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Title of Invention	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] 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: Michael Phelan Date (Optional): 24 OCT 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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DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

INVENTION PRIORITY

[0001] The present application is a continuation of nonprovisional patent application no. 14/464,188, entitled "Driver Authentication System and Method for Monitoring and Controlling Vehicle Usage," filed August 20, 2014, which is a continuation-in-part of nonprovisional patent application no. 13/858,930, entitled "Driver Authentication System and Method For Monitoring and Controlling Vehicle Usage," filed April 8, 2013, which is a continuation of nonprovisional patent application no. 12/496,509, entitled "Driver Authentication System and Method For Monitoring and Controlling Vehicle Usage," filed July 1, 2009. Nonprovisional patent applications 14/464,188, 13/858,930, and 12/496,509 are each herein incorporated by refer in their entirety. Nonprovisional patent application no. 12/496,509 claims the priority and benefit under 35 U.S.C. §119(e) of U.S. provisional patent application no. 61/077,568, entitled "Systems and Methods for Monitoring and Controlling Vehicle Usage by Young Drivers", filed July 2, 2008. Provisional patent application 61/077,568 is herein incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] Embodiments are generally related to techniques for use in ensuring motor vehicle operation safety. Embodiments are also related to systems and methods for monitoring and controlling vehicle usage by high-risk drivers.

BACKGROUND OF THE INVENTION

[0003] The widespread usage of motor vehicles for both personal and work related activities places millions of vehicles on roads each day with their operation being largely unmonitored. Unmonitored vehicle operation can lead to issues including, for example, abusive use of the vehicle and lack of experience. With more young drivers getting licenses each year, there has been an unfortunate increase in accidents along with the ensuing damage, debilitating injuries and sometimes death. Most of these accidents are attributable to speeding and generally poor driving habits.

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[0004] FIG. 1 illustrates a graphical representation 100 that depicts the actual deaths in passenger vehicles by age provided by National Highway Transportation Safety Administration (NHTSA). The curve 110 represents the death rate associated with male drivers and the curve 120 represents the death rate of female drivers. From the graph 100, it is clear that the distribution of age related deaths is bi-modal, and clearly depicts the relationship between youth and auto fatality. Current data indicates that the offering of a driver education course results in a great increase in the number of licensed drivers without any decrease in the rate of fatal and serious crash involvement. Although such driver's education programs do teach safety skills, students are not motivated to utilize them and they actually foster overconfidence and do not fully address safety issues.

[0005] The factors that have been researched and proven as the leading contributors to accidents, injuries and fatalities among at risk drivers include lack of driving experience, inadequate driving skills, risk-taking behavior, poor judgment and decision making, distraction, lack of focus, fatigue, and impairment. As a result of these factors.

[0006] Based on the foregoing it is believed that a need exists for an improved driver authentication system and method for monitoring and controlling vehicle usage by a high-risk driver. A need also exists for an improved method for identifying and authenticating the driver and programming the vehicle operating parameters that trigger control and driver feedback intervention, as described in greater detail herein.

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BRIEF SUMMARY

[0007] The following summary is provided to facilitate an understanding of some of the innovative features unique to the present invention and is not intended to be a full description. A full appreciation of the various aspects of the embodiments disclosed herein can be gained by taking the entire specification, claims, drawings, and abstract as a whole.

[0008] It is, therefore, one aspect of the present invention to provide for an improved driver authentication system and method.

[0009] It is another aspect of the present invention to provide for an improved system and method for monitoring and controlling vehicle usage by high-risk drivers.

[0010] It is further aspect of the present invention to provide for an improved method for remotely and/or wirelessly identifying and authenticating the driver and remotely and/or wirelessly programming the vehicle operating parameters that trigger vehicle control and driver feedback intervention.

[0011] The aforementioned aspects and other objectives and advantages can now be achieved as described herein. A driver authentication system and method for monitoring and controlling vehicle usage by a high-risk driver (e.g., teen driver, fleet or rental drivers, habitual reckless drivers, aged drivers, drunk drivers, drowsily drivers, distracted drivers etc) is disclosed. A proprietary and centralized database comprising a software application can be accessed by an authorized user via a network utilizing a remote computer in order to configure a desired operating profile that matches requirements of the high-risk driver. The operating profile can be loaded to a driver identification and data logging module in conjunction with the remote computer. A master control unit can receive a unique identification code from the data logging device to authenticate the high-risk driver and to operate the vehicle within the desired operating profile. A slave control unit receives commands from the master control unit and generates a real time alarm signal if the driver violates the preprogrammed operating profile unique to the driver.

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[0012] The alarm signal generated by the slave control unit can remain until the driver corrects the operating condition and brings the vehicle within the desired operating profile. Also, the system can provide an alarm signal to the authorized user (e.g., parent) utilizing an auto dial feature that communicates the authorized user via a telephone or internet when the driver violates preprogrammed operating profile. The operating parameters can be for example, but not limited to, data concerning maximum allowable vehicle speed, vehicle location, vehicle hours of operating and seat belt usage. The slave control unit can generate the alarm signal via a voice synthesized means, sounding a cabin buzzer, toggling the dome light and/or powering the radio off, etc. The driver identification and data logging module can allow identification of various drivers associated with the vehicle, thereby allowing the vehicle to perform in one way for the intended high-risk drivers, yet another way for the authorized user. The system can include a GPS (Global Positioning System) module to determine and measure parameters such as, time of day, speed and location data associated with the vehicle.

[0013] The driver authentication system can include additional features such as data logging, alarming, operation governance, ease of programmability and can utilize GPS technology to provide high-risk driver safety. The system also provides user awareness that reduce the likelihood of a high-risk driver injury or fatality by helping the high-risk drivers with safe driving habits through immediate and real time feedback and governing. The programmable operating parameters associated with the real time driver feedback can categorize the system as a unique driver safety device. Additionally, the system and method described herein can provide multiple operating profiles for a single vehicle that allows the owners to operate the vehicle without any restrictions yet have restrictions in affect when the vehicle is operated by the high risk driver.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The accompanying figures, in which like reference numerals refer to identical or functionally-similar elements throughout the separate views and which are incorporated in and form a part of the specification, further illustrate the present invention and, together with the detailed description of the invention, serve to explain the principles of the present invention.

[0015] FIG. 1 illustrates a graphical representation depicting actual deaths in passenger vehicles by age;

[0016] FIG. 2 illustrates a schematic view of a computer system in which the present invention can be embodied;

[0017] FIG. 3 illustrates a schematic view of a software system including an operating system, application software, and a user interface that can be used for carrying out the present invention;

[0018] FIG. 4 depicts a graphical representation of a network of data processing systems in which aspects of the present invention can be implemented;

[0019] FIG. 5 illustrates a block diagram of a driver authentication system, in accordance with an embodiment;

[0020] FIG. 6 illustrates a schematic block diagram of the driver authentication system for monitoring and controlling vehicle usage, in accordance with an embodiment;

[0021] FIG. 7 illustrates a flow chart of operation illustrating logical operation steps of a method for monitoring and controlling vehicle usage, in accordance with embodiments; and

[0022] FIG. 8 illustrates a high level flow chart of operation illustrating logical operation steps of a method for monitoring and controlling vehicle usage by a high-risk driver, in accordance with embodiments.

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DETAILED DESCRIPTION

[0023] The particular values and configurations discussed in these non-limiting examples can be varied and are cited merely to illustrate at least one embodiment and are not intended to limit the scope thereof.

[0024] FIGS. 2-4 are provided as exemplary diagrams of data processing environments in which embodiments of the present invention may be implemented. It should be appreciated that FIGS. 2-4 are only exemplary and are not intended to assert or imply any limitation with regard to the environments in which aspects or embodiments of the present invention may be implemented. Many modifications to the depicted environments may be made without departing from the spirit and scope of the present invention.

[0025] As depicted in FIG. 2, the present invention may be embodied in the context of a data-processing apparatus 200 comprising a central processor 201, a non-transitory main memory 202, an input/output controller 203, a keyboard 204, a pointing device 205 (e.g., mouse, track ball, pen device, touch sensitive display, or the like), a display device 206, and a mass storage 207 (e.g., hard disk). Additional input/output devices, such as wireless communications 208, may be included in the data-processing apparatus 200 as desired. The wireless communications 208 can include cellular, GPS, satellite, etc. As illustrated, the various components of the data-processing apparatus 200 communicate through a system bus 210 or similar architecture. It should be appreciated that data-processing apparatus 200 can comprise a WIFI enabled device, an RFID enabled device, a Bluetooth enabled device, a cellular telephone, a Smartphone, a tablet computer, a portable computer, or the like.

[0026] FIG. 3 illustrates a computer software system 250 for directing the operation of the data-processing apparatus 200 depicted in FIG. 1. Software system 250, which is stored in main system memory 202 and on disk memory 207, can include a kernel or operating system 280 and a shell or interface 270. One or more application programs, such as software application 260, may be "loaded" (i.e., transferred from mass storage 207 into the main memory 202) for execution by the data-processing apparatus 200. The data-processing apparatus 200 receives user commands and data through user

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interface 270; these inputs may then be acted upon by the data-processing apparatus 200 in accordance with instructions from operating module 280 and/or application module 260.

[0027] The interface 270, which is preferably a graphical user interface (GUI), also serves to display results, whereupon the user may supply additional inputs or terminate the session. In one possible embodiment, operating system 280 and interface 270 can be implemented in the context of menu-driven systems. It can be appreciated, of course, that other types of systems are possible. For example, rather than a traditional menu-driven system, other operation systems can also be employed with respect to operating system 280 and interface 270. Software Application Module 260 can be adapted for monitoring and controlling vehicle usage by high-risk drivers utilizing an operating profile. Software application module 260 can be adapted for providing a real time, remote and/or wireless alarm signal if the driver violates the operating profile. Software application module 260, on the other hand, can include instructions, such as the various operations described herein with respect to the various components and modules described herein.

[0028] The following discussion is intended to provide a brief, general description of suitable computing environments in which the method and system may be implemented. Although not required, the method and system will be described in the general context of computer-executable instructions, such as program modules, being executed by a single computer, Smartphone, tablet computer, or other similar device. Generally, program modules include routines, programs, objects, components, data structures, etc., that perform particular tasks or implement particular abstract data types. Moreover, those skilled in the art will appreciate that the method and system may be practiced with other computer system configurations, including hand-held devices, multi-processor systems, microprocessor-based or programmable consumer electronics, networked PCs, minicomputers, mainframe computers, and the like.

[0029] FIG. 4 depicts a graphical representation of a network of data processing systems 300 in which aspects of the present invention may be implemented. Network data processing system 300 is a network of computers in which embodiments of the present invention may be implemented. Network data processing system 300 contains

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network 360, which is the medium used to provide communications links between various devices and computers connected together within network data processing apparatus 200. Network 360 may include connections, such as wire, wireless communication links, Bluetooth, or fiber optic cables.

[0030] In the depicted example, server 310 and server 320 connect to network 360 along with storage unit 370. In addition, remote clients 330, 340, and 350 connect to network 360. These remote clients 330, 340, and 350 may be, for example, vehicle-based or portable computers, transducers, sensors, GPS devices, etc. Data-processing apparatus 200 depicted in FIG. 2 can be, for example, a client such as client 330, 340, and/or 350. Alternatively, data-processing apparatus 200 can be implemented as a server, such as servers 320 and/or 310, depending upon design considerations.

[0031] In the depicted example, server 320 provides data, such as operating commands, operating system images, and applications to clients 330, 340, and 350. Remote clients 330, 340, and 350 are clients to server 320 in this example. Network data processing system 300 may include additional servers, clients, and other devices not shown. Specifically, clients may connect to any member of a network of servers which provide equivalent content.

[0032] In the depicted example, network data processing system 300 is the Internet with network 360 representing a worldwide collection of networks and gateways that use the Transmission Control Protocol/Internet Protocol (TCP/IP) suite of protocols to communicate with one another. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers, consisting of thousands of commercial, government, educational and other computer systems that route data and messages. Of course, network data processing system 300 also may be implemented as a number of different types of networks, such as for example, cellular, satellite, or other wireless communications means such as Bluetooth, or using RFID technology.

[0033] The following description is presented with respect to embodiments of the present invention, which can be embodied in the context of a data-processing system such as data-processing apparatus 200, computer software system 250 and network

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360 depicted respectively in FIGS. 2-4. The present invention, however, is not limited to any particular application or any particular environment. Instead, those skilled in the art will find that the system and methods of the present invention may be advantageously applied to a variety of system and application software, including database management systems, word processors, and the like. Moreover, the present invention may be embodied on a variety of different platforms, including Macintosh, UNIX, LINUX, and the like. Therefore, the description of the exemplary embodiments, which follows, is for purposes of illustration and not considered a limitation.

[0034] FIG. 5 illustrates a block diagram of a driver authentication system 450, in accordance with an embodiment. Note that in FIGS. 1-8, identical or similar blocks are generally indicated by identical reference numerals. The driver authentication system 450 can be utilized for monitoring and controlling vehicle usage by high-risk drivers such as driver 410. The high-risk drivers can be, for example, teen drivers, fleet and rental drivers, and habitually reckless drivers, sleepy drivers, impaired drivers etc. The authentication system 450 can provide effective training and safety means for the high-risk driver 410 by setting safe operating parameters. The system 450 monitors a vehicle 420 and provides real time driver corrective feedback to an authorized vehicle owner 470 of the vehicle 420.

[0035] The system 450 generally includes a master control unit 430 and a slave control unit 440 that can be accessed and programmed via the software application module 260 stored in the proprietary and centralized database 370. Note that as utilized herein, the term "module" may refer to a physical hardware component and/or to a software module. In the computer programming arts, such a software "module" may be implemented as a collection of routines and data structures that performs particular tasks or implements a particular abstract data type. Modules of this type are generally composed of two parts. First, a software module may list the constants, data types, variable, routines, and so forth that can be accessed by other modules or routines. Second, a software module may be configured as an implementation, which can be private (i.e., accessible only to the module), and which contains the source code that actually implements the routines or subroutines upon which the module is based.

[0036] Therefore, when referring to a "module" herein, the inventors are generally

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referring to such software modules or implementations thereof. The methodology described herein can be implemented as a series of such modules or as a single software module. Such modules can be utilized separately or together to form a program product that can be implemented through signal-bearing media, including transmission media and recordable media. The present invention is capable of being distributed as a program product in a variety of forms, which apply equally regardless of the particular type of signal-bearing media utilized to carry out the distribution.

[0037] Examples of signal-bearing media can include, for example, recordable-type media, such as floppy disks, hard disk drives, CD ROMs, CD-Rs, etc., and transmission media, such as signals transmitted over digital and/or analog communication links. Examples of transmission media can also include devices such as modems, which permit information to be transmitted over standard cellular communications and/or the more advanced wireless data communications.

[0038] The proprietary and centralized database 370 including the software application 260 can be accessed via a remote computer 465 and the network 360. Note that the remote computer 465 can be a data processing apparatus 200 depicted in FIG. 2 and may alternatively be embodied as a smart phone, tablet computer, or other mobile computing device. The authorized vehicle owner 470 can access the software application 260 over a data network 360, via the remote computer 465 (remote computer 465 may be embodied as a smart phone, tablet computer, laptop computer, or other mobile computing device), in order to program a desired operating profile 435 representing various operating parameters associated with the vehicle 420. Note that the operating parameters can be for example, but are not limited to, data concerning maximum allowable vehicle speed, user infraction limits, mobile device operating parameters, impaired driver parameters, vehicle locations, vehicle hours of operation and seat belt usage associated with the vehicle 420. The system 450 can also track various other features such as for example, data concerning hard braking and fast cornering, etc. Note that these features may or may not be viewed as key risk factors and therefore can be offered as additional features to the basic operating parameters of the driver authentication system 450.

[0039] The authorized vehicle owner 470 can be for example, but is not limited to a

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parent of a teen, a fleet manager or operator, and a judicial authority, etc. The operating profile 435 programmed by the owner 470 can include a set of driving rules and conditions that best fit the requirements of the intended high-risk driver 410 within the vehicle 420.

[0040] Further, the operating profile 435 can be loaded to a driver identification and data logging module 425. The driver identification and data logging module 425 can be a mobile telephone, a Smartphone, a WIFI enabled device, an RFID enabled device, a Bluetooth enabled device, a tablet computer a USB compatible device such as for example, iButton, radio frequency identification device (RFID), software, etc that can be utilized in conjunction with the remote computer 465 in order to wirelessly load the operating profile 235 into the master control unit 430. This requires master control unit 430 to be capable of accepting data via WIFI, RFID, Bluetooth, USB, via cellular data signals, etc. The driver identification and data logging module 225 can allow identification of various drivers 410 associated with the vehicle 420, thereby allowing the vehicle 420 to perform one way for the intended high-risk driver 410, yet another way for the authorized vehicle owner 470.

[0041] The driver authentication and data logging module or device 425 can be connected to the remote computer 465 wirelessly or otherwise, and the operating profile 435 can be stored. The master control unit 430 can authenticate the driver 410 utilizing a unique identification code 415 provided by the driver identification and data logging module 425.

[0042] In one embodiment, the driver authentication and data logging module or device 425 can be a smart phone with one or more of WIFI, RFID, Bluetooth, and GPS capabilities. The device 425 or phone is transported with the potential driver. When the driver enters the vehicle, the device 425 can automatically, or at the user's request, connects to the master control unit 465. The device 425 can wirelessly provide the unique identification code 415 (which may be stored on the devices memory, or may be entered by the driver via the device 425) to authenticate the driver. The device may further store the driver operating profile 435 for the driver and provide that profile to the master control unit 430.

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[0043] A data logging device 452 can be used to record vehicle operation data associated with the operation of the vehicle. Included may be a GPS module 451 which can be used to monitor the vehicles speed, location, and acceleration/deceleration data. The data collected by the data logging device 452 can be provided to the master control unit 430. In another embodiment, the data logging device 452 and GPS module 451 may be provided as functionalities associated with the driver identification and data logging module when that module is embodied as a mobile device equipped with at least GPS capabilities (i.e. a Smartphone with GPS capability).

[0044] The master control unit 430 can enable vehicle operation within the programmed operating profile 435. If the driver 410 violates the preprogrammed operating profile 435 the master control unit 430 can communicate with the slave control unit 440 and generate a real time driver alarm signal 445. The alarm signal 445 can result in an actual audible alarm, or it can be used to control/govern operational aspects of the vehicle. For example, the real time driver alarm signal 445 can be used to communicate conditions to the driver, limit/disable radio functionality, limit/disable mobile cellular devices in the vehicle, limit/disable internet applications provided in the vehicle, limit/disable GPS related applications provided by the vehicle, limit/disable the driver's cellular telephone or other such devices in the vehicle, govern mechanical operations (e.g., lower/limit speed), remotely contact vehicle owners/fleet managers, and other electrical or mechanical functions, while maintaining driver and occupant safety.

[0045] The driver alarm signal 445 generated by the slave control unit 440 can remain until the driver 410 corrects the operating conditions and brings the vehicle 420 within the programmed operating profile 435. The slave control unit 440 can generate the driver alarm signal 445 via a voice synthesized means, sounding a cabin buzzer, sounding toggling the dome light and/or cutting the radio off, etc. The slave control unit can in addition, or alternatively, provide the alarm signal 445 to the driver identification and data logging module 425, and cause that device to sound an alarm etc. Also, the system 450 can provide an owner alarm signal 460 that remotely alerts the authorized vehicle owner 470 regarding violation of the programmed operating profile 435. The owner alarm signal 460 can be an auto dial feature that communicates the authorized owner 470 via a cellular or data network.

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[0046] Alternatively, or additionally, the wireless identification and data logging module 425 can be configured to wirelessly receive vehicle specific performance and infraction data from the master control unit. This data may also be formatted to provide feedback to the driver via a display associated with the wireless identification and data logging module 425 to help the driver correct their potentially unsafe driving habits.

[0047] A plurality of transducers 461 may further be provided throughout the vehicle 420. These transducers 461 can be configured as sensors designed to measure various data related to the vehicle and vehicle driver. For example, the sensors 461-464 may provide information regarding the location, speed, acceleration, proximity to other vehicles, proximity to road obstructions, proximity to street lines, driver head movement, driver eye movement, ambient vehicle noise, driver Blood Alcohol Level, etc.

[0048] Information from these sensors can be provided to the slave control unit 440. The slave control unit 440 can process the data collected from the sensors and determine if the data indicates a condition that requires a warning. For example, the sensors may indicate that the vehicle is speeding, veering off the road, approaching an obstruction in the road, too close to another vehicle, that the vehicle driver is distracted, sleepy, or not paying attention, that the vehicle driver is impaired etc. If one of these conditions is identified, the slave control unit 440 signals the master control unit 430 and the master control unit issues a driver alarm signal 445 as described above. In the case where the impairment sensor 462 provides a signal to the slave control unit 440 indicating that the driver's impairment is above a prescribed limit, the slave control unit can prevent the vehicle from starting.

