.

12. The integrated rail car tracking system of claim 7 and including programming means operable in the rail car message system for transmitting periodic messages to the remote receiver and for transmitting status change messages to the remote receiver upon detection of a status change.

13. The integrated rail car tracking system of claim 7 and including locomotive status sensors mounted in the locomotive and coupled to the locomotive communication system for providing data indicative of locomotive status to the remote receiver.

14. The integrated rail car tracking system of claim 12 wherein one of the status change messages comprises a message indicating movement across a predetermined geographical boundary.

15. The integrated rail car tracking system **7** and including a rail car battery saving function for reducing rail car transmissions when the rail car is coupled to the locomotive.

16. The integrated rail car tracking system of claim 7 and including a rail car battery saving function for reducing rail car transmissions when the rail car remains stationary.

17. A method for tracking a rail car having an on-board communication system including a location determining system and a transceiver for receiving and transmitting rail car data, the system including a processor responsive to an executable program for enabling operation of the transceiver to transmit rail car data during a reporting event, the method comprising providing a remotely addressable software database accessible by the executable program for establishing a reporting event in response to at least one of a selected time, a change in geographical location, an extended time in a geographical location, an approach to a specified geographical location, a coupling/decoupling of the rail car with a particular locomotive and a command to report.

18. The integrated rail car tracking system of claim 7 and including an AEI reader attached to the rail car for reading AEI tags on other rail vehicles passing by the reader, the reader being in communication with the rail car message system for transmitting data indicating at least a location of the other rail vehicles.

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