[0049] The master control unit 430 can be configured to include driver identification and validation module 502, a GPS antenna processing module 504, a master micro controller and processor 506, a memory module 508 and a function indicator module 510. The master control unit 430 may also receive data indicative of the speed of the vehicle 420, the location of the motor vehicle 420, and the time of day from a plurality of sources including a WIFI enabled device, an RF source, a Bluetooth enabled device, and a smart-road network source. This would allow the master control unit 430 to for example, receive real-time data indicative of the present road the vehicle 420 is

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travelling on via any of a WIFI enabled device, an RF source, a Bluetooth device, and a smart-road network source. The driver identification and validation module 502 can be utilized to authenticate the driver 410 utilizing the unique identification code 415 and enable the vehicle operation. The master control unit 430 can interpret driver authorization, and ascertain the vehicle speed. The master control unit 430 also interprets the location and time of day parameters versus maximum desired threshold limits.

[0050] The driver operating profile 435 can be programmed by the authorized vehicle owner 470 to place limits on the operation of the vehicle 420 by the driver 410. For example, the driver operating profile can define speed limits for each unique driver and can include geo-fencing for each driver. These limits can be dynamically determined according to location provided via the GPS module and time of day. For example, a concerned parent may set a geo-fence of 20 miles from their house for their teenage driver during the day and a 10 mile geo-fence at night. If the teenage driver exceeds this distance an alarm signal can be provided by the master control unit 430. Similarly, the parent can set speed limits that prevent the teenage driver from exceeding the speed limit on any road by more than 3 miles per hour. The speed limit can be identified for each road via wireless, GPS, or smart road network technology. If the teenage driver exceeds that limit an alarm signal can be provided by the master control unit 430 to the parent. Alternatively or additionally, the vehicle control module 467 can be signaled by the master control unit 430 to reduce the speed of the vehicle automatically if it exceeds the prescribed limits. The driver operating profile 435 can, in this way define a maximum vehicle speed, an allowable vehicle location, allowable hours of vehicle operation, require the driver's seat belt be engaged before the vehicle can be started, and define an impairment threshold for the driver.

[0051] The master control unit 430 can also provide real-time data regarding vehicle location, speed, and infractions to the authorized vehicle owner. Preferably, this data can be provided via network connection at the computer 465 (embodied as a cellular telephone, smart phone, tablet computer, vehicle integrated wireless communication device, WIFI enabled device, RFID enabled device, Bluetooth enabled device, mobile computer etc.) of the authorized vehicle owner.

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[0052] The driver authentication system can include a phone governor module 465. The phone governor module 465 can be software installed on a driver's 410 cellular telephone, smart phone, tablet computer, vehicle integrated wireless communication device, WIFI enabled device, RFID enabled device, Bluetooth enabled device, mobile computer etc. The phone governor device is configured to receive instructions from the master control unit 430. The master control unit 430 can instruct the phone governor module 465 to restrict calls on the driver's mobile device. This can include preventing any incoming or outgoing calls or restriction on phone numbers that can be dialed out or received. The master control unit 430 can further instruct the phone governor module 465 to power down the mobile device and disable text messaging or other applications involving text entry. Similarly, an internet governor module 466 may be configured to signal the master control unit 430 to disable all integrated in-vehicle internet or GPS related applications while the vehicle is in operation. This may include on-board mapping applications, services associated with the vehicle, internet search services, etc.

[0053] A vehicle control module 467 can also be configured to operate with the master control unit 430 to accelerate the vehicle, decelerate the vehicle, or alter the vehicle's direction. For example, if head/eye sensors 464 indicate that driver 410 is asleep while the vehicle is in motion, vehicle control module 467 can prompt the master control unit 430 to in addition to issuing an alarm, operate the vehicle's brakes automatically to reduce the speed of the vehicle until the vehicle is stopped. The vehicle control module 467 can further be instructed by the master control unit to simultaneously direct the vehicle out of traffic and on the shoulder of the road until the driver is awake.

[0054] The GPS antenna processing module 504 can be utilized to determine and measure time of day, speed and location data of the vehicle 420. The GPS antenna processing module 504 provides location information associated with the vehicle 420 to the authorized vehicle owner 470 hence the system 450 is compatible for any vehicle for monitoring and controlling the high-risk driver 410. The master microcontroller/processor 506 can process and control the operations associated with the master control unit 430. The memory module 508 associated with the master control unit 430 can be utilized to store the driver authentication 415 and operating profile 435 associated with the driver 410. The memory module 508 can further provide information for proper operation of the vehicle 420. The function indicator module 510 can monitor various functions in

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association with the vehicle 420 such for example, power, fault detection and monitoring, and other functions.

[0055] The master control 430 can be configured to define a number of operating parameters for a given driver such as a maximum speed limit and a geo-fence limit defining an acceptable space in which the vehicle may be operated. These parameters may be dependent on the time of day. Likewise, the parameters can be dynamically set according to the present location of the vehicle.

[0056] FIG. 6 illustrates a schematic block diagram of the driver authentication system 450, in accordance with an embodiment. The master control unit 430 can authenticate the driver 410 utilizing the unique identification code 415 provided by the data logging device 425. The data logging device 425 associated with the master control unit 430 can be collectively called as 'brain' of the driver authentication system 450. The master control unit 430 can be installed in the vehicle 420 in a suitable place where the master control unit 430 can be directly exposed to the driver from a dash board of the vehicle 420.

[0057] The master control unit 430 can communicate and send commands to the slave control unit 440 associated with the driver authentication system 450. The slave control unit 440 can include a power generator 530, a slave micro controller and processor 528, a starter relay 526, a definable relay 524, and an alarm synthesizer 522. The slave control unit 440 can be mounted under the dash board of the vehicle 420. The slave control unit 440 can receive wireless commands from master control unit 430 and generates the alarm signal 445 and 460. The slave control unit 440 can include pins such as a dirty 12 VDC pin 532, a dirty ground pin 534, a starter in pin 536, a starter out pin 538, seat belt sensor pin 540, a breathalyzer pin 542, a definable input pin on dash slave control unit 440.

[0058] The power regulator 530 can be utilized to regulate a power source and operate the system 450 via the dirty 12 VDC pin 532 and the dirty ground pin 534. The starter relay 526 can be an electromechanical device that is operated by an electrical current that is provided by the starter in pin 536. The starter relay 526 can be enabled by a starter enable signal 518 from the master control unit 430 when the driver 410 is

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authenticated. The starter relay 426 can generate an output via a starter out pin 538 that can be a mechanical function utilized to operate the vehicle 420. The seat belt sensor pin 540 can be externally connected to a seat belt sensor associated with the vehicle 420 where it obtains the information regarding usage of seat belt by the driver 410.

[0059] The breathalyzer 542 in pin 524 can provide status regarding alcohol consumption of the driver 410 while driving the vehicle 420. The slave microcontroller/ processor 528 can process and control the operations of the slave control unit 440. The alarm/speaker/voice synthesizer 522 can receive the alarm enable signal 516 from the master control unit 430 and generate the owner programmed driver alarm signal 445 in the vehicle 420 when the driver 410 violates the programmed parameters. Further, the master control unit 430 and the slave control unit 440 can be communicated via various communication signal lines such as a clean power signal 520, an alarm enable signal 516, internal definable input signal 514 and an internal definable output signal 512.

[0060] FIG. 7 illustrates a flow chart of operation illustrating logical operation steps of a method 600 for monitoring and controlling vehicle usage, in accordance with an embodiment. The software application module 260 with operating parameters associated with the vehicle 420 can be configured and stored in the proprietary and centralized database 370, as depicted at block 610. The driver specific operating profile 435 for the high-risk driver 410 can be programmed by accessing the software application 260 via the remote computer 465, as indicated at block 620. Note that the software application 260 can include programming software that can be utilized to program the features of the driver authentication system 450. The software application module 260 monitors various parameters such as the 'trigger' levels for speed, and time of operation, etc. The software application module 260 can be accessible by the authorized owners 470 and can also be utilized to download the actual data logged during the operation of the vehicle 420. Further, the software application 260 can also be intuitive for the customer through the process of selecting parameters, trigger thresholds, etc.

[0061] The operating profile 435 for the driver 410 can be loaded to the driver identification and data logging module 425, as illustrated at block 630. The master control unit 430 can authenticate and validate the driver 410 utilizing the unique

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identification code 415 provided by the driver identification and data logging module 425, as indicated at block 640. The operating profile 435 for the driver 410 can be transferred to the master control unit 430, as shown at block 650. The master control unit 430 monitors and logs vehicle performance via the GPS module 504 associated with master control unit 430, as depicted at block 660. The slave control unit 440 generates the driver alarm signal 445, if the driver 410 violates the programmed operating profile 435, as illustrated at block 670.

[0062] FIG. 8 illustrates a high level flow chart of operation illustrating a method 700 for monitoring and controlling vehicle usage by the high-risk driver 410, in accordance with an embodiment. Again as reminder, in FIGS. 1-8, identical or similar blocks are generally indicated by identical reference numerals. The operating profile 435 for the high-risk driver 410 can be programmed by accessing the software application 260 via the remote computer 465, as depicted at block 710. The programmed operating profile 435 for the high-risk driver 410 can be transferred into the driver identification and data logging module 425, as illustrated at block 720.

[0063] The driver 410 can be authenticated utilizing the unique identification code 415 provided by the driver identification and data logging module 425 and the programmed operating profile 435 for the driver 410 can be copied into the driver authentication system 450, as depicted at block 730. A determination can be made whether the driver 410 violates the operating profile 435, as illustrated at block 740. If the driver violates the operating profile 435, as shown at block 750, the driver alarm 445 signal can be generated by the driver authentication system 450, as depicted at block 755. Otherwise, the process can be continued to block 740.

[0064] The driver authentication system includes features such as data logging, alarming, operation governance, ease of programmability and utilizes GPS technology to provide high-risk driver safety. The system provides user awareness that reduce the likelihood of a high-risk driver injury or fatality by helping the high-risk drivers with safe driving habits through immediate and real time feedback and governing. The programmable operating parameters associated with the real time driver feedback can categorize the system as unique driver safety device. Additionally, the system and method described herein can provide multiple operating profiles for a single vehicle that

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allows the owners to operate the vehicle without any restrictions yet have restrictions in affect when the vehicle is operated by the high risk driver.

[0065] It will be appreciated that variations of the above-disclosed and other features and functions, or alternatives thereof, may be desirably combined into many other different systems or applications. Also that various presently unforeseen or unanticipated alternatives, modifications, variations or improvements therein may be subsequently made by those skilled in the art which are also intended to be encompassed by the following claims.

[0066] In one embodiment A driver authentication and monitoring system, comprises a wireless identification and data logging module; a master control unit in a motor vehicle for wirelessly authenticating at least one driver via the wireless driver identification and data logging module and associating an operating profile with the at least one driver; a GPS module providing at least location and speed information in association with movement of the motor vehicle; a data logging device recording vehicle operation data associated with a use of the motor vehicle by the at least one driver comprising at least the location and speed information from the GPS module; and a slave control unit in the motor vehicle and in communication with the master control unit, the slave control unit configured to receive commands from the master control unit and to generate an alarm signal if the at least one driver violates the operating profile unique to the at least one driver thereby providing feedback about the vehicle usage; wherein the master control unit permits the at least one driver to operate the vehicle within an operating profile if the master control unit receives at least one of a unique identification code to permit the at least one driver to operate the vehicle within an operating profile and the at least one driver has not violated the operating profile.

[0067] The driver authentication and monitoring system of further comprises a plurality of transducers comprising at least one of proximity sensors, head movement sensors, and eye movement sensors wherein the transducers send signals to the slave control unit and the slave control unit determines if the signals are indicative of a driving condition requiring a warning and in turn signals the master control unit to alert the driver. The driver authentication and monitoring system also comprises an impairment sensor wherein the slave control unit receives signals from impairment sensor and

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prevents the motor vehicle from starting when the transducer senses a driver impairment above a prescribed limit.

[0068] The driver authentication and monitoring system further comprises configuring the wireless identification and data logging module as at least one of a WIFI enabled device; an RFID enabled device, a Bluetooth enabled device; a cellular telephone; and a smart phone.

[0069] In another embodiment of the driver authentication system, the wireless identification and data logging module is further configured to wirelessly load the operating profile for the at least one driver into the master control unit. The wireless identification and data logging module is further configured to wirelessly receive driver specific vehicle performance and infraction data from the master control unit and present the driver specific vehicle performance and infraction data.

[0070] In another embodiment of the driver authentication device, the master control unit is further configured for wirelessly receiving data indicative of a speed of the motor vehicle, a location of the motor vehicle, and a time of day from at least one of a WIFI source; an RF source; a Bluetooth source; and a smart-road network source. The master control is configured for wirelessly receiving data indicative of a speed limit associated with a road the motor vehicle is currently traveling on from at least one of a WIFI source; an RF source; a Bluetooth source; and a smart-road network source. The master control is configured to define a maximum speed limit and a geo-fence limit for the at least one driver according to the time of day.

[0071] In another embodiment, the driver authentication module further comprises an alarm module configured to wirelessly receive data from at least one of the master controller, the slave controller, and the GPS module wherein the alarm module is further configured to present at least one of location data, speed data, and infraction data in real time. The alarm module comprises at least one of a cellular telephone; a smart phone; a computer; a vehicle integrated wireless communication device; a WIFI enabled device; an RFID enabled device; and a Bluetooth enabled device.

[0072] The driver authentication device further comprises a phone governor module

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configured to receive at least one instruction from the master control unit the instructions comprising at least one of restricting calls on the at least one driver's cellular telephone; powering off the at least one driver's cellular telephone; and disabling text messaging on the at least one driver's cellular telephone.

[0073] The driver authentication device further comprises an internet governor module configured to disables all integrated in-vehicle internet related applications when the vehicle is in operation.

[0074] The driver authentication device further comprises a vehicle control module configured to receive at least one instruction from the master control unit the instructions comprising at least one of reducing the vehicles speed; increasing the vehicles speed; and altering the vehicles direction.

[0075] The driver authentication and monitoring system includes the slave control unit further comprising a power regulator module; a starter relay module; a definable relay module; a slave microcontroller; and an alarm synthesizer. The operating profile comprises at least one operating parameter including at least one of: a maximum allowable vehicle speed; an allowable vehicle location; allowable hours of operation; and a seatbelt usage. The slave control unit generates an alarm signal for remotely alerting the authorized user when the at least one driver violates the operating profile.

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CLAIMS

What is claimed is:

1. A vehicle control system, comprising:

a wireless identification and data logging module;

a master control unit in a motor vehicle for wirelessly authenticating at least one occupant via said wireless driver identification and data logging module and associating an operating profile with said at least one occupant;

a module for receiving at least location and speed information in association with movement of said motor vehicle;

a data logging device recording vehicle operation data associated with a use of said motor vehicle comprising at least said location and speed information received from said module; and

a slave control unit in said motor vehicle and in communication with said master control unit, said slave control unit configured to receive commands from said master control unit and to generate an alarm signal;

wherein said master control unit provides operation governance of said vehicle within an operating profile.

2. The vehicle control system of claim 1 further comprising:

a plurality of transducers comprising at least one of an image capturing sensor and a proximity sensor, wherein said transducers send signals to said slave control unit and said slave control unit determines if said signals are indicative of a driving condition requiring a warning and in turn signals said master control unit.

3. The vehicle control system of claim 1 further comprising:

a vehicle control module configured to control a vehicle speed and allowable vehicle location.

4. The vehicle control system of claim 1 further comprising configuring said wireless identification and data logging module as at least one of:

a WIFI enabled device;

an RFID enabled device;

a Bluetooth enabled device;

a cellular telephone; and

a smartphone.

5. The vehicle control system of claim 4 wherein said wireless identification and data logging module is further configured to wirelessly load said operating profile into said master control unit.

6. The vehicle control system of claim 4 wherein said wireless identification and data logging module is further configured to wirelessly receive specific vehicle performance and infraction data from said master control unit.

7. The vehicle control system of claim 3 wherein said wireless identification and data logging module is further configured to present vehicle performance data to said vehicle control module in order to guide governance of said vehicle's operation by said vehicle control module.

8. The vehicle control system of claim 1 wherein said master control unit is further configured for wirelessly receiving data indicative of a speed of said motor vehicle, a location of said motor vehicle, and a time of day from at least one of:

a WIFI source;

an RF source;

a Bluetooth source;

an image capturing source;

a processing device;

a proximity sensor; and

a smart-road network source.

9. The vehicle control system of claim 8 wherein said master control is configured for wirelessly receiving data indicative of a speed limit associated with a road said motor vehicle is currently traveling on from at least one of:

a WIFI source;

an RF source;

a Bluetooth source;

an image capturing source;

a processing device;

a proximity sensor; and

a smart-road network source.

10. The vehicle control system of claim 9 wherein said master control is configured to define a speed, a positioning of said vehicle on a road, a distance from another object, a distance from another vehicle, and a geo-fence limit for said vehicle.

11. The vehicle control system of claim 1 further comprising an alarm module configured to wirelessly receive data from at least one of said master controller, said slave controller, and said GPS module wherein said alarm module is further configured to present at least one of location data, speed data, and infraction data in real time.

12. The vehicle control system of claim 11 wherein said alarm module comprises at least one of:

a cellular telephone;

a smartphone;

a computer;

a vehicle integrated wireless communication device;

a WIFI enabled device;

an RFID enabled device; and

a Bluetooth enabled device.

13. The vehicle control system of claim 1 further comprising a phone governor module configured to receive at least one instruction from said master control unit said instructions comprising at least one of:

restricting calls on said at least one driver's cellular telephone;

powering off said at least one driver's cellular telephone; and

disabling text messaging on said at least one driver's cellular telephone.

14. The vehicle control system of claim 1 further comprising an internet governor module configured to disable integrated in-vehicle internet related applications when said vehicle is in operation.

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15. The vehicle control system of claim 2 further comprising a steering control module, a braking control module, and an acceleration control module configured to receive at least one instruction from said master control unit said instructions comprising at least one of:

reducing said vehicles speed;

increasing said vehicles speed;

altering said vehicles direction on said road;

altering said vehicles proximity to other vehicles; and

altering said vehicles proximity to other objects.

16. The vehicle control system of claim 15 wherein said vehicle operates autonomously.

17. The vehicle control system of claim 1, wherein said slave control unit further comprises a power regulator module; a starter relay module; a definable relay module; a slave microcontroller; and an alarm synthesizer.

18. The vehicle control system of claim 1, wherein said operating profile comprises at least one operating parameter including at least one of: a maximum allowable vehicle speed; an allowable vehicle location; allowable hours of operation; an allowable destination; and a seatbelt usage.

19. The vehicle control system of claim 1 wherein said slave control unit generates an alarm signal for remotely alerting said authorized user when said vehicle violates said operating profile.

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ABSTRACT

A driver authentication and safety system and method for monitoring and controlling vehicle usage by high-risk drivers. A centralized database comprising a software application can be accessed by an authorized user via a data communications network utilizing a remote computer in order to configure a desired operating profile that matches requirements of the high-risk driver. The operating profile can be loaded to a driver identification and data logging module in conjunction with the remote computer. A master control unit receives a unique identification code from the data logging device to authenticate the high-risk driver and to operate the vehicle within the desired operating profile. A slave control unit receives commands from the master control unit and generates a real time alarm signal if the driver violates the preprogrammed operating profile unique to the driver.

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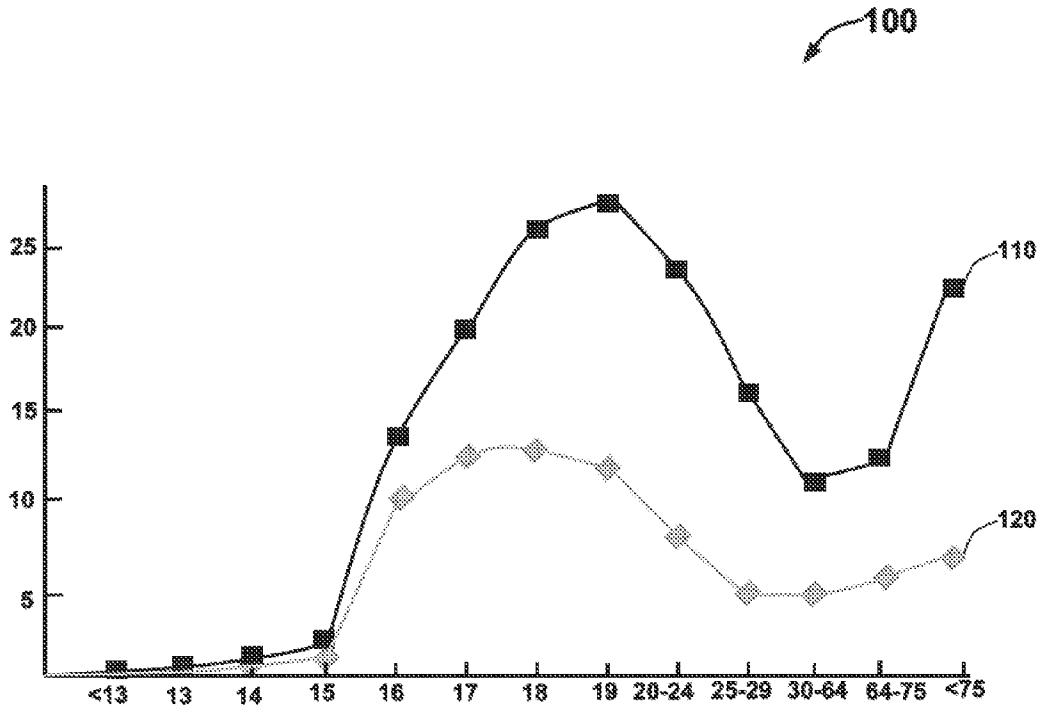

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FIG. 1

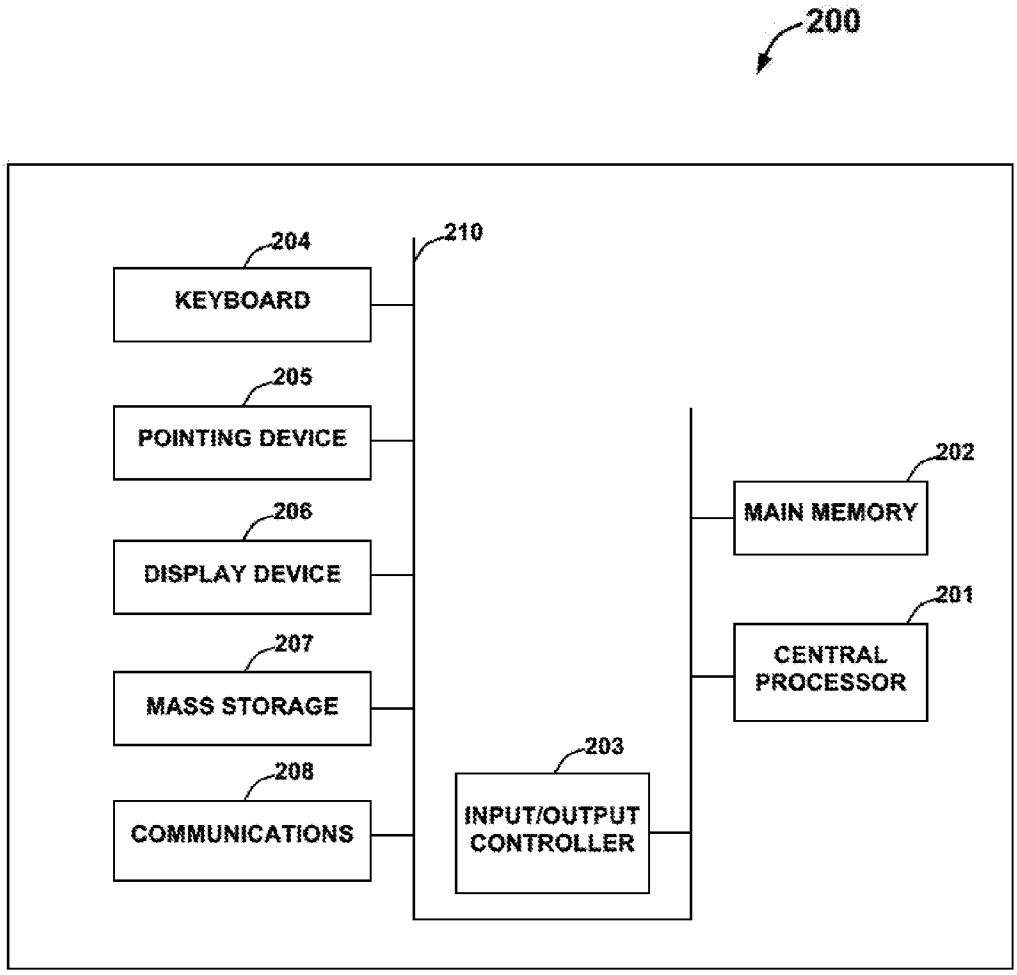

200
204
KEYBOARD
205
POINTING DEVICE
206
DISPLAY DEVICE
207
MASS STORAGE
208
COMMUNICATIONS
210
203
INPUT/OUTPUT CONTROLLER
202
MAIN MEMORY
201
CENTRAL PROCESSOR

FIG. 2

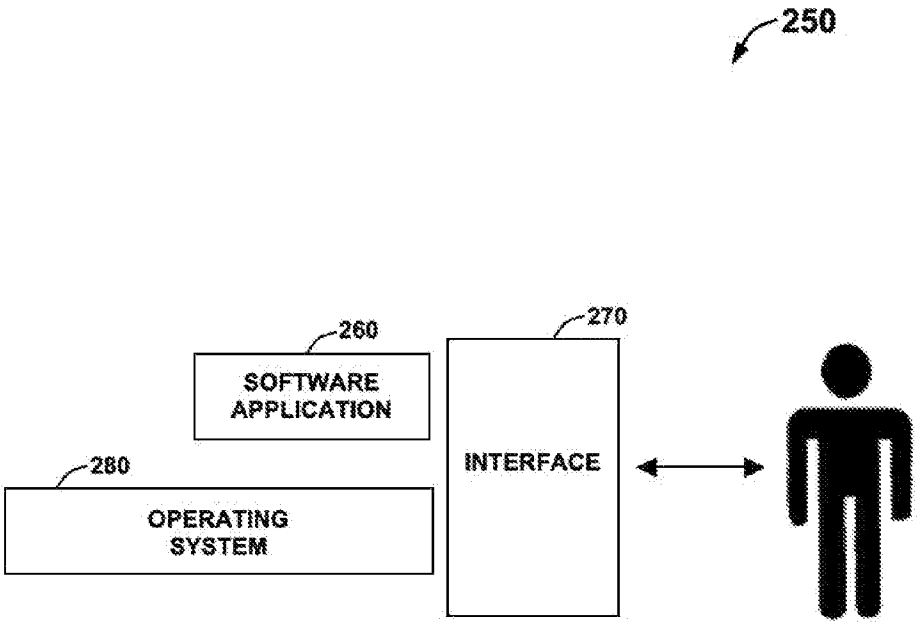

250
260
SOFTWARE APPLICATION
270
INTERFACE
280
OPERATING SYSTEM

FIG. 3

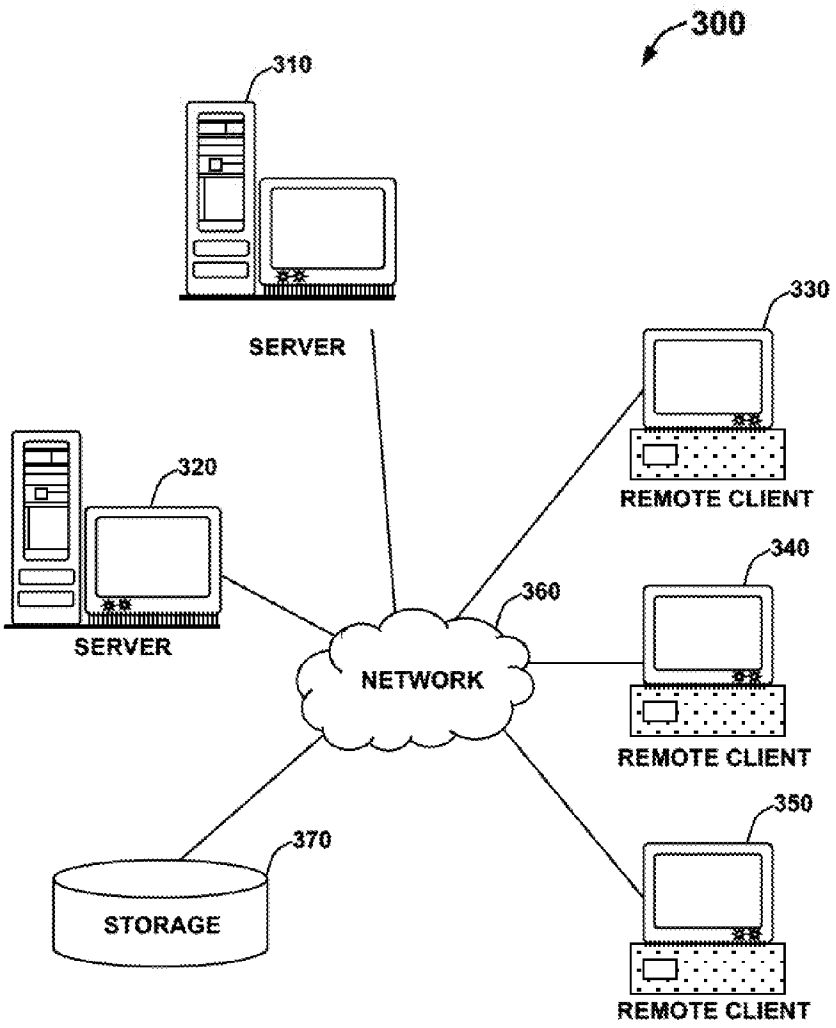

300
310
SERVER
330
REMOTE CLIENT
320
SERVER
340
360
NETWORK
REMOTE CLIENT
350
370
STORAGE
REMOTE CLIENT

FIG. 4

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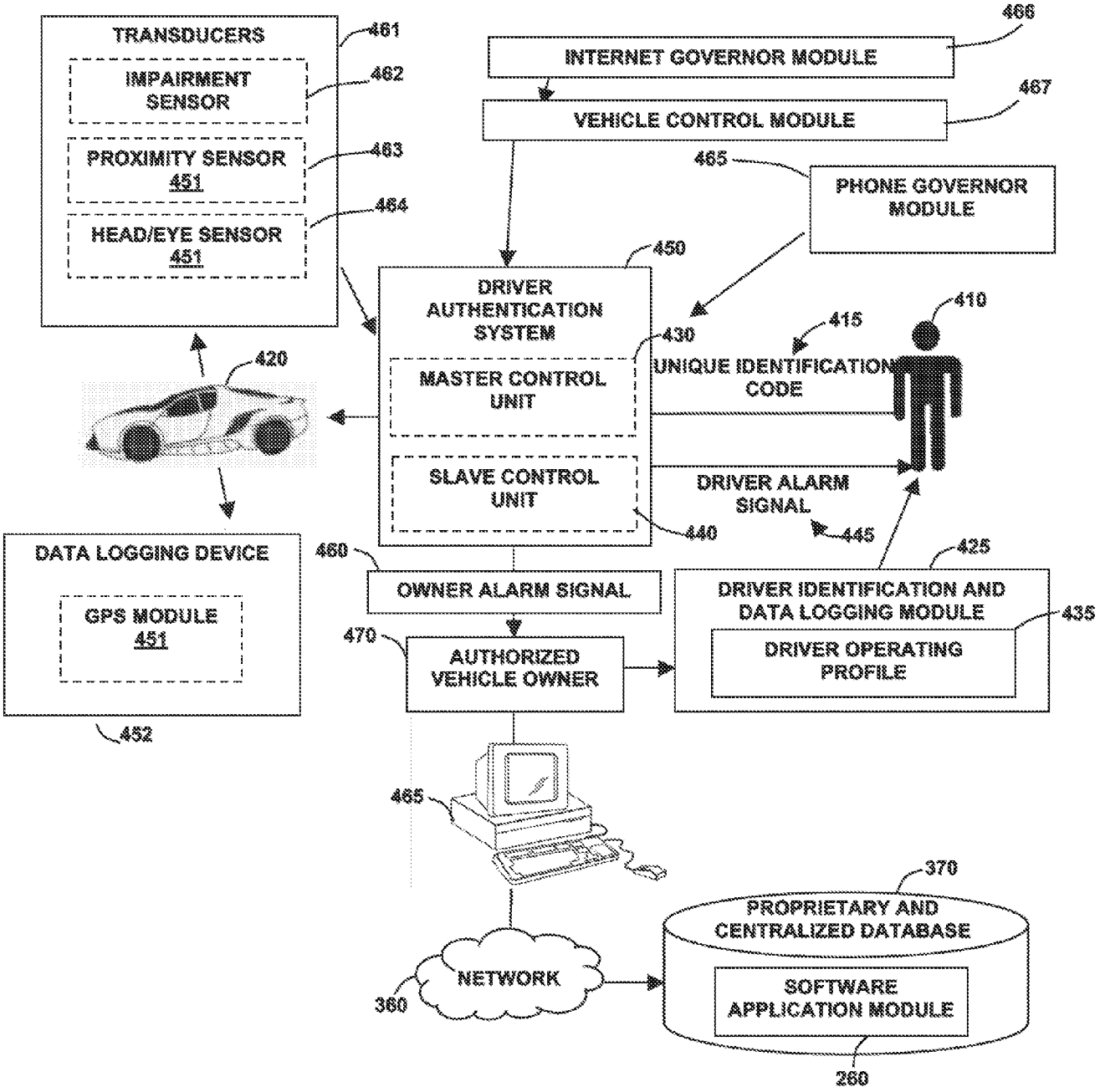


FIG. 5

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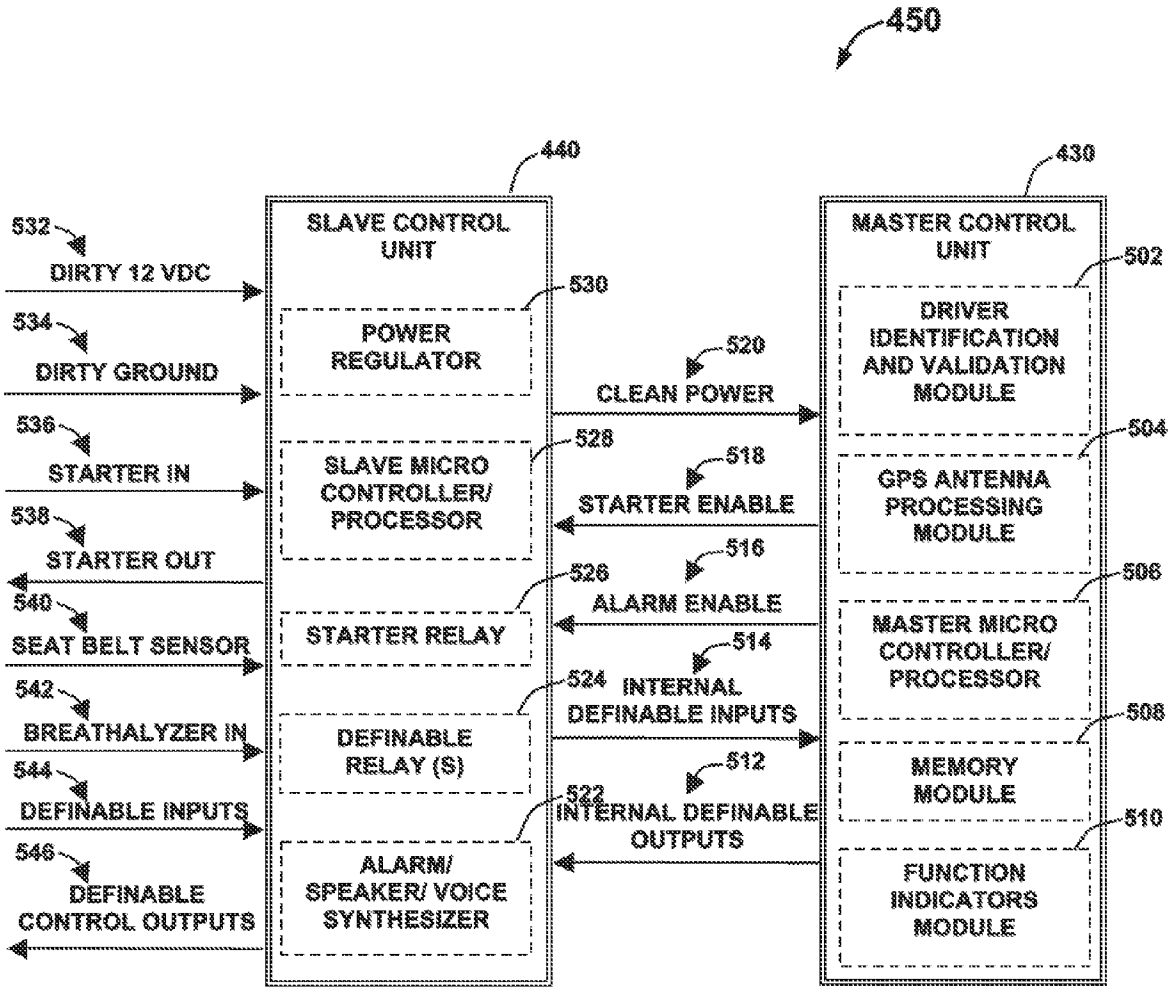

450
440
SLAVE CONTROL UNIT
430
MASTER CONTROL UNIT
532
DIRTY 12 VDC
534
DIRTY GROUND
536
STARTER IN
538
STARTER OUT
540
SEAT BELT SENSOR
542
BREATHALYZER IN
544
DEFINABLE INPUTS
546
DEFINABLE CONTROL OUTPUTS
530
POWER REGULATOR
528
SLAVE MICRO CONTROLLER/ PROCESSOR
526
STARTER RELAY
524
DEFINABLE RELAY (S)
522
ALARM/ SPEAKER/ VOICE SYNTHESIZER
520
CLEAN POWER
518
STARTER ENABLE
516
ALARM ENABLE
514
INTERNAL DEFINABLE INPUTS
512
INTERNAL DEFINABLE OUTPUTS
502
DRIVER IDENTIFICATION AND VALIDATION MODULE
504
GPS ANTENNA PROCESSING MODULE
506
MASTER MICRO CONTROLLER/ PROCESSOR
508
MEMORY MODULE
510
FUNCTION INDICATORS MODULE

FIG. 6

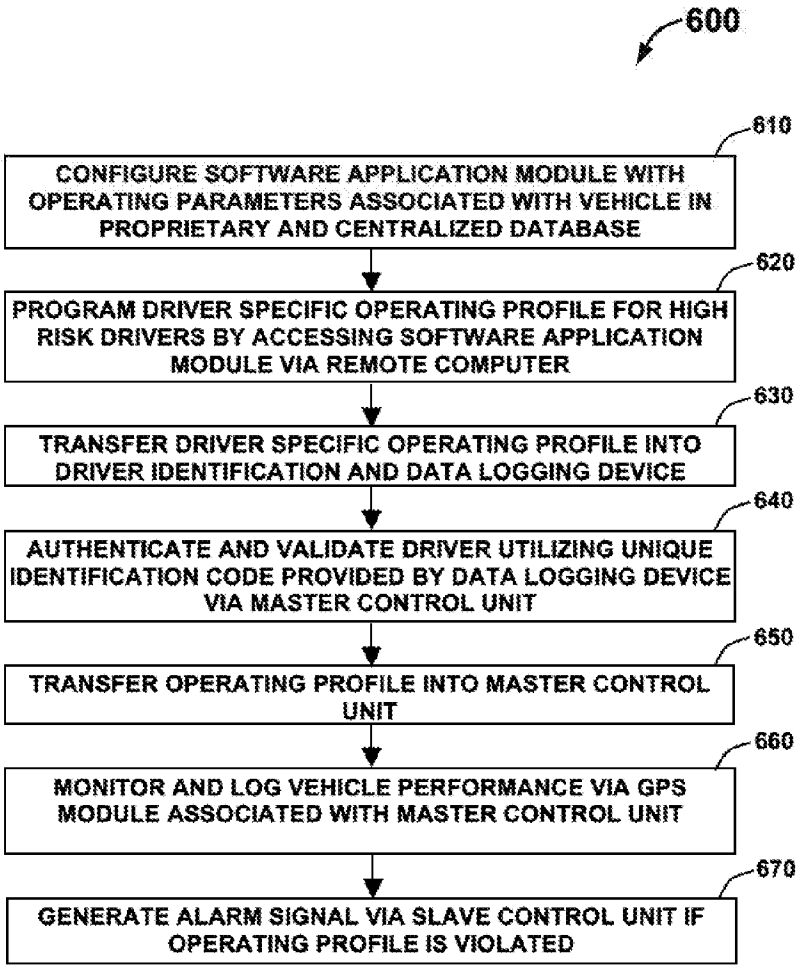

600
610
CONFIGURE SOFTWARE APPLICATION MODULE WITH OPERATING PARAMETERS ASSOCIATED WITH VEHICLE IN PROPRIETARY AND CENTRALIZED DATABASE
620
PROGRAM DRIVER SPECIFIC OPERATING PROFILE FOR HIGH RISK DRIVERS BY ACCESSING SOFTWARE APPLICATION MODULE VIA REMOTE COMPUTER
630
TRANSFER DRIVER SPECIFIC OPERATING PROFILE INTO DRIVER IDENTIFICATION AND DATA LOGGING DEVICE
640
AUTHENTICATE AND VALIDATE DRIVER UTILIZING UNIQUE IDENTIFICATION CODE PROVIDED BY DATA LOGGING DEVICE VIA MASTER CONTROL UNIT
650
TRANSFER OPERATING PROFILE INTO MASTER CONTROL UNIT
660
MONITOR AND LOG VEHICLE PERFORMANCE VIA GPS MODULE ASSOCIATED WITH MASTER CONTROL UNIT
670
GENERATE ALARM SIGNAL VIA SLAVE CONTROL UNIT IF OPERATING PROFILE IS VIOLATED

FIG. 7

8/8

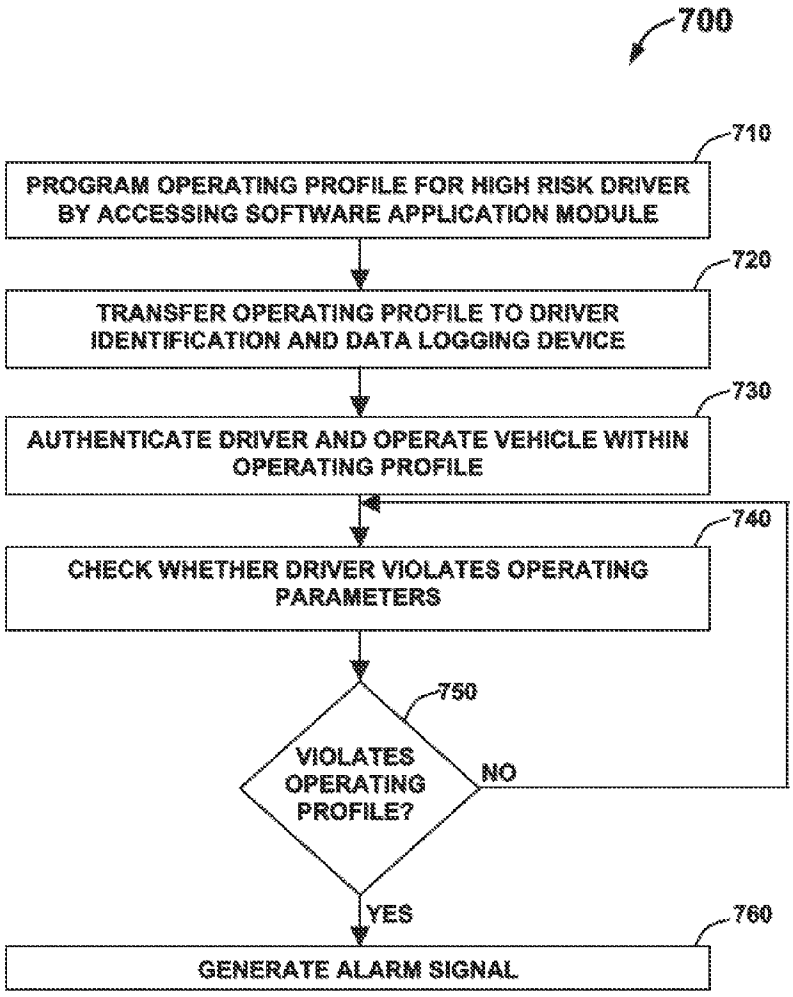

700
710
PROGRAM OPERATING PROFILE FOR HIGH RISK DRIVER BY ACCESSING SOFTWARE APPLICATION MODULE
720
TRANSFER OPERATING PROFILE TO DRIVER IDENTIFICATION AND DATA LOGGING DEVICE
730
AUTHENTICATE DRIVER AND OPERATE VEHICLE WITHIN OPERATING PROFILE
740
CHECK WHETHER DRIVER VIOLATES OPERATING PARAMETERS
750
VIOLATES OPERATING PROFILE?
NO
YES
760
GENERATE ALARM SIGNAL

FIG. 8

Electronic Acknowledgement Receipt	
EFS ID:	27343889
Application Number:	15336110
International Application Number:	
Confirmation Number:	5824
Title of Invention:	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE
First Named Inventor/Applicant Name:	Michael Phelan
Customer Number:	64064
Filer:	Kevin Lee Soules/Kemlyn Evans
Filer Authorized By:	Kevin Lee Soules
Attorney Docket Number:	1000-1796-C3
Receipt Date:	27-OCT-2016
Filing Date:	
Time Stamp:	15:47:19
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	1000-1796-C3_Transmittal.pdf	290969 b0d87138a0f11d1bc78fbd6b19371f83758 3ecdc	no	2
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Information:					
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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.

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
15/336,110	10/27/2016

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 64064

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Michael Phelan

☑ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☐ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	10/27/2016
Name	Michael Phelan		
Title	INVENTOR		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ Total of 2 forms are submitted.

This collection of information is required by 37 CFR 1.131, 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

Electronic Acknowledgement Receipt	
EFS ID:	27344157
Application Number:	15336110
International Application Number:	
Confirmation Number:	5824
Title of Invention:	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE
First Named Inventor/Applicant Name:	Michael Phelan
Customer Number:	64064
Filer:	Kevin Lee Soules/Kemlyn Evans
Filer Authorized By:	Kevin Lee Soules
Attorney Docket Number:	1000-1796-C3
Receipt Date:	27-OCT-2016
Filing Date:	
Time Stamp:	15:56:28
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	1000-1796-C3_POA.pdf	2351407 6dd23d8af5c35d81e37e8e79f01245218bf2e042	no	1
Warnings:					

Information:	
Total Files Size (in bytes):	2351407

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.

SCORE Placeholder Sheet for IFW Content

Application Number: 15336110 Document Date: 10/27/2016

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

- Drawings – Other than Black and White Line Drawings

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

To access the documents in the SCORE database, refer to instructions below.

At the time of document entry (noted above):

- Examiners may access SCORE content via the eDAN interface.
- Other USPTO employees can bookmark the current SCORE URL (http://Score.uspto.gov/ScoreAccessWeb/).
- External customers may access SCORE content via the Public and Private PAIR interfaces.

Form Revision Date: September 30, 2013

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	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/336,110	10/27/2016	Michael Phelan	1000-1796-C3

CONFIRMATION NO. 5824

64064
ORTIZ & LOPEZ, PLLC
P.O. BOX 4484
ALBUQUERQUE, NM 87196-4484

FORMALITIES LETTER

OC000000087026742

Date Mailed: 11/09/2016

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.)

- $ **70** basic filing fee.
- $ **70** surcharge.
- $ **300** search fee.
- $ **360** examination fee.
- $(**0**) previous unapplied payment amount.
- $ **800** TOTAL FEE BALANCE DUE.

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UNIFIED PATENTS EX1012
Page 854 of 1244
Page 61 of 199

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**.

/jmilani/

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/336,110

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	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	19 minus 20 =	*	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*	x 210 =	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			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	730		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	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))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	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))									
	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.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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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
15/336,110	10/27/2016	3661	0.00	1000-1796-C3	19	1

CONFIRMATION NO. 5824

FILING RECEIPT

64064
ORTIZ & LOPEZ, PLLC
P.O. BOX 4484
ALBUQUERQUE, NM 87196-4484

OC000000087026741

Date Mailed: 11/09/2016

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)

Michael Phelan, Santa Fe, NM;

Applicant(s)

Michael Phelan, Santa Fe, NM;

Power of Attorney: The patent practitioners associated with Customer Number 64064

Domestic Priority data as claimed by applicant

This application is a CON of 14/464,188 08/20/2014 PAT 9493149
which is a CIP of 13/858,930 04/08/2013 PAT 9045101
which is a CON of 12/496,509 07/01/2009 PAT 8417415
which claims benefit of 61/077,568 07/02/2008

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: No

Permission to Access Search Results: No

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: 11/04/2016

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UNIFIED PATENTS EX1012
Page 857 of 1244
Page 64 of 199

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/336,110**

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

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

Preliminary Class

701

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 AssetsControl, 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Michael Phelan	**EXAMINER:**	TBD
SERIAL NO.:	15/336,110	**GROUP:**	3661
FILED:	10/27/2016	**ATTY DKT NO.:**	1000-1796-C3
TITLE:	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE		

Submission of Missing Parts

Sir:

In response to the Notice to File Missing Parts mailed on November 9, 2016 having a statutory response period extending through January 9, 2017, please accept this submission of the missing parts. No new matter has been introduced.

The filing fees with surcharge fee are submitted along with this paper.

Date: January 9, 2017

Respectfully submitted,



Kevin Soules
Attorney for the Applicants
Registration No. 66,033
Telephone No.: (505) 314-1310
Fax No.: (505) 314-1307

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UNIFIED PATENTS EXHIBIT 1002

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/336,110	10/27/2016	Michael Phelan	1000-1796-C3

CONFIRMATION NO. 5824

64064
ORTIZ & LOPEZ, PLLC
P.O. BOX 4484
ALBUQUERQUE, NM 87196-4484

FORMALITIES LETTER

OC000000087026742

Date Mailed: 11/09/2016

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.)

- $ **70** basic filing fee.
- $ **70** surcharge.
- $ **300** search fee.
- $ **360** examination fee.
- $(**0**) previous unapplied payment amount.
- $ **800** TOTAL FEE BALANCE DUE.

Mercedes EX1012
UNIFIED PATENTS EX1012
Page 861 of 1244
Page 68 of 199

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**.

/jmilani/

Mercedes EX1012
UNIFIED PATENTS EX1012
Page 862 of 1244
Page 69 of 199

Electronic Patent Application Fee Transmittal

Application Number:	15336110
Filing Date:	27-Oct-2016
Title of Invention:	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE
First Named Inventor/Applicant Name:	Michael Phelan
Filer:	Kevin Lee Soules/Kemlyn Evans
Attorney Docket Number:	1000-1796-C3

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	70	70
UTILITY SEARCH FEE	2111	1	300	300
UTILITY EXAMINATION FEE	2311	1	360	360
Pages:				
Claims:				
Miscellaneous-Filing:				
LATE FILING FEE FOR OATH OR DECLARATION	2051	1	70	70
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		800

Electronic Acknowledgement Receipt	
EFS ID:	28011406
Application Number:	15336110
International Application Number:	
Confirmation Number:	5824
Title of Invention:	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE
First Named Inventor/Applicant Name:	Michael Phelan
Customer Number:	64064
Filer:	Kevin Lee Soules/Kemlyn Evans
Filer Authorized By:	Kevin Lee Soules
Attorney Docket Number:	1000-1796-C3
Receipt Date:	09-JAN-2017
Filing Date:	27-OCT-2016
Time Stamp:	16:14:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$800
RAM confirmation Number	011017INTEFSW00003321504516
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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	1000-1796-C3_RespMissParts_Jan2017.pdf	188344 7745046196 6ee385a8d0e41b94848e2a1bf906b3	no	3
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	36870 17725e6144b46b4adbdd1f3f1e824f85c093f66e	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	225214		

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.

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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
15/336,110	10/27/2016	3661	800	1000-1796-C3	19	1

CONFIRMATION NO. 5824

UPDATED FILING RECEIPT

64064
ORTIZ & LOPEZ, PLLC
P.O. BOX 4484
ALBUQUERQUE, NM 87196-4484

OC000000088426381

Date Mailed: 01/12/2017

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)

Michael Phelan, Santa Fe, NM;

Applicant(s)

Michael Phelan, Santa Fe, NM;

Power of Attorney: The patent practitioners associated with Customer Number 64064

Domestic Priority data as claimed by applicant

This application is a CON of 14/464,188 08/20/2014 PAT 9493149
which is a CIP of 13/858,930 04/08/2013 PAT 9045101
which is a CON of 12/496,509 07/01/2009 PAT 8417415
which claims benefit of 61/077,568 07/02/2008

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: No

Permission to Access Search Results: No

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: 11/04/2016

Mercedes EX1012
UNIFIED PATENTS EXHIBIT 1002
Page 867 of 1244
Page 74 of 199

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/336,110**

Projected Publication Date: 04/20/2017

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

Preliminary Class

701

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

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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 AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

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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).

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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: 15/336,110

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	19 minus 20 =	*	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*	x 210 =	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			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	730		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	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))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	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))									
	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	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/336,110	10/27/2016	Michael Phelan	1000-1796-C3

CONFIRMATION NO. 5824

64064
ORTIZ & LOPEZ, PLLC
P.O. BOX 4484
ALBUQUERQUE, NM 87196-4484

PUBLICATION NOTICE

OC000000090780976

Title:DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

Publication No.US-2017-0106877-A1
Publication Date:04/20/2017

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.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/336,110	10/27/2016	Michael Phelan	1000-1796-C3	5824

64064 7590 08/27/2018

Ortiz & Lopez, PLLC
P.O. BOX 4484
ALBUQUERQUE, NM 87196-4484

EXAMINER	
DAGER, JONATHAN M	

ART UNIT	PAPER NUMBER
3663	

NOTIFICATION DATE	DELIVERY MODE
08/27/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docketing@olpatentlaw.com
eofficeaction@appcoll.com
krukar@olpatentlaw.com

Office Action Summary	Application No. 15/336,110	Applicant(s) Phelan, Michael	
	Examiner JONATHAN M DAGER	Art Unit 3663	AIA Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 27 October 2016.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ 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.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-19 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-19 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, 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.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on See Continuation Sheet is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ 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)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

Continuation of Application Papers 11): 27 October 2016

DETAILED CORRESPONDENCE

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Double Patenting

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP

§§ 706.02(l)(1) - 706.02(l)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

1a. Claims 1-5 and 17-19 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-18 of U.S. Patent No. 9,493,149. Although the claims at issue are not identical, they are not patentably distinct from each other because the scope of said claims have already been encompassed by those of the patent.

1b. Claims 1 and 17-19 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 11-14 of U.S. Patent No. 9,045,101 and 9,908,508. Although the claims at issue are not identical, they are not patentably distinct from each other because the scope of said claims have already been encompassed by those of the patent.

1c. Claims 1, 17, and 18 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 9-11 of U.S. Patent No. 8,417,415. Although the claims at issue are not identical, they are not patentably distinct from each other because the scope of said claims have already been encompassed by those of the patent.

1d. Claims 1 and 17-19 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claim 11-14 of copending Application No. 15/898,322 (reference application). Although the claims at issue are not identical, they are not patentably distinct from each other because the scope of said claims have already been encompassed by those of the application.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Prior Art

2. None of the prior art cited could anticipate, or be combined to render obvious the claimed invention. Upon resolution of the above cited issues, the claims will be in condition for allowance.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JONATHAN M DAGER whose telephone number is (571)270-1332. The examiner can normally be reached on M-F 0830-1730.

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, Angela Ortiz can be reached on 571-272-1206. 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 http://pair-direct.uspto.gov. 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.

/JONATHAN M DAGER/
Primary Examiner, Art Unit 3663
22 August 2018

Notice of References Cited	Application/Control No. 15/336,110	Applicant(s)/Patent Under Reexamination Phelan, Michael	
	Examiner JONATHAN M DAGER	Art Unit 3663	Page 1 of 4

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20020049538-A1	04-2002	Knapton, Cary Paul	G01C21/28	701/472
*	B	US-20030181822-A1	09-2003	Victor, Trent	A61B3/113	600/558
*	C	US-20030204290-A1	10-2003	Sadler, John G.	B60R25/04	701/1
*	D	US-20030231550-A1	12-2003	Macfarlane, Jane F.	B60R25/257	367/198
*	E	US-20040064221-A1	04-2004	DePrez, Mary K.	B60T7/042	701/2
*	F	US-20040225557-A1	11-2004	Phelan, Joseph	G01M17/00	701/1
*	G	US-20050237150-A1	10-2005	Sun, Hao	G07C9/00182	340/5.52
*	H	US-20050288837-A1	12-2005	Wiegand, Michael	B60R16/037	701/36
*	I	US-20060047419-A1	03-2006	Diendorf; John R.	G01C21/26	701/532
*	J	US-20060066149-A1	03-2006	Holloway; Lane Thomas	B60R25/24	307/10.3
*	K	US-20060200008-A1	09-2006	Moore-Ede; Martin	B60K28/06	600/300
*	L	US-20060212195-A1	09-2006	Veith; Gregory W.	G06Q10/06	701/33.4
*	M	US-20070082706-A1	04-2007	Campbell; Douglas C.	B60R16/0373	455/563

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20070129056-A1	06-2007	Cheng; Russel	G06Q30/02	455/405
*	B	US-20070155368-A1	07-2007	Phelan; James Daniel	H04W8/245	455/412.1
*	C	US-20070158128-A1	07-2007	Gratz; Rosemarie M.	B60R25/1004	180/287
*	D	US-20070200663-A1	08-2007	White; Steve	A61B5/117	340/5.31
*	E	US-20080039998-A1	02-2008	Fein; Gene	B60R16/037	701/36
*	F	US-20080269979-A1	10-2008	Hermann; Thomas	H04L41/082	701/29.6
*	G	US-20080319602-A1	12-2008	McClellan; Scott	G07C5/008	701/31.4
*	H	US-20090024273-A1	01-2009	Follmer; Todd	G06Q10/10	701/33.4
*	I	US-20090027177-A1	01-2009	Hodder; David John	B60R25/04	340/426.12
*	J	US-20090030770-A1	01-2009	Hersh; Richard	G06Q10/06311	705/7.13
*	K	US-20090069954-A1	03-2009	ALADESUYI; Kayode	B60R25/102	701/2
*	L	US-20090079555-A1	03-2009	Aguirre De Carcer; Giadha	G07C5/008	340/441
*	M	US-20090189736-A1	07-2009	Hayashi; Hitoshi	G06F21/32	340/5.81

FOREIGN PATENT DOCUMENTS

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20100045452-A1	02-2010	Periwal; Neeraj	B60Q9/00	340/439
*	B	US-20100087986-A1	04-2010	LAL; DHANANJAY	B60R16/023	701/36
*	C	US-20100161171-A1	06-2010	Valentine; Eric Lee	B22D11/12	701/31.4
*	D	US-20140358376-A1	12-2014	Phelan; Michael	B60W10/18	701/41
*	E	US-20150350750-A1	12-2015	YUN; Doo Seop	H04Q9/00	340/870.07
*	F	US-20160001715-A1	01-2016	Laifenfeld; Moshe	B60R16/023	701/32.7
*	G	US-20160001718-A1	01-2016	Laifenfeld; Moshe	H04W84/005	701/32.7
*	H	US-5481253-A	01-1996	Phelan; Michael D.	B60R25/04	307/10.2
*	I	US-6430488-B1	08-2002	Goldman; Kenneth Alan	B60R25/00	307/10.1
*	J	US-6741920-B1	05-2004	Otto; Richard E.	B60R16/037	340/5.6
*	K	US-8131441-B2	03-2012	Nallapa; Venkatapathi Raju	B60W30/188	701/87
*	L	US-8258939-B2	09-2012	Miller; Thomas Lee	B60R25/00	340/301
*	M	US-8463488-B1	06-2013	Hart; Paul	G07C5/008	340/576

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*	A	US-8751105-B2	06-2014	Whelan; Rene A.	B60W50/0098	180/268
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FOREIGN PATENT DOCUMENTS

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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/336,110	Phelan, Michael
	Examiner	Art Unit
	JONATHAN M DAGER	3663

CPC - Searched*		
Symbol	Date	Examiner

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
REVIEW OF PARENT	08/22/2018	JD
IDS	08/22/2018	JD
ASSIGNEE	08/22/2018	JD
INVENTOR	08/22/2018	JD
KEYWORD	08/22/2018	JD
CITATION OF BEST PRIOR ART	08/22/2018	JD

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/22/2018								
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	2	✓								
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	18	✓								
	19	✓								

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	0	"15898322"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/22 08:47
L2	3	"14464188"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/22 08:47
S1	43505	340/988-996,425$3-490.ccls. or 701/1,2,19-49,70,93,200-216,300.ccls. or phelan.in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:28
S2	7394	S1 and ((central$5 or remot$3 or main) with (manager$4 or monitor$4 or station or database))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:29
S3	1220	S2 and ((user or driver or operator) with (file or profile))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:30
S4	883	S3 and ((user or driver or operator) with (authenticat$4 or biometric or keyword or password or code or identify$4 or identification))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:30
S5	57	S3 and (((user or driver or operator) with (authenticat$4 or biometric or keyword or password or code or identify$4 or identification)) same terminal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:31
S6	13	S5 and ((overspeed or speed$4 or location or reckless or abusive or seatbelt or unauthorized or prohibit$4) with (alert$4 or alarm$4))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:32
S7	619575	((central$5 or remot$3 or main) with (manager$4 or monitor$4 or station or database or server))	US-PGPUB; USPAT; FPRS;	OR	ON	2011/09/30 14:40

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			EPO; JPO; DERWENT			
S8	115297	S7 and ((user or driver or operator) with (file or profile))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:40
S9	82875	S8 and ((user or driver or operator) with (pin or authenticat$4 or biometric or keyword or password or code or identify$4 or identification))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:40
S10	8210	S8 and (((user or driver or operator) with (pin or authenticat$4 or biometric or keyword or password or code or identify$4 or identification)) same terminal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:41
S11	586	S10 and ((overspeed or speed$4 or location or reckless or abusive or seatbelt or unauthorized or prohibit$4) with (alert$4 or alarm$4))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:41
S12	222	S11 and gps	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:42
S13	27	S12 and (vehicle with terminal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:44
S14	1	("2007/0158128").URPN.	USPAT	OR	ON	2011/09/30 14:48
S15	0	("2008/0245598").URPN.	USPAT	OR	ON	2011/09/30 14:48
S16	10	"196509".ap.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:20
S17	8	"496509".ap.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:20
S18	0	("2010/0004818").URPN.	USPAT	OR	ON	2011/10/03 09:51
S19	11	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$	US-PGPUB	OR	ON	2011/10/03 09:56

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		or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$).did.				
S20	0	S19 and rfid	US-PGPUB	OR	ON	2011/10/03 09:56
S21	1	S19 and fob	US-PGPUB	OR	ON	2011/10/03 09:56
S22	0	S16 and rfid	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:57
S23	619817	((central$5 or remot$3 or main) with (manager$4 or monitor$4 or station or database or server))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:57
S24	115299	S23 and ((user or driver or operator) with (file or profile))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:57
S25	8210	S24 and (((user or driver or operator) with (pin or authenticat$4 or biometric or keyword or password or code or identify$4 or identification)) same terminal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:57
S26	586	S25 and ((overspeed or speed$4 or location or reckless or abusive or seatbelt or unauthorized or prohibit$4) with (alert$4 or alarm$4))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:57
S27	222	S26 and gps	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:57
S28	66	S27 and rfid	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:58
S29	9	S28 and (fob or keyfob or "key fob")	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:02
S30	25	S27 and (fob or keyfob or "key fob")	US-PGPUB; USPAT; FPRS;	OR	ON	2011/10/03 10:03

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			EPO; JPO; DERWENT			
S31	1024	rke	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:04
S32	535	S31 and (authenticat$4 or identif$)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:05
S33	170	S31 and ((authenticat$4 or identif$) with (user or driver))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:05
S34	62	S31 and (((authenticat$4 or identif$) with (user or driver)) same (fob or keyfob or transciever or key-fob or smart))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:06
S35	61	S34 and vehicle	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:06
S36	2	S34 and ((user or driver or operator) with (file or profile))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:06
S37	1	"12496509"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2012/03/05 13:32
S38	12	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$).did.	US-PGPUB	OR	OFF	2012/03/05 16:28
S39	9	S38 and (fault$4 or error or malfunction or breakdown or accident)	US-PGPUB	OR	OFF	2012/03/05 16:28
S40	12	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$	US-PGPUB	OR	OFF	2012/03/05 17:03

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		or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$).did.				
S41	9	S40 and (fault$4 or error or malfunction or breakdown or accident)	US-PGPUB	OR	OFF	2012/03/05 17:03
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S43	1318	phelan.in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2012/03/05 17:14
S44	163	S43 and vehicle	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2012/03/05 17:15
S45	46	S44 and ((authenticat$4 or identif$) with (user or driver))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2012/03/05 17:16
S46	13	S45 and ((central$5 or remot$3 or main) with (manager$4 or monitor$4 or station or database))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2012/03/05 17:16
S47	41	("20010033225" | "20020022920" | "20020049538" | "20020111735" | "20020123834" | "20020178033" | "20030195694" | "20030216857" | "20040083041" | "20040153362" | "4007438" | "5797134" | "5819198" | "6064970" | "6067489" | "6438472" | "6473000" | "6636790" | "6771176").PN. OR ("6931309").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/03/05 17:17
S48	19	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$).did.	US-PGPUB	OR	OFF	2012/09/25 14:46
S49	1	"12496509"	US-PGPUB; USPAT; USOCR;	OR	OFF	2012/09/25 14:48

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			EPO; JPO; DERWENT			
S50	11	S48 and (radio or audio or stereo)	US-PGPUB	OR	OFF	2012/09/25 15:01
S51	5235	vehicle same parent$4 same control$4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2012/09/25 15:06
S52	46	S51 and ((disabl$4 or prevent$4 or prohibit$4 or ((power$4 or turn$4) with (off or down))) with (radio or stereo))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2012/09/25 15:07
S53	51	S51 and ((disabl$4 or prevent$4 or restrict$4 or prohibit$4 or ((power$4 or turn$4) with (off or down))) with (radio or stereo))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2012/09/25 15:08
S54	118	("4477874" | "4707788" | "4835970" | "5091856" | "5124920" | "5247440" | "5289369" | "5303163" | "5379219" | "5446659" | "5504482" | "5513107" | "5532690" | "5581464" | "5608629" | "5680328" | "5812070" | "5877707" | "5938716" | "5948026" | "5969598" | "6006148" | "6076026" | "6122580" | "6173231" | "6232874" | "6256565" | "6275231" | "6278928").PN. OR ("6430488").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:14
S55	82	S54 and radio	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:15
S56	1014581	"9" and parent$3	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:15
S57	27	S55 and parent$3	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:15
S58	1012	phelan.in.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:18
S59	131	phelan.in. and vehicle	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:18
S60	49	phelan.in. and vehicle and radio	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:18
S61	46	phelan.in. and vehicle and radio and identif$	US-PGPUB; USPAT;	OR	OFF	2012/09/25 15:18

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			USOCR			
S62	46	phelan.in. and vehicle and radio and (identif$$4 or identification)	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:19
S63	46	phelan.in. and vehicle and radio and (identif$4 or identification)	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:19
S64	1	S63 and authentication	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:19
S65	76	("3059070" | "3187334" | "3520161" | "3644745" | "3651464" | "3660624" | "3757305" | "3796889" | "3870895" | "4148372" | "4150731" | "4222034" | "4296402" | "4335370" | "4347545" | "4379966" | "4390758" | "4436993" | "4438426" | "4533016" | "4555619" | "4565922" | "4578573" | "4645939" | "4659915" | "4682062" | "4686358" | "4733638" | "4842093" | "4965460" | "4993627" | "5006843" | "5079435" | "5109221").PN. OR ("5481253").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:21
S66	1	S65 and (radio same (alert$4 or alarm$4))	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:22
S67	25	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-20090027177-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$).did.	US-PGPUB; USPAT	OR	OFF	2012/09/25 19:46
S68	36	PHELAN.IN. and ("307" or "180" or "701" or "340" or "180").clas.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2012/12/13 14:22
S69	8	S68 and gps and profile	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2012/12/13 14:23
S70	1	"12196509"	US-PGPUB;	OR	ON	2014/05/15 19:09

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			USPAT; USOCR; EPO; JPO; DERWENT			
S71	213	phelan.in. and unique	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2014/05/15 19:09
S72	29	phelan.in. and (unique with code)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2014/05/15 19:10
S73	15	phelan.in. and (unique with code) and driver	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2014/05/15 19:10
S74	2	"6633800".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2014/05/20 11:59
S75	2	"20060224280"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2014/05/20 12:00
S76	0	"13858930"	US-PGPUB; USPAT; EPO; JPO	OR	ON	2014/08/29 10:46
S77	2	"12496509"	US-PGPUB; USPAT; EPO; JPO	OR	ON	2014/08/29 10:56
S78	16	phelan.in. and (unique with code) and driver	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2014/08/29 12:32
S79	5	("2010/0004818").URPN.	USPAT	OR	ON	2014/08/29 12:32
S80	20	phelan.in. and (unique with code) and driver	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2015/01/30 11:50
S81	29	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$	US-PGPUB; USPAT	OR	ON	2015/06/19 11:51

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		or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-20090027177-$ or US-20100004818-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$ or US-8751105-$ or US-8751104-$ or US-8463488-$).did.				
S82	7	S81 and pin	US-PGPUB; USPAT; EPO; JPO	OR	ON	2015/06/19 11:51
S83	20	S81 and (pin or code)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2015/06/19 11:51
S84	6	"11742091"	US-PGPUB; USPAT; EPO; JPO	OR	ON	2015/06/19 12:02
S85	74	("20020049538" | "20020096572" | "20020135466" | "20030078709" | "20030181822" | "20040010358" | "20040019416" | "20040085189" | "20040092253" | "20040124968" | "20040158373" | "20040225557" | "20050030184" | "20050134477" | "20050137757" | "20050159853" | "20050182538" | "20050216144" | "20050237150" | "20050288837" | "20060001523" | "20060047419" | "20060049962" | "20060106515" | "20060111817" | "20060122749" | "20060195483" | "20060200008" | "20060212195" | "20070082706" | "20070139170" | "20070158128" | "20070200663" | "20080077298" | "20080228358" | "20080245598" | "20080269979" | "20080319602" | "20090024273" | "20090027177" | "20090030770" | "20090069954" | "20090079555" | "20090082928" | "20090189736" | "20090195370" | "20100004818" | "20100161171" | "4754255" | "5525977" | "5808374" | "6148212" | "6266589" | "6323761" | "6445084" | "6532298" | "6549115" | "6711474" | "6759943" | "6830123" | "6999858" | "7038596" | "7085635" | "7170400" | "7419027" | "7454545" | "7483772" | "7564342" | "7685162" | "7801507" | "7979177" | "8050815" | "8577548").PN. OR ("8751104").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/19 12:03
S86	13	("20030204290" | "20060066149" |	US-	OR	ON	2015/06/19

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		"20070046425" | "20070143482" | "20080093445" | "20080255722" | "20090069954" | "20100004818" | "20100045452" | "20110254655" | "7548491").PN. OR ("8463488").URPN.	PGPUB; USPAT; USOCR			12:07
S87	2	"20030231550"	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/19 12:16
S88	35	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-20090027177-$ or US-20100004818-$ or US-20080269979-$ or US-20100161171-$ or US-20100045452-$ or US-20060066149-$ or US-20030204290-$).did. or (US-20030231550-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$ or US-8751105-$ or US-8751104-$ or US-8463488-$).did.	US-PGPUB; USPAT	OR	ON	2015/06/19 12:18
S89	8	S81 and ((alcohol or drinking or inebriat$4 or impair) with (driver or user))	US-PGPUB; USPAT; EPO; JPO	OR	ON	2015/06/19 12:19
S90	7	S89 and (vehicle same (location or gps) same speed)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2015/06/19 12:19
S91	4	("2006/0066149").URPN.	USPAT	OR	ON	2015/06/22 11:17
S92	6	("2009/0069954").URPN.	USPAT	OR	ON	2015/06/22 11:30
S93	39	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-20090027177-$ or US-20080269979-$ or US-20100161171-$ or US-20100045452-$ or US-20060066149-$ or US-20030204290-$ or US-	US-PGPUB; USPAT	OR	ON	2015/06/22 11:33

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		20030231550-$).did. or (US-20070200663-$ or US-20050288837-$ or US-20050237150-$ or US-20030181822-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$ or US-8751105-$ or US-8751104-$ or US-8463488-$ or US-8131441-$).did.				
S94	29	S93 and (driver with (identif$ or authenticat$4))	US-PGPUB; USPAT	OR	ON	2015/06/22 11:33
S95	3	("2008/0269979").URPN.	USPAT	OR	ON	2015/06/22 11:39
S96	18	("20030078709" | "20040010358" | "20040158373" | "20050237150" | "20060001523" | "20060049962" | "20080077298" | "20080228358" | "20080269979" | "20090082928" | "20100161171" | "6445084" | "6532298" | "6549115" | "6999858" | "7038596" | "7685162").PN. OR ("7979177").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/22 11:39
S97	21	S94 and gps	US-PGPUB; USPAT	OR	ON	2015/06/22 11:41
S98	2795	wireless same vehicle same architecture	US-PGPUB; USPAT; EPO; JPO	OR	ON	2016/03/02 11:08
S99	12	(wireless same vehicle same architecture) and (wireless with ecu with communication)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2016/03/02 11:08
S100	19	("20020009296" | "20020196510" | "20030040347" | "20030114980" | "20050046584" | "20060036930" | "20060208169" | "20110064126" | "20120093198" | "20120133843" | "20120291537" | "20130029624" | "20140073243" | "20140163751" | "5833025" | "6091362" | "6369923" | "7164117" | "8050318").PN. OR ("9227579").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/03/02 11:10
S101	31	("20030186652" | "20050090953" | "20050273211" | "20080039998" | "6078252" | "6177867" | "6195602" | "6480144" | "7005972" | "7084748" | "7099751" | "7177743" | "7603214" | "7689327").PN. OR ("8229625").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/03/02 11:11
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		or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-20090027177-$ or US-20080269979-$ or US-20100161171-$ or US-20100045452-$ or US-20060066149-$ or US-20030204290-$ or US-20030231550-$).did. or (US-20070200663-$ or US-20050288837-$ or US-20050237150-$ or US-20030181822-$ or US-20160001718-$ or US-20160001715-$ or US-20150350750-$ or US-20100087986-$ or US-20080039998-$ or US-20040064221-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$ or US-8751105-$ or US-8751104-$ or US-8463488-$ or US-8131441-$).did.				
S104	3	S103 and ((inhibit$4 or restrict$4) with (phone or cellular))	US-PGPUB; USPAT; EPO; JPO	OR	ON	2016/03/02 11:41
S105	22	("20020078726" | "20030169163" | "20050200466" | "20080245598" | "20090195376" | "20090198413" | "20090312901" | "20090312902" | "20100004818" | "20110082625" | "20110137520" | "6198996" | "6278358" | "6362734" | "6501374" | "6507779" | "6806810" | "7868750" | "8421589" | "8527146").PN. OR ("8751105").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/03/02 11:42
S106	1	"20120283911"	US-PGPUB; USPAT; EPO; JPO	OR	ON	2016/03/04 10:00
S107	37	phelan.in. and (unique with code)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2016/06/20 10:44
S109	6	"12496509"	US-PGPUB; USPAT; EPO; JPO	OR	ON	2017/02/13 11:20
S110	7785	vehicle same parent$4 same control$4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2017/02/14 11:53
S111	95	phelan.in. and vehicle and radio and (identif$4 or identification)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/02/14 11:54

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S112	23	phelan.in. and (unique with code) and driver	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2017/02/14 11:54
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S116	6	"13858930"	US-PGPUB; USPAT; EPO; JPO	OR	ON	2017/06/01 10:36
S117	48	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-20090027177-$ or US-20080269979-$ or US-20100161171-$ or US-20100045452-$ or US-20060066149-$ or US-20030204290-$ or US-20030231550-$).did. or (US-20070200663-$ or US-20050288837-$ or US-20050237150-$ or US-20030181822-$ or US-20160001718-$ or US-20160001715-$ or US-20150350750-$ or US-20100087986-$ or US-20080039998-$ or US-20040064221-$ or US-20070155368-$ or US-20070129056-$ or US-20140358376-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$ or US-8751105-$ or US-8751104-$ or US-8463488-$ or US-8131441-$).did.	US-PGPUB; USPAT	OR	ON	2017/06/01 11:08
S118	12	S117 and (vehicle same (speed with gps))	US-PGPUB; USPAT; EPO; JPO	OR	ON	2017/06/01 11:08
S119	36	phelan.in. and (unique with code)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2017/06/01 11:31
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		20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-20090027177-$ or US-20080269979-$ or US-20100161171-$ or US-20100045452-$ or US-20060066149-$ or US-20030204290-$ or US-20030231550-$).did. or (US-20070200663-$ or US-20050288837-$ or US-20050237150-$ or US-20030181822-$ or US-20160001718-$ or US-20160001715-$ or US-20150350750-$ or US-20100087986-$ or US-20080039998-$ or US-20040064221-$ or US-20070155368-$ or US-20070129056-$ or US-20140358376-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$ or US-8751105-$ or US-8751104-$ or US-8463488-$ or US-8131441-$).did.				
S121	58	("2004/0225557").URPN.	USPAT	OR	ON	2017/08/02 11:29
S126	2	"14712124"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/16 11:04
S127	7	"13858930"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/16 11:05
S128	1	"8417415".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/16 11:12
S129	1	"9045101".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/21 09:11
S130	2	"9493149"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/21 09:12
S131	7	"13858930"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/21 09:14
S132	2	"9493149"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/21 09:15
S133	3	"14464188"	US-PGPUB;	OR	ON	2018/08/21 09:44

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			USPAT; USOCR; EPO; JPO			
S134	8	"12496509"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/21 09:53

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S108	33	phelan.in. and (unique with code)	US-PGPUB; USPAT	OR	ON	2016/06/20 10:51
S113	34	phelan.in. and (unique with code)	US-PGPUB; USPAT	OR	ON	2017/02/14 11:39
S114	0	("2014/0358376").URPN.	USPAT	OR	ON	2017/02/14 11:47
S122	37	phelan.in. and (unique with code)	US-PGPUB; USPAT	OR	ON	2017/10/18 11:50
S123	8	S122 and profile	US-PGPUB; USPAT	OR	ON	2017/10/18 11:50
S124	0	("2017/0106877").URPN.	USPAT	OR	ON	2017/10/18 11:52
S125	31	("20020049538" | "20040225557" | "20050137757" | "20050182538" | "20060047419" | "20060106515" | "20060111817" | "20060122749" | "20060200008" | "20060212195" | "20070082706" | "20070158128" | "20080245598" | "20080319602" | "20090024273" | "20090027177" | "20090030770" | "20090069954" | "20090079555" | "20090189736" | "20100004818" | "5481253" | "6430488" | "6741920" | "7956730" | "8258939" | "8463488" | "8751104" | "8751105").PN. OR ("9045101").URPN.	US-PGPUB; USPAT	OR	ON	2017/10/18 11:52

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	Michael Phelan
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	1000-1796-C3

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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	5481253		1996-01-02	Phelan et al.	
	2	6430488	B1	2002-08-05	Goldman et al.	
	3	6741920	B1	2004-05-25	Otto	
	4	7956730	B2	2011-06-07	White et al.	
	5	8131441	B2	2012-03-06	Nallapa et al.	
	6	8258939	B2	2012-09-04	Miller et al.	
	7	8463488	B1	2013-06-11	Hart	
	8	8751105	B2	2014-06-10	Whelan et al.	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Michael Phelan
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	1000-1796-C3

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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	20020049538	A1	2002-04-25	Knapton et al.	
	2	20040225557	A1	2004-11-11	Phelan et al.	
	3	20050137757	A1	2005-06-23	Phelan et al.	
	4	20050182538	A1	2005-08-18	Phelan et al.	
	5	20060047419	A1	2006-03-02	Diendorf et al.	
	6	20060106515	A1	2006-05-18	Phelan et al.	
	7	20060111817	A1	2006-05-25	Phelan et al.	
	8	20060122749	A1	2006-06-08	Phelan et al.	
	9	20060200008	A1	2006-09-07	Moore-Ede	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Michael Phelan
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	1000-1796-C3

	10	20060212195	A1	2006-09-21	Veith et al.	
	11	20070082706	A1	2007-04-12	Campbell et al.	
	12	20070158128	A1	2007-07-12	Gratz et al.	
	13	20080245598	A1	2008-10-09	Gratz et al.	
	14	20080319602	A1	2008-12-25	McClellan et al.	
	15	20090024273	A1	2009-01-22	Follmer et al.	
	16	20090027177	A1	2009-01-29	Hodder	
	17	20090030770	A1	2009-01-29	Hersh et al.	
	18	20090069954	A1	2009-03-12	Aladesuyi	
	19	20090079555	A1	2009-03-26	Aguirre De Carcer et al.	
	20	20090189736	A1	2009-07-30	Hayashi	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Michael Phelan
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	1000-1796-C3

	21	20100004818	A1	2010-01-07	Phelan	
	22	20030181822	A1	2003-09-25	Victor	
	23	20030204290	A1	2003-10-30	Sadler et al.	
	24	20030231550	A1	2003-12-18	Macfarlane	
	25	20040064221	A1	2004-04-01	DePrez et al.	
	26	20050237150	A1	2005-10-27	Sun et al.	
	27	20050288837	A1	2005-12-29	Wiegand et al.	
	28	20060066149	A1	2006-03-30	Halloway et al.	
	29	20070200663	A1	2007-08-30	White et al.	
	30	20080039998	A1	2008-02-14	Fein et al.	
	31	20080269979	A1	2008-10-30	Hermann et al.	

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	Application Number	
	Filing Date	
	First Named Inventor	Michael Phelan
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	1000-1796-C3

	32	20100045452	A1	2010-02-25	Periwal	
	33	20100161171	A1	2010-06-24	Valentine et al.	
	34	20150350750	A1	2015-12-03	Yun et al.	
	35	20160001715	A1	2016-01-07	Laifenfeld et al.	
	36	20160001718	A1	2016-01-07	Laifenfeld et al.	

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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		

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Michael Phelan
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	1000-1796-C3

EXAMINER SIGNATURE			
Examiner Signature	/JONATHAN M DAGER/	Date Considered	08/22/2018

*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	
	Filing Date	
	First Named Inventor	Michael Phelan
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	1000-1796-C3

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	/KEVIN SOULES/	Date (YYYY-MM-DD)	2016-10-27
Name/Print	Kevin Soules	Registration Number	66033

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.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /KS/

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 record s.

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.

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT5137112

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT

CONVEYING PARTY DATA

Name	Execution Date
MICHAEL D PHELAN	05/27/2016

RECEIVING PARTY DATA

Name:	THE PHELAN GROUP, LLC
Street Address:	851 CAMINO FRANCISCA
City:	SANTA FE
State/Country:	NEW MEXICO
Postal Code:	87506

PROPERTY NUMBERS Total: 6

Property Type	Number
Patent Number:	8417415
Patent Number:	9045101
Patent Number:	9493149
Patent Number:	9908508
Application Number:	15336110
Application Number:	15898322

CORRESPONDENCE DATA

Fax Number: (505)314-1307

Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.

Phone: 505-314-1311
Email: lortiz@olpatentlaw.com
Correspondent Name: LUIS M. ORTIZ
Address Line 1: 117 BRYN MAWR DRIVE SE
Address Line 4: ALBUQUERQUE, NEW MEXICO 87106

ATTORNEY DOCKET NUMBER:	1000-1796
NAME OF SUBMITTER:	LUIS M. ORTIZ
SIGNATURE:	/LUIS M ORTIZ/
DATE SIGNED:	09/12/2018
	This document serves as an Oath/Declaration (37 CFR 1.63).

Total Attachments: 1
source=Assignment_MichaelPhelan#page1.tif

PATENT ASSIGNMENT

WHEREAS, I, Michael D. Phelan, citizen of the United States, have invented certain new and useful improvements in monitoring and controlling vehicle usage represented by issued patent nos. 8,417,415, 9,045,101, 9,493,149, 9,908,508, and pending patent application serial nos. 15/336,110 and 15/898,322, and from which additional continuation application will be filed.

Whereas, THE PHELAN GROUP, LLC, having its principal offices at 851 Camino Francisca, Santa Fe, New Mexico USA 87506, is desirous of acquiring the entire right, title and interest in and to said invention, said application and in, to and under any and all Letters Patent to be obtained therefor and therefrom;

Now, therefore, for good and valuable consideration to me paid by THE PHELAN GROUP, LLC, the receipt of which is hereby acknowledged, I have sold, assigned and transferred, and by these presents do hereby sell, assign and transfer unto THE PHELAN GROUP, LLC, its successors and assigns, my entire right, title and interest in and to said invention represented by the issued patents and pending patent applications identified above, and any continuation applications that may issue therefrom, both foreign and domestic, including all of my rights under any and all international conventions, treaties and/or agreements concerning patents to which the United States is a party, and I do hereby authorize and request the Commissioner of Patents to issue said Letters Patent to the above mentioned assignee in accordance herewith.

I further authorize said assignee, its successors and assigns, or anyone it may properly designate, to apply for Letters Patent, in its own name if desired, in any and all foreign countries, and additionally to claim the filing date of said United States application and/or otherwise take advantage of the provisions of any international convention, treaty and/or agreement.

I do hereby covenant and agree with the said assignee, its successors and assigns, that I will not execute any writing or do any act whatsoever conflicting with these presents, and that I or my executors or administrators will at any time upon request, without further or additional consideration, but at the expense of the said assignee, its successors and assigns, execute such additional writings and do such additional acts as said assignee, its successors and assigns, may deem necessary or desirable to perfect the assignee's enjoyment of this grant, and render all necessary assistance in making application for and obtaining original, continuation, divisional, reissued or extended Letters Patent of the United States, or any of and all foreign countries on said invention, and in enforcing any rights, occurring as a result of such applications or patents, by giving testimony in any proceedings or transactions involving such applications or patents.

27 MAY 2016

Michael D. Phelan — Date

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

CORRECTED ADS FORM

Application Number	15336110
Title of Invention	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

Inventor Information

****If no data is shown, no data has been corrected****

	Data of Record	Updated Data
Order Number		
Name		
Residence Information		
Residency		
City		
State		
Country of Residence		
Mailing Address of Inventor		
Address 1		
Address 2		
City,State/Province, Postal Code		
Country		

Corrected ADS 1.0

Application Information

	Data of Record	Updated Data
Title of Invention	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE	
Attorney Docket Number	1000-1796-C3	
Entity Type	Small	

Domestic Benefit/National Stage Information

****If no data is shown, no data has been corrected****

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 this 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(a).

		Data of Record	Updated Data
	Prior Application Status		
	Application Number		
	Continuity Type		
	Prior Application Number		
	Filing Date (YYYY-MM-DD)		
	Patent Number		
	Issue Date (YYYY-MM-DD)		

Foreign Priority Information

Mercedes EX1012
UNIFIED PATENTS EXHIBIT 1002

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

If no data is shown, no data has been corrected

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) 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).

		Data of Record	Updated Data
	Application Number		
	Country		
	Filing Date		
	Access Code		

Applicant Information

If no data is shown, no data has been corrected
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.

	Data of Record	Updated Data
Applicant Type		ASG
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		
Applicant is an Organization		Yes
Name		
Organization Name		THE PHELAN GROUP, LLC
Address 1		851 Camino Francisca
Address 2		

City,State/Province,Postal Code		Santa Fe NM 87506
Country		US
Phone Number		
Fax Number		
Email Address		

Assignee Information including Non-Applicant Assignee Information

****If no data is shown, no data has been corrected****
Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office

	Data of Record	Updated Data
Order		
Applicant is an Organization		
Name		
Organization Name		
Mailing Address		
Address 1		
Address 2		
City,State/Province,Postal Code		
Country		
Phone Number		
Fax Number		
Email Address		

Corrected ADS 1.0

Signature

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b).

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	/Kermit D. Lopez/	Registration Number	41953
First Name	Kermit	Last Name	Lopez

Mercedes EX1012
UNIFIED PATENTS EXHIBIT 1002

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
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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.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: The Phelan Group, LLC

Application No./Patent No.: 15/336,110 Filed/Issue Date: 10-27-2016

Titled: DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

The Phelan Group, LLC, a limited liability orporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 046851, Frame 0608, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). 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 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.**

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

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Kermit D. Lopez/	November 5, 2018
Signature	Date
Kermit D. Lopez	41,953
Printed or Typed Name	Title or Registration Number

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 disclosure of these records is required by the Freedom of Information Act.
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).
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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 or regulation.

Page 918 of 1244

Electronic Acknowledgement Receipt	
EFS ID:	34202738
Application Number:	15336110
International Application Number:	
Confirmation Number:	5824
Title of Invention:	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE
First Named Inventor/Applicant Name:	
Customer Number:	64064
Filer:	Kermit Dean Lopez/Kathleen Smith
Filer Authorized By:	Kermit Dean Lopez
Attorney Docket Number:	1000-1796-C3
Receipt Date:	05-NOV-2018
Filing Date:	27-OCT-2016
Time Stamp:	16:01:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet to update/ correct info	CorrectedADS.pdf	65429 d2a1f613073cad35da5dda4f3dd7fd417eb7ef11	no	5

Warnings:

Information:					
2	Assignee showing of ownership per 37 CFR 3.73	PHELAN-1001CON3_373c.pdf	93070 01d669cbc43080dff70b4f7c4aad3f974a5c9fdf	no	3
Warnings:					
Information:					
			Total Files Size (in bytes):	158499	

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.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	15/336,110
Filing Date	October 27, 2016
First Named Inventor	Michael Phelan
Title	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE
Art Unit	3663
Examiner Name	Jonathan M. Dager
Attorney Docket Number	PHELAN-1001CON3

SIGNATURE of Applicant or Patent Practitioner

Signature	/Kermit D. Lopez/	Date (Optional)	
Name	Kermit D. Lopez	Registration Number	41953
Title (if Applicant is a juristic entity)	Attorney of Record		
Applicant Name (if Applicant is a juristic entity)	The Phelan Group, LLC		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.131, 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.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 141361

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

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

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

The Phelan Group, LLC

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	29 OCTOBER 2018
Name	Michael Phelan		
Title	PRESIDENT		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 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.

Electronic Acknowledgement Receipt	
EFS ID:	34213970
Application Number:	15336110
International Application Number:	
Confirmation Number:	5824
Title of Invention:	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE
First Named Inventor/Applicant Name:	Michael Phelan
Customer Number:	64064
Filer:	Kermit Dean Lopez/Kathleen Smith
Filer Authorized By:	Kermit Dean Lopez
Attorney Docket Number:	1000-1796-C3
Receipt Date:	05-NOV-2018
Filing Date:	27-OCT-2016
Time Stamp:	16:03:29
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	PHELAN-1001CON3_ExecutedPOA.pdf	944121 1117f3deed9e3e187fdac49367b5f164e8a21d97	no	2

Warnings:

Information:	
Total Files Size (in bytes):	944121

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

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	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/336,110	10/27/2016	Michael Phelan	PHELAN-1001CON3

CONFIRMATION NO. 5824

POA ACCEPTANCE LETTER

141361
LOZA & LOZA, LLP
Kermit D. Lopez, Esq.
305 N. Second Avenue #127
Upland, CA 91786-6064

OC000000103659221

Date Mailed: 11/13/2018

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/05/2018.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

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**.

/ttran/

Mercedes EX1012
UNIFIED PATENTS EXHIBIT 1002
Page 925 of 1244
Page 132 of 199

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	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/336,110	10/27/2016	Michael Phelan	1000-1796-C3

CONFIRMATION NO. 5824

64064
Ortiz & Lopez, PLLC
P.O. BOX 4484
ALBUQUERQUE, NM 87196-4484

POWER OF ATTORNEY NOTICE

OC000000103659198

Date Mailed: 11/13/2018

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/05/2018.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

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**.

/ttran/

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
15/336,110	10/27/2016	3663	800	PHELAN-1001CON3	19	1

CONFIRMATION NO. 5824

CORRECTED FILING RECEIPT

141361
LOZA & LOZA, LLP
Kermit D. Lopez, Esq.
305 N. Second Avenue #127
Upland, CA 91786-6064



Date Mailed: 11/13/2018

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)

Michael Phelan, Santa Fe, NM;

Applicant(s)

THE PHELAN GROUP, LLC, Santa Fe, NM;

Power of Attorney: The patent practitioners associated with Customer Number 141361

Domestic Priority data as claimed by applicant

This application is a CON of 14/464,188 08/20/2014 PAT 9493149
which is a CIP of 13/858,930 04/08/2013 PAT 9045101
which is a CON of 12/496,509 07/01/2009 PAT 8417415
which claims benefit of 61/077,568 07/02/2008

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: No

Permission to Access Search Results: No

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: 11/04/2016

Mercedes EX1012
UNIFIED PATENTS EX1012
Page 927 of 1244
Page 134 of 199

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/336,110**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

Preliminary Class

701

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 AssetsControl, 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).

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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.

Doc Code: DIST.E.FILE Document Description: Electronic Terminal Disclaimer - Filed	PTO/SB/25 PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**TERMINAL DISCLAIMER TO OBVIATE A PROVISIONAL DOUBLE PATENTING REJECTION OVER A PENDING "REFERENCE" APPLICATION AND TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT**
Application Number	15336110
Filing Date	27-Oct-2016
First Named Inventor	Michael Phelan
Attorney Docket Number	PHELAN-1001CON3
Title of Invention	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
THE PHELAN GROUP, LLC	100 %

The owner(s) of percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of any patent granted on pending reference Application Number(s)

15898322 filed on 02/16/2018

as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and any patent granted on the reference application are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term of any patent granted on said reference application, "as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application," in the event that any such patent granted on the pending reference application: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as shortened by any terminal disclaimer filed prior to its grant.

The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

8417415

9908508

9045101

9493149

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

◉ Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.

○ I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.

Applicants claims the following fee status:

◉ Small Entity

○ Micro Entity

○ Regular Undiscounted

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

◉ An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application

Registration Number 41953

○ A sole inventor

○ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application

○ A joint inventor; all of whom are signing this request

Signature	/Kermit Lopez/
Name	Kermit Lopez

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal	
Application Number:	15336110
Filing Date:	27-Oct-2016
Title of Invention:	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE
First Named Inventor/Applicant Name:	Michael Phelan
Filer:	Kermit Dean Lopez/Shirley Hsu
Attorney Docket Number:	PHELAN-1001CON3
Filed as Small Entity	
Filing Fees for Utility under 35 USC 111(a)	

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	2814	1	160	160
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**160**

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 15336110

Filing Date: 27-Oct-2016

Applicant/Patent under Reexamination: Phelan

Electronic Terminal Disclaimer filed on November 15, 2018

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt	
EFS ID:	34323624
Application Number:	15336110
International Application Number:	
Confirmation Number:	5824
Title of Invention:	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE
First Named Inventor/Applicant Name:	Michael Phelan
Customer Number:	141361
Filer:	Kermit Dean Lopez/Shirley Hsu
Filer Authorized By:	Kermit Dean Lopez
Attorney Docket Number:	PHELAN-1001CON3
Receipt Date:	15-NOV-2018
Filing Date:	27-OCT-2016
Time Stamp:	16:35:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$160
RAM confirmation Number	111618INTEFSW16352400
Deposit Account	505240
Authorized User	Loza and Loza - Accounting
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)	

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	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	37198 65aa9735ac928d82319d8947b7301c5356ee3222	no	3
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30414 2e74cf81949bc2164be45f14c4ef604e22ad26e7	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	67612		

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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
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New International Application Filed with the USPTO as a Receiving Office
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Electronic Acknowledgement Receipt	
EFS ID:	34324292
Application Number:	15336110
International Application Number:	
Confirmation Number:	5824
Title of Invention:	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE
First Named Inventor/Applicant Name:	Michael Phelan
Customer Number:	141361
Filer:	Kermit Dean Lopez/Shirley Hsu
Filer Authorized By:	Kermit Dean Lopez
Attorney Docket Number:	PHELAN-1001CON3
Receipt Date:	15-NOV-2018
Filing Date:	27-OCT-2016
Time Stamp:	16:37:46
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	PHELAN-1001CON3_Reply_Nov2018.pdf	70559 77c82ca5bc10a6e04ddf262abb86c15e8aa05773	no	9

Warnings:

Information:	
Total Files Size (in bytes):	70559

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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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Michael Phelan	**EXAMINER:**	Jonathan M. Dager
SERIAL NO.:	15/336,110	**GROUP:**	3663
FILED:	10/27/2016	**ATTY DKT NO.:**	PHELAN-1001CON3

TITLE: DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

Please forward all correspondence to:
Loza & Loza, LLP
305 N. Second Ave., #127
Upland, CA 91786
(505) 314-1312

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

AMENDMENTS AND REPLY TO NON-FINAL ACTION AND REQUEST FOR RECONSIDERATION

Dear Examiner:

In response to the non-final Office Action (the "*Office Action*") dated August 27, 2018 in the above captioned matter, please enter the following amendments and remarks:

Amendments to the claims begin on Page 2 of this Paper.

Remarks begin on Page 7 of this Paper.

This reply is being filed within three (3) months of the August 27, 2018 date of the Office Action.

Two (2) Terminal Disclaimers are included with this response, including two Terminal Disclaimer fees of $160 each for a total of $320.

CLAIM AMENDMENTS

Please amend claims 1, 3, 4, 6-11, 13, 15, 17-19; and enter new claim 20 as follows:

1. (Currently Amended) A vehicle control system, comprising:

a wireless identification and data logging module;

a master control unit in a ~~motor~~ vehicle for wirelessly authenticating at least one occupant via said wireless driver identification and data logging module and associating an operating profile with said at least one occupant;

a module for receiving at least location and speed information in association with a movement of said ~~motor~~ vehicle;

a data logging device that records ~~recording~~ vehicle operation data associated with a use of said ~~motor~~ vehicle, the vehicle operation data comprising at least said location and speed information received from said module; and

a slave control unit in said ~~motor~~ vehicle and which communicates ~~in communication~~ with said master control unit, wherein said slave control unit receives ~~configured to~~ receive commands from said master control unit and [[to]] generate an alarm signal;

wherein said master control unit provides operation governance of said vehicle within said [[an]] operating profile.

2. (Original) The vehicle control system of claim 1 further comprising:

a plurality of transducers comprising at least one of an image capturing sensor and a proximity sensor, wherein said plurality of transducers transmits ~~send~~ signals to said slave control unit and wherein said slave control unit determines if said signals are indicative of a driving condition requiring a warning and in turn signals said master control unit.

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3. (Currently Amended) The vehicle control system of claim 1 further comprising: a vehicle control module that controls ~~configured to control~~ a ~~vehicle~~ speed of the vehicle and an allowable ~~vehicle~~ location of the vehicle.

4. (Currently Amended) The vehicle control system of claim 1 wherein ~~further comprising configuring~~ said wireless identification and data logging module comprises [[as]] at least one of: a WIFI enabled device; an RFID enabled device; a Bluetooth enabled device; a cellular telephone; and a smartphone.

5. (Original) The vehicle control system of claim 4 wherein said wireless identification and data logging module is further configured to wirelessly load said operating profile into said master control unit.

6. (Currently Amended) The vehicle control system of claim 4 wherein said wireless identification and data logging module is further configured to wirelessly receive specific vehicle performance and infraction data of the vehicle from said master control unit.

7. (Currently Amended)The vehicle control system of claim 3 wherein said wireless identification and data logging module is further configured to present vehicle performance data of the vehicle to said vehicle control module in order to guide the operation governance of said vehicle ~~vehicle's operation~~ by said vehicle control module.

8. (Currently Amended) The vehicle control system of claim 1 wherein said master control unit is further configured for wirelessly receiving data indicative of a speed of said ~~motor~~ vehicle, a location of said ~~motor~~ vehicle, and a time of

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day from at least one of: a WIFI source; an RF source; a Bluetooth source; an image capturing source; a processing device; a proximity sensor; and a smart-road network source.

9. (Currently Amended) The vehicle control system of claim 8 wherein said master control is configured for wirelessly receiving data indicative of a speed limit associated with a road said ~~motor~~ vehicle is currently traveling on from at least one of: a WIFI source; an RF source; a Bluetooth source; an image capturing source; a processing device; a proximity sensor; and a smart-road network source.

10. (Currently Amended) The vehicle control system of claim 9 wherein said master control unit is configured to define a speed, a positioning of said vehicle on a road, a distance from another object, a distance from another vehicle, and a geo-fence limit for said vehicle.

11. (Currently Amended) The vehicle control system of claim 1 further comprising an alarm module configured to wirelessly receive data from at least one of said master control unit ~~controller~~, said slave control unit ~~controller~~, and said GPS module wherein said alarm module is further configured to present at least one of location data, speed data, and infraction data in real time.

12. (Original) The vehicle control system of claim 11 wherein said alarm module comprises at least one of: a cellular telephone; a smartphone; a computer; a vehicle integrated wireless communication device; a WIFI enabled device; an RFID enabled device; and a Bluetooth enabled device.

13. (Currently Amended) The vehicle control system of claim 1 further comprising a phone governor module configured to receive instructions ~~at least~~

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~~one instruction~~ from said master control unit, said instructions comprising at least one of:

restricting calls on a ~~said at least one driver's~~ cellular telephone associated with a driver of said vehicle;

powering off said ~~at least one driver's~~ cellular telephone; and

disabling text messaging for [[on]] said ~~at least one driver's~~ cellular telephone.

14. (Original) The vehicle control system of claim 1 further comprising an Internet governor module configured to disable integrated in-vehicle Internet related applications when said vehicle is in operation.

15. (Currently Amended) The vehicle control system of claim 2 further comprising a steering control module, a braking control module, and an acceleration control module configured to receive instructions ~~at least one instruction~~ from said master control unit, said instructions comprising at least one of:

reducing a ~~said vehicles~~ speed of said vehicle;

increasing said ~~vehicles~~ speed of said vehicle;

altering a ~~said vehicles~~ direction of said vehicle on said road;

altering a ~~said vehicles~~ proximity of said vehicle with respect to other vehicles; and

altering said ~~vehicles~~ proximity of said vehicle with respect to other objects.

16. (Original) The vehicle control system of claim 15 wherein said vehicle operates autonomously.

17. (Currently Amended) The vehicle control system of claim 1, wherein said slave control unit further comprises: a power regulator module; a starter relay module; a definable relay module; a slave microcontroller; and an alarm synthesizer.

18. (Currently Amended) The vehicle control system of claim 1, wherein said operating profile comprises at least one operating parameter including at least one of:

a maximum allowable ~~vehicle~~ speed of said vehicle;
an allowable ~~vehicle~~ location of said vehicle;
allowable hours of operation of said vehicle;
an allowable destination; and
a seatbelt usage.

19. (Currently Amended) The vehicle control system of claim 1 wherein said slave control unit generates an alarm signal for remotely alerting an [[said]] authorized user when said vehicle violates said operating profile.

20. (New) The vehicle control system of claim 1 wherein the slave control unit is mounted under a dash board of the vehicle.

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REMARKS

I. Double Patenting

In the Office Action of August 27, 2018, the Examiner rejected claims 1-5 and 17-19 on the ground of nonstatutory double patenting as being unpatentable over claims 1-18 of U.S. Patent No. 9,493,149. The Examiner contends that although the claims at issue are not identical, they are not patentably distinct from each other because the scope of the claims have already been encompassed by that of the patent.

In the Office Action of August 27, 2018, the Examiner also rejected claims 1 and 17-19 over claims 11-14 of U.S. Patent No. 9,045,101 and U.S. Patent No. 9,908,508. The Examiner contends that although the claims at issue are not identically, the Examiner asserted that they are not patentably distinct from each other because the scope of the claims have already been encompassed by that of the patent.

In the Office Action of August 27, 2018, the Examiner rejected claims 1, 17, and 18 on the ground of nonstatutory double patenting as being unpatentable over claims 9-11 of U.S. Patent No. 8,417,415 The Examiner asserts that although the claims at issue are not identical, they are not patentably distinct from each other because the scope of the claims have already been encompassed by that of the patent.

In the Office Action of August 27, 2018, the Examiner rejected claims 1 and 17-19 on the ground of nonstatutory double patenting as being unpatentable over claims 11-14 of co-pending U.S. Patent Application Serial No. 15/898,322. The Examiner argued that although the claims at issue are not identical, they are not patentably distinct from each because the scope of the claims have already been encompassed by that of the patent application.

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The Examiner noted that a timely filed terminal disclaimer incompliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided that the reference application or patent either is shown to be commonly owned with the examined application, or the claims an invention made as a result of activities undertaking with the scope of a joint research agreement.

The Applicant is submitting a terminal disclaimer with this response. The Applicant submits that given this terminal disclaimer, the aforementioned double patenting rejection is traversed. The Applicant respectfully requests withdrawal of the double patenting rejection.

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II. Conclusion

The Applicant submits that one or more of the claims are in condition for allowance. Should there be any outstanding matters that need to be resolved, the Examiner is respectfully requested to contact the undersigned representative to conduct an interview in an effort to expedite issuance of the present application.

Respectfully submitted,

Dated: November 15, 2018

/Kermit D. Lopez/

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Attorney for Applicant
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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/336,110	Filing Date 10/27/2016	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) 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 $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ 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

AMENDMENT	11/15/2018	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X $50 =	0
	Independent (37 CFR 1.16(h))	* 1	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

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ 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.
** 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 number found in the appropriate box in column 1.

LIE
DANTE SMITH

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.**

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

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NOTICE OF ALLOWANCE AND FEE(S) DUE

141361 7590 12/17/2018

LOZA & LOZA, LLP
Kermit D. Lopez, Esq.
305 N. Second Avenue #127
Upland, CA 91786-6064

EXAMINER	
DAGER, JONATHAN M	
ART UNIT	PAPER NUMBER
3663	

DATE MAILED: 12/17/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/336,110	10/27/2016	Michael Phelan	PHELAN-1001CON3	5824

TITLE OF INVENTION: DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

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	03/18/2019

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.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

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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
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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)

141361 7590 12/17/2018

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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.

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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.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/336,110	10/27/2016	Michael Phelan	PHELAN-1001CON3	5824

TITLE OF INVENTION: DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

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	03/18/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
DAGER, JONATHAN M	3663	701-036000

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 _____

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)

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 _____

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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.

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 _____ Date _____

Typed or printed name _____ Registration No. _____

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/336,110	10/27/2016	Michael Phelan	PHELAN-1001CON3	5824

141361 7590 12/17/2018

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305 N. Second Avenue #127
Upland, CA 91786-6064

EXAMINER	
DAGER, JONATHAN M	

ART UNIT	PAPER NUMBER
3663	

DATE MAILED: 12/17/2018

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.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

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.

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 disclosure of these records is required by the Freedom of Information Act.
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 or regulation.

Notice of Allowability	Application No. 15/336,110	Applicant(s) Phelan, Michael	
	Examiner JONATHAN M DAGER	Art Unit 3663	AIA 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 terminal disclaimer filed 15 November 2018.
   ☐ 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 1-20 . 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 areply 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 _____.
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 _____.

/JONATHAN M DAGER/
Primary Examiner, Art Unit 3663

DETAILED CORRESPONDENCE

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Response to Arguments

2. Applicant's contention (see pages 7-8 filed 15 November 2018) with respect to the provisional/nonprovisional double patenting rejections has been fully considered and is persuasive in view of the terminal disclaimer filed 15 November 2018. Therefore, the provisional/nonprovisional double patenting rejections has been withdrawn.

EXAMINER'S AMENDMENT

3. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows to correct a minor wording redundancy:

1. (Currently Amended) A vehicle control system, comprising:

a wireless identification and data logging module;

a master control unit in a vehicle for wirelessly authenticating at least one occupant via said wireless driver identification and data logging module and associating an operating profile with said at least one occupant;

a module for receiving at least location and speed information in association with a movement of said vehicle;

a data logging device that records vehicle operation data associated with a use of said vehicle, the vehicle operation data comprising at least said location and speed information received from said module; and

a slave control unit in said vehicle and which communicates with said master control unit, wherein said slave control unit receives [[receive]] commands from said master control unit and generate an alarm signal;

wherein said master control unit provides operation governance of said vehicle within said operating profile.

Claims Allowable - Reasons for Allowance

This statement is not intended to necessarily state all the reasons for allowance or all the details why the claims are allowed and has not been written to specifically or impliedly state that all the reasons for allowance are set forth (MPEP 1302.14).

4. The following is an examiner's statement of reasons for allowance:

Independent claim 1 is allowed. None of the prior art cited could anticipate, or be combined to render obvious a slave control unit in said vehicle and which communicates with said master control unit, wherein said slave control unit receives commands from said master control unit and generate an alarm signal; wherein said master control unit provides operation governance of said vehicle within said operating profile.

Subsequently, claims 2-20 are also now allowable due to dependence on claim 1.

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 JONATHAN M DAGER whose telephone number is (571)270-1332. The examiner can normally be reached on M-F 0830-1730.

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, Angela Ortiz can be reached on 571-272-1206. 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 http://pair-direct.uspto.gov. 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.

/JONATHAN M DAGER/
Primary Examiner, Art Unit 3663
10 December 2018

Notice of References Cited	Application/Control No. 15/336,110	Applicant(s)/Patent Under Reexamination Phelan, Michael	
	Examiner JONATHAN M DAGER	Art Unit 3663	Page 1 of 4

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20020049538-A1	04-2002	Knapton, Cary Paul	G01C21/28	701/472
*	B	US-20030181822-A1	09-2003	Victor, Trent	A61B3/113	600/558
*	C	US-20030204290-A1	10-2003	Sadler, John G.	B60R25/04	701/1
*	D	US-20030231550-A1	12-2003	Macfarlane, Jane F.	B60R25/257	367/198
*	E	US-20040064221-A1	04-2004	DePrez, Mary K.	B60T7/042	701/2
*	F	US-20040225557-A1	11-2004	Phelan, Joseph	G01M17/00	701/1
*	G	US-20050237150-A1	10-2005	Sun, Hao	G07C9/00182	340/5.52
*	H	US-20050288837-A1	12-2005	Wiegand, Michael	B60R16/037	701/36
*	I	US-20060047419-A1	03-2006	Diendorf; John R.	G01C21/26	701/532
*	J	US-20060066149-A1	03-2006	Holloway; Lane Thomas	B60R25/24	307/10.3
*	K	US-20060200008-A1	09-2006	Moore-Ede; Martin	B60K28/06	600/300
*	L	US-20060212195-A1	09-2006	Veith; Gregory W.	G06Q10/06	701/33.4
*	M	US-20070082706-A1	04-2007	Campbell; Douglas C.	B60R16/0373	455/563

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
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	R					
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Notice of References Cited	Application/Control No. 15/336,110	Applicant(s)/Patent Under Reexamination Phelan, Michael	
	Examiner JONATHAN M DAGER	Art Unit 3663	Page 2 of 4

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20070129056-A1	06-2007	Cheng; Russel	G06Q30/02	455/405
*	B	US-20070155368-A1	07-2007	Phelan; James Daniel	H04W8/245	455/412.1
*	C	US-20070158128-A1	07-2007	Gratz; Rosemarie M.	B60R25/1004	180/287
*	D	US-20070200663-A1	08-2007	White; Steve	A61B5/117	340/5.31
*	E	US-20080039998-A1	02-2008	Fein; Gene	B60R16/037	701/36
*	F	US-20080269979-A1	10-2008	Hermann; Thomas	H04L41/082	701/29.6
*	G	US-20080319602-A1	12-2008	McClellan; Scott	G07C5/008	701/31.4
*	H	US-20090024273-A1	01-2009	Follmer; Todd	G06Q10/10	701/33.4
*	I	US-20090027177-A1	01-2009	Hodder; David John	B60R25/04	340/426.12
*	J	US-20090030770-A1	01-2009	Hersh; Richard	G06Q10/06311	705/7.13
*	K	US-20090069954-A1	03-2009	ALADESUYI; Kayode	B60R25/102	701/2
*	L	US-20090079555-A1	03-2009	Aguirre De Carcer; Giadha	G07C5/008	340/441
*	M	US-20090189736-A1	07-2009	Hayashi; Hitoshi	G06F21/32	340/5.81

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
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Notice of References Cited	Application/Control No. 15/336,110	Applicant(s)/Patent Under Reexamination Phelan, Michael	
	Examiner JONATHAN M DAGER	Art Unit 3663	Page 3 of 4

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20100045452-A1	02-2010	Periwal; Neeraj	B60Q9/00	340/439
*	B	US-20100087986-A1	04-2010	LAL; DHANANJAY	B60R16/023	701/36
*	C	US-20100161171-A1	06-2010	Valentine; Eric Lee	B22D11/12	701/31.4
*	D	US-20140358376-A1	12-2014	Phelan; Michael	B60W10/18	701/41
*	E	US-20150350750-A1	12-2015	YUN; Doo Seop	H04Q9/00	340/870.07
*	F	US-20160001715-A1	01-2016	Laifenfeld; Moshe	B60R16/023	701/32.7
*	G	US-20160001718-A1	01-2016	Laifenfeld; Moshe	H04W84/005	701/32.7
*	H	US-5481253-A	01-1996	Phelan; Michael D.	B60R25/04	307/10.2
*	I	US-6430488-B1	08-2002	Goldman; Kenneth Alan	B60R25/00	307/10.1
*	J	US-6741920-B1	05-2004	Otto; Richard E.	B60R16/037	340/5.6
*	K	US-8131441-B2	03-2012	Nallapa; Venkatapathi Raju	B60W30/188	701/87
*	L	US-8258939-B2	09-2012	Miller; Thomas Lee	B60R25/00	340/301
*	M	US-8463488-B1	06-2013	Hart; Paul	G07C5/008	340/576

FOREIGN PATENT DOCUMENTS

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Notice of References Cited	Application/Control No. 15/336,110	Applicant(s)/Patent Under Reexamination Phelan, Michael	
	Examiner JONATHAN M DAGER	Art Unit 3663	Page 4 of 4

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-8751105-B2	06-2014	Whelan; Rene A.	B60W50/0098	180/268
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/336,110	Phelan, Michael
	Examiner	Art Unit
	JONATHAN M DAGER	3663

CPC - Searched*		
Symbol	Date	Examiner

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
REVIEW OF PARENT	08/22/2018	JD
IDS	08/22/2018	JD
ASSIGNEE	08/22/2018	JD
INVENTOR	08/22/2018	JD
KEYWORD	08/22/2018	JD
CITATION OF BEST PRIOR ART	08/22/2018	JD
ASSIGNEE	12/10/2018	JD
INVENTOR	12/10/2018	JD
KEYWORD	12/10/2018	JD
CITATION OF BEST PRIOR ART	12/10/2018	JD

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	Examiner	Art Unit
	JONATHAN M DAGER	3663

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	TEXT	12/10/2018	JD

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/336,110	Phelan, Michael
	Examiner	Art Unit
	JONATHAN M DAGER	3663

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/22/2018	12/10/2018							
	1	✓	=							
	2	✓	=							
	3	✓	=							
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	17	✓	=							
	18	✓	=							
	19	✓	=							
	20		=							

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/336,110	Phelan, Michael
	Examiner	**Art Unit**
	JONATHAN M DAGER	3663

CPC								
Symbol							**Type**	**Version**
B60W	/	50	/	12			F	2013-01-01
B60W	/	10	/	18			I	2013-01-01
B60W	/	10	/	20			I	2013-01-01
B60R	/	16	/	033			I	2013-01-01
H04W	/	4	/	80			I	2018-02-01
B60W	/	10	/	04			I	2013-01-01
B60W	/	10	/	30			I	2013-01-01
B60W	/	40	/	08			I	2013-01-01
B60W	/	50	/	14			I	2013-01-01
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B60W	/	2040	/	0809			A	2013-01-01
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CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/JONATHAN M DAGER/ Primary Examiner, Art Unit 3663	10 December 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office — Part of Paper No.: 20181210

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	Examiner	**Art Unit**
	JONATHAN M DAGER	3663

INTERNATIONAL CLASSIFICATION				
CLAIMED				
G06F	/	19	/	00

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 20	
/JONATHAN M DAGER/ Primary Examiner, Art Unit 3663 (Primary Examiner)	10 December 2018 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 2

U.S. Patent and Trademark Office — Part of Paper No.: 20181210

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	Examiner	**Art Unit**
	JONATHAN M DAGER	3663

☑ 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										
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	8		17												
	9		18												

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/JONATHAN M DAGER/ Primary Examiner, Art Unit 3663	10 December 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office — Part of Paper No.: 20181210

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Bibliographic Data

Application No: 15/336,110

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /JONATHAN M DAGER/ (Examiner's Signature) | (Initials)

Title: DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/27/2016	701	3663	PHELAN-1001CON3
RULE			

APPLICANTS

THE PHELAN GROUP, LLC, Santa Fe, NM, UNITED STATES

INVENTORS

Michael Phelan Santa Fe, NM, UNITED STATES

CONTINUING DATA

This application is a CON of 14464188 08/20/2014 PAT 9493149

14464188 is a CIP of 13858930 04/08/2013 PAT 9045101

13858930 is a CON of 12496509 07/01/2009 PAT 8417415

12496509 has PRO of 61077568 07/02/2008

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

11/04/2016

** SMALL ENTITY **

STATE OR COUNTRY

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LOZA & LOZA, LLP
Kermit D. Lopez, Esq.
305 N. Second Avenue #127
Upland, CA 91786-6064
UNITED STATES

FILING FEE RECEIVED

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	43505	340/988-996,425$3-490.ccls. or 701/1,2,19-49,70,93,200-216,300.ccls. or phelan.in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:28
S2	7394	S1 and ((central$5 or remot$3 or main) with (manager$4 or monitor$4 or station or database))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:29
S3	1220	S2 and ((user or driver or operator) with (file or profile))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:30
S4	883	S3 and ((user or driver or operator) with (authenticat$4 or biometric or keyword or password or code or identify$4 or identification))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:30
S5	57	S3 and (((user or driver or operator) with (authenticat$4 or biometric or keyword or password or code or identify$4 or identification)) same terminal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:31
S6	13	S5 and ((overspeed or speed$4 or location or reckless or abusive or seatbelt or unauthorized or prohibit$4) with (alert$4 or alarm$4))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:32
S7	619575	((central$5 or remot$3 or main) with (manager$4 or monitor$4 or station or database or server))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:40
S8	115297	S7 and ((user or driver or operator) with (file or profile))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:40
S9	82875	S8 and ((user or driver or operator) with (pin or authenticat$4 or biometric	US-PGPUB;	OR	ON	2011/09/30 14:40

		or keyword or password or code or identify$4 or identification))	USPAT; FPRS; EPO; JPO; DERWENT			
S10	8210	S8 and (((user or driver or operator) with (pin or authenticat$4 or biometric or keyword or password or code or identify$4 or identification)) same terminal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:41
S11	586	S10 and ((overspeed or speed$4 or location or reckless or abusive or seatbelt or unauthorized or prohibit$4) with (alert$4 or alarm$4))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:41
S12	222	S11 and gps	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:42
S13	27	S12 and (vehicle with terminal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/09/30 14:44
S14	1	("2007/0158128").URPN.	USPAT	OR	ON	2011/09/30 14:48
S15	0	("2008/0245598").URPN.	USPAT	OR	ON	2011/09/30 14:48
S16	10	"196509".ap.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:20
S17	8	"496509".ap.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:20
S18	0	("2010/0004818").URPN.	USPAT	OR	ON	2011/10/03 09:51
S19	11	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$).did.	US-PGPUB	OR	ON	2011/10/03 09:56
S20	0	S19 and rfid	US-PGPUB	OR	ON	2011/10/03 09:56
S21	1	S19 and fob	US-PGPUB	OR	ON	2011/10/03 09:56
S22	0	S16 and rfid	US-	OR	ON	2011/10/03

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			PGPUB; USPAT; FPRS; EPO; JPO; DERWENT			09:57
S23	619817	((central$5 or remot$3 or main) with (manager$4 or monitor$4 or station or database or server))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:57
S24	115299	S23 and ((user or driver or operator) with (file or profile))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:57
S25	8210	S24 and (((user or driver or operator) with (pin or authenticat$4 or biometric or keyword or password or code or identify$4 or identification)) same terminal)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:57
S26	586	S25 and ((overspeed or speed$4 or location or reckless or abusive or seatbelt or unauthorized or prohibit$4) with (alert$4 or alarm$4))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:57
S27	222	S26 and gps	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:57
S28	66	S27 and rfid	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 09:58
S29	9	S28 and (fob or keyfob or "key fob")	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:02
S30	25	S27 and (fob or keyfob or "key fob")	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:03
S31	1024	rke	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:04
S32	535	S31 and (authenticat$4 or identif$)	US-	OR	ON	2011/10/03

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			PGPUB; USPAT; FPRS; EPO; JPO; DERWENT			10:05
S33	170	S31 and ((authenticat$4 or identif$) with (user or driver))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:05
S34	62	S31 and (((authenticat$4 or identif$) with (user or driver)) same (fob or keyfob or transciever or key-fob or smart))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:06
S35	61	S34 and vehicle	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:06
S36	2	S34 and ((user or driver or operator) with (file or profile))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2011/10/03 10:06
S37	1	"12496509"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2012/03/05 13:32
S38	12	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$).did.	US-PGPUB	OR	OFF	2012/03/05 16:28
S39	9	S38 and (fault$4 or error or malfunction or breakdown or accident)	US-PGPUB	OR	OFF	2012/03/05 16:28
S40	12	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$).did.	US-PGPUB	OR	OFF	2012/03/05 17:03
S41	9	S40 and (fault$4 or error or malfunction or breakdown or accident)	US-PGPUB	OR	OFF	2012/03/05 17:03
S42	10	("2006/0212195").URPN.	USPAT	OR	OFF	2012/03/05

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						17:12
S43	1318	phelan.in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2012/03/05 17:14
S44	163	S43 and vehicle	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2012/03/05 17:15
S45	46	S44 and ((authenticat$4 or identif$) with (user or driver))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2012/03/05 17:16
S46	13	S45 and ((central$5 or remot$3 or main) with (manager$4 or monitor$4 or station or database))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2012/03/05 17:16
S47	41	("20010033225" | "20020022920" | "20020049538" | "20020111735" | "20020123834" | "20020178033" | "20030195694" | "20030216857" | "20040083041" | "20040153362" | "4007438" | "5797134" | "5819198" | "6064970" | "6067489" | "6438472" | "6473000" | "6636790" | "6771176").PN. OR ("6931309").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/03/05 17:17
S48	19	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$).did.	US-PGPUB	OR	OFF	2012/09/25 14:46
S49	1	"12496509"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2012/09/25 14:48
S50	11	S48 and (radio or audio or stereo)	US-PGPUB	OR	OFF	2012/09/25 15:01
S51	5235	vehicle same parent$4 same control$4	US-PGPUB; USPAT; USOCR; EPO; JPO;	OR	OFF	2012/09/25 15:06

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			DERWENT			
S52	46	S51 and ((disabl$4 or prevent$4 or prohibit$4 or ((power$4 or turn$4) with (off or down))) with (radio or stereo))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2012/09/25 15:07
S53	51	S51 and ((disabl$4 or prevent$4 or restrict$4 or prohibit$4 or ((power$4 or turn$4) with (off or down))) with (radio or stereo))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2012/09/25 15:08
S54	118	("4477874" | "4707788" | "4835970" | "5091856" | "5124920" | "5247440" | "5289369" | "5303163" | "5379219" | "5446659" | "5504482" | "5513107" | "5532690" | "5581464" | "5608629" | "5680328" | "5812070" | "5877707" | "5938716" | "5948026" | "5969598" | "6006148" | "6076026" | "6122580" | "6173231" | "6232874" | "6256565" | "6275231" | "6278928").PN. OR ("6430488").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:14
S55	82	S54 and radio	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:15
S56	1014581	"9" and parent$3	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:15
S57	27	S55 and parent$3	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:15
S58	1012	phelan.in.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:18
S59	131	phelan.in. and vehicle	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:18
S60	49	phelan.in. and vehicle and radio	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:18
S61	46	phelan.in. and vehicle and radio and identif$	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:18
S62	46	phelan.in. and vehicle and radio and (identif$$4 or identification)	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:19
S63	46	phelan.in. and vehicle and radio and (identif$4 or identification)	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:19

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S64	1	S63 and authentication	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:19
S65	76	("3059070" | "3187334" | "3520161" | "3644745" | "3651464" | "3660624" | "3757305" | "3796889" | "3870895" | "4148372" | "4150731" | "4222034" | "4296402" | "4335370" | "4347545" | "4379966" | "4390758" | "4436993" | "4438426" | "4533016" | "4555619" | "4565922" | "4578573" | "4645939" | "4659915" | "4682062" | "4686358" | "4733638" | "4842093" | "4965460" | "4993627" | "5006843" | "5079435" | "5109221").PN. OR ("5481253").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:21
S66	1	S65 and (radio same (alert$4 or alarm$4))	US-PGPUB; USPAT; USOCR	OR	OFF	2012/09/25 15:22
S67	25	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-20090027177-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$).did.	US-PGPUB; USPAT	OR	OFF	2012/09/25 19:46
S68	36	PHELAN.IN. and ("307" or "180" or "701" or "340" or "180").clas.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2012/12/13 14:22
S69	8	S68 and gps and profile	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2012/12/13 14:23
S70	1	"12196509"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2014/05/15 19:09
S71	213	phelan.in. and unique	US-PGPUB; USPAT; FPRS; EPO; JPO;	OR	ON	2014/05/15 19:09

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			DERWENT			
S72	29	phelan.in. and (unique with code)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2014/05/15 19:10
S73	15	phelan.in. and (unique with code) and driver	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2014/05/15 19:10
S74	2	"6633800".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2014/05/20 11:59
S75	2	"20060224280"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2014/05/20 12:00
S76	0	"13858930"	US-PGPUB; USPAT; EPO; JPO	OR	ON	2014/08/29 10:46
S77	2	"12496509"	US-PGPUB; USPAT; EPO; JPO	OR	ON	2014/08/29 10:56
S78	16	phelan.in. and (unique with code) and driver	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2014/08/29 12:32
S79	5	("2010/0004818").URPN.	USPAT	OR	ON	2014/08/29 12:32
S80	20	phelan.in. and (unique with code) and driver	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2015/01/30 11:50
S81	29	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-	US-PGPUB; USPAT	OR	ON	2015/06/19 11:51

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		20090027177-$ or US-20100004818-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$ or US-8751105-$ or US-8751104-$ or US-8463488-$).did.				
S82	7	S81 and pin	US-PGPUB; USPAT; EPO; JPO	OR	ON	2015/06/19 11:51
S83	20	S81 and (pin or code)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2015/06/19 11:51
S84	6	"11742091"	US-PGPUB; USPAT; EPO; JPO	OR	ON	2015/06/19 12:02
S85	74	("20020049538" | "20020096572" | "20020135466" | "20030078709" | "20030181822" | "20040010358" | "20040019416" | "20040085189" | "20040092253" | "20040124968" | "20040158373" | "20040225557" | "20050030184" | "20050134477" | "20050137757" | "20050159853" | "20050182538" | "20050216144" | "20050237150" | "20050288837" | "20060001523" | "20060047419" | "20060049962" | "20060106515" | "20060111817" | "20060122749" | "20060195483" | "20060200008" | "20060212195" | "20070082706" | "20070139170" | "20070158128" | "20070200663" | "20080077298" | "20080228358" | "20080245598" | "20080269979" | "20080319602" | "20090024273" | "20090027177" | "20090030770" | "20090069954" | "20090079555" | "20090082928" | "20090189736" | "20090195370" | "20100004818" | "20100161171" | "4754255" | "5525977" | "5808374" | "6148212" | "6266589" | "6323761" | "6445084" | "6532298" | "6549115" | "6711474" | "6759943" | "6830123" | "6999858" | "7038596" | "7085635" | "7170400" | "7419027" | "7454545" | "7483772" | "7564342" | "7685162" | "7801507" | "7979177" | "8050815" | "8577548").PN. OR ("8751104").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/19 12:03
S86	13	("20030204290" | "20060066149" | "20070046425" | "20070143482" | "20080093445" | "20080255722" | "20090069954" | "20100004818" | "20100045452" | "20110254655" | "7548491").PN. OR ("8463488").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/19 12:07
S87	2	"20030231550"	US-PGPUB; USPAT;	OR	ON	2015/06/19 12:16

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			USOCR			
S88	35	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-20090027177-$ or US-20100004818-$ or US-20080269979-$ or US-20100161171-$ or US-20100045452-$ or US-20060066149-$ or US-20030204290-$).did. or (US-20030231550-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$ or US-8751105-$ or US-8751104-$ or US-8463488-$).did.	US-PGPUB; USPAT	OR	ON	2015/06/19 12:18
S89	8	S81 and ((alcohol or drinking or inebriat$4 or impair) with (driver or user))	US-PGPUB; USPAT; EPO; JPO	OR	ON	2015/06/19 12:19
S90	7	S89 and (vehicle same (location or gps) same speed)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2015/06/19 12:19
S91	4	("2006/0066149").URPN.	USPAT	OR	ON	2015/06/22 11:17
S92	6	("2009/0069954").URPN.	USPAT	OR	ON	2015/06/22 11:30
S93	39	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-20090027177-$ or US-20080269979-$ or US-20100161171-$ or US-20100045452-$ or US-20060066149-$ or US-20030204290-$ or US-20030231550-$).did. or (US-20070200663-$ or US-20050288837-$ or US-20050237150-$ or US-20030181822-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$ or US-8751105-$ or US-8751104-$ or US-8463488-$ or US-8131441-$).did.	US-PGPUB; USPAT	OR	ON	2015/06/22 11:33
S94	29	S93 and (driver with (identif$ or	US-	OR	ON	2015/06/22

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		authenticat$4))	PGPUB; USPAT			11:33
S95	3	("2008/0269979").URPN.	USPAT	OR	ON	2015/06/22 11:39
S96	18	("20030078709" | "20040010358" | "20040158373" | "20050237150" | "20060001523" | "20060049962" | "20080077298" | "20080228358" | "20080269979" | "20090082928" | "20100161171" | "6445084" | "6532298" | "6549115" | "6999858" | "7038596" | "7685162").PN. OR ("7979177").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2015/06/22 11:39
S97	21	S94 and gps	US-PGPUB; USPAT	OR	ON	2015/06/22 11:41
S98	2795	wireless same vehicle same architecture	US-PGPUB; USPAT; EPO; JPO	OR	ON	2016/03/02 11:08
S99	12	(wireless same vehicle same architecture) and (wireless with ecu with communication)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2016/03/02 11:08
S100	19	("20020009296" | "20020196510" | "20030040347" | "20030114980" | "20050046584" | "20060036930" | "20060208169" | "20110064126" | "20120093198" | "20120133843" | "20120291537" | "20130029624" | "20140073243" | "20140163751" | "5833025" | "6091362" | "6369923" | "7164117" | "8050318").PN. OR ("9227579").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/03/02 11:10
S101	31	("20030186652" | "20050090953" | "20050273211" | "20080039998" | "6078252" | "6177867" | "6195602" | "6480144" | "7005972" | "7084748" | "7099751" | "7177743" | "7603214" | "7689327").PN. OR ("8229625").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/03/02 11:11
S102	2	"20040064221"	US-PGPUB; USPAT; USOCR	OR	ON	2016/03/02 11:19
S103	45	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-20090027177-$ or US-20080269979-$ or US-20100161171-$ or US-20100045452-$ or US-20060066149-$	US-PGPUB; USPAT	OR	ON	2016/03/02 11:40

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Page 187 of 199

		or US-20030204290-$ or US-20030231550-$).did. or (US-20070200663-$ or US-20050288837-$ or US-20050237150-$ or US-20030181822-$ or US-20160001718-$ or US-20160001715-$ or US-20150350750-$ or US-20100087986-$ or US-20080039998-$ or US-20040064221-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$ or US-8751105-$ or US-8751104-$ or US-8463488-$ or US-8131441-$).did.				
S104	3	S103 and ((inhibit$4 or restrict$4) with (phone or cellular))	US-PGPUB; USPAT; EPO; JPO	OR	ON	2016/03/02 11:41
S105	22	("20020078726" | "20030169163" | "20050200466" | "20080245598" | "20090195376" | "20090198413" | "20090312901" | "20090312902" | "20100004818" | "20110082625" | "20110137520" | "6198996" | "6278358" | "6362734" | "6501374" | "6507779" | "6806810" | "7868750" | "8421589" | "8527146").PN. OR ("8751105").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/03/02 11:42
S106	1	"20120283911"	US-PGPUB; USPAT; EPO; JPO	OR	ON	2016/03/04 10:00
S107	37	phelan.in. and (unique with code)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2016/06/20 10:44
S109	6	"12496509"	US-PGPUB; USPAT; EPO; JPO	OR	ON	2017/02/13 11:20
S110	7785	vehicle same parent$4 same control$4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2017/02/14 11:53
S111	95	phelan.in. and vehicle and radio and (identif$4 or identification)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/02/14 11:54
S112	23	phelan.in. and (unique with code) and driver	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT	OR	ON	2017/02/14 11:54
S115	1	"8417415".PN.	US-PGPUB; USPAT; EPO; JPO	OR	ON	2017/06/01 10:34

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Page 981 of 1244
Page 188 of 199

S116	6	"13858930"	US-PGPUB; USPAT; EPO; JPO	OR	ON	2017/06/01 10:36
S117	48	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-20090027177-$ or US-20080269979-$ or US-20100161171-$ or US-20100045452-$ or US-20060066149-$ or US-20030204290-$ or US-20030231550-$).did. or (US-20070200663-$ or US-20050288837-$ or US-20050237150-$ or US-20030181822-$ or US-20160001718-$ or US-20160001715-$ or US-20150350750-$ or US-20100087986-$ or US-20080039998-$ or US-20040064221-$ or US-20070155368-$ or US-20070129056-$ or US-20140358376-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$ or US-8751105-$ or US-8751104-$ or US-8463488-$ or US-8131441-$).did.	US-PGPUB; USPAT	OR	ON	2017/06/01 11:08
S118	12	S117 and (vehicle same (speed with gps))	US-PGPUB; USPAT; EPO; JPO	OR	ON	2017/06/01 11:08
S119	36	phelan.in. and (unique with code)	US-PGPUB; USPAT; EPO; JPO	OR	ON	2017/06/01 11:31
S120	48	(US-20090079555-$ or US-20090069954-$ or US-20090030770-$ or US-20090024273-$ or US-20080319602-$ or US-20080245598-$ or US-20060047419-$ or US-20060212195-$ or US-20090189736-$ or US-20070158128-$ or US-20060200008-$ or US-20070082706-$ or US-20060122749-$ or US-20060111817-$ or US-20060106515-$ or US-20050182538-$ or US-20050137757-$ or US-20040225557-$ or US-20020049538-$ or US-20090027177-$ or US-20080269979-$ or US-20100161171-$ or US-20100045452-$ or US-20060066149-$ or US-20030204290-$ or US-20030231550-$).did. or (US-20070200663-$ or US-20050288837-$ or US-20050237150-$ or US-	US-PGPUB; USPAT	OR	ON	2017/06/01 11:39

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Page 189 of 199

		20030181822-$ or US-20160001718-$ or US-20160001715-$ or US-20150350750-$ or US-20100087986-$ or US-20080039998-$ or US-20040064221-$ or US-20070155368-$ or US-20070129056-$ or US-20140358376-$).did. or (US-6430488-$ or US-8258939-$ or US-7956730-$ or US-6741920-$ or US-5481253-$ or US-8751105-$ or US-8751104-$ or US-8463488-$ or US-8131441-$).did.				
S121	58	("2004/0225557").URPN.	USPAT	OR	ON	2017/08/02 11:29
S126	2	"14712124"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/16 11:04
S127	7	"13858930"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/16 11:05
S128	1	"8417415".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/16 11:12
S129	1	"9045101".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/21 09:11
S130	2	"9493149"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/21 09:12
S131	7	"13858930"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/21 09:14
S132	2	"9493149"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/21 09:15
S133	3	"14464188"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/21 09:44
S134	8	"12496509"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/21 09:53
S135	0	"15898322"	US-PGPUB;	OR	ON	2018/08/22 08:47

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			USPAT; USOCR; EPO; JPO			
S136	3	"14464188"	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2018/08/22 08:47

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	27	phelan.in. and (MASTER AND SLAVE)	US-PGPUB; USPAT	OR	ON	2018/12/10 09:12
L2	0	("2017/0106877").URPN.	USPAT	OR	ON	2018/12/10 09:12
S108	33	phelan.in. and (unique with code)	US-PGPUB; USPAT	OR	ON	2016/06/20 10:51
S113	34	phelan.in. and (unique with code)	US-PGPUB; USPAT	OR	ON	2017/02/14 11:39
S114	0	("2014/0358376").URPN.	USPAT	OR	ON	2017/02/14 11:47
S122	37	phelan.in. and (unique with code)	US-PGPUB; USPAT	OR	ON	2017/10/18 11:50
S123	8	S122 and profile	US-PGPUB; USPAT	OR	ON	2017/10/18 11:50
S124	0	("2017/0106877").URPN.	USPAT	OR	ON	2017/10/18 11:52
S125	31	("20020049538" | "20040225557" | "20050137757" | "20050182538" | "20060047419" | "20060106515" | "20060111817" | "20060122749" | "20060200008" | "20060212195" | "20070082706" | "20070158128" | "20080245598" | "20080319602" | "20090024273" | "20090027177" | "20090030770" | "20090069954" | "20090079555" | "20090189736" | "20100004818" | "5481253" | "6430488" | "6741920" | "7956730" | "8258939" | "8463488" | "8751104" | "8751105").PN. OR ("9045101").URPN.	US-PGPUB; USPAT	OR	ON	2017/10/18 11:52

12/ 10/ 2018 9:13:25 AM
C:\ Users\ jdager\ Desktop\ patent searches\ phelan\ 15336110 22 august 2018.wsp

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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)

141361 7590 12/17/2018

LOZA & LOZA, LLP
Kermit D. Lopez, Esq.
305 N. Second Avenue #127
Upland, CA 91786-6064

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.

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.

Shirley Hsu	(Typed or printed name)
/shirley hsu/	(Signature)
February 28, 2019	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/336,110	10/27/2016	Michael Phelan	PHELAN-1001CON3	5824

TITLE OF INVENTION: DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE

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	03/18/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
DAGER, JONATHAN M	3663	701-036000

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 Kermit D. Lopez
2 Luis M. Ortiz
3 Loza & Loza, LLP

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

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. 505240

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 /Kermit D. Lopez/ Date February 28, 2019

Typed or printed name Kermit D. Lopez Registration No. 41,953

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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UNIFIED PATENTS EXHIBIT 1002
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Electronic Patent Application Fee Transmittal

Application Number:	15336110
Filing Date:	27-Oct-2016
Title of Invention:	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE
First Named Inventor/Applicant Name:	Michael Phelan
Filer:	Kermit Dean Lopez/Shirley Hsu
Attorney Docket Number:	PHELAN-1001CON3

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:	35293764
Application Number:	15336110
International Application Number:	
Confirmation Number:	5824
Title of Invention:	DRIVER AUTHENTICATION SYSTEM AND METHOD FOR MONITORING AND CONTROLLING VEHICLE USAGE
First Named Inventor/Applicant Name:	Michael Phelan
Customer Number:	141361
Filer:	Kermit Dean Lopez/Shirley Hsu
Filer Authorized By:	Kermit Dean Lopez
Attorney Docket Number:	PHELAN-1001CON3
Receipt Date:	28-FEB-2019
Filing Date:	27-OCT-2016
Time Stamp:	20:40:40
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	030119INTEFSW20411700
Deposit Account	505240
Authorized User	Loza and Loza - Accounting
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)	

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)	PHELAN-1001CON3_IssueFeeTransmittal.pdf	113861 73e8cd3b571da6a22f701c8480907a0ea5f23be8	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30083 8e8b620e46a8494ed6c4f8c5ade600d0661313d9	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	143944		

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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.

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/336,110	04/16/2019	10259470	PHELAN-1001CON3	5824

141361 7590 03/27/2019

LOZA & LOZA, LLP
Kermit D. Lopez, Esq.
305 N. Second Avenue #127
Upland, CA 91786-6064

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 243 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):

Michael Phelan, Santa Fe, NM;
THE PHELAN GROUP, LLC, Santa Fe, NM;

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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	REQUEST ID
15/336,110	10259470	3663	103133

PAIR Correspondence Address/Fee Address Change

The following fields have been changed to Customer Number 64064 on 01/10/2020 via Private PAIR in view of the certification copied below that authorized the change.

- Correspondence Address

The address for Customer Number 64064 is:
64064
Ortiz & Lopez, PLLC
P.O. BOX 4484
ALBUQUERQUE, NM 87196-4484

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

An attorney or Agent of Record registered to practice before the Patent and Trademark Office who has been given power of attorney in this application

Signature:	/Luis Ortiz/
Name:	Luis Ortiz
Registration Number:	36230

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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	REQUEST ID
15/336,110	10259470	3663	103133

PAIR Correspondence Address/Fee Address Change

The following fields have been changed to Customer Number 64064 on 01/10/2020 via Private PAIR in view of the certification copied below that authorized the change.

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64064
Ortiz & Lopez, PLLC
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An attorney or Agent of Record registered to practice before the Patent and Trademark Office who has been given power of attorney in this application

Signature:	/Luis Ortiz/
Name:	Luis Ortiz
Registration Number:	36230

EXHIBIT 1004

U.S. Patent Publication 2006/0052909 ("Cherouny")

US 20060052909A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2006/0052909 A1**

Cherouny (43) **Pub. Date: Mar. 9, 2006**

(54) **ELECTRONIC PROGRAMMABLE SPEED LIMITER**

(76) Inventor: **Peter H. Cherouny**, So. Burlington, VT (US)

Correspondence Address:
James W. Hiney, Esq.
Suite 1100
1872 Pratt Drive
Blacksburg, VA 24060 (US)

(21) Appl. No.: **11/235,350**

(22) Filed: **Sep. 26, 2005**

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/695,443, filed on Jun. 19, 2001, now Pat. No. 6,970,075.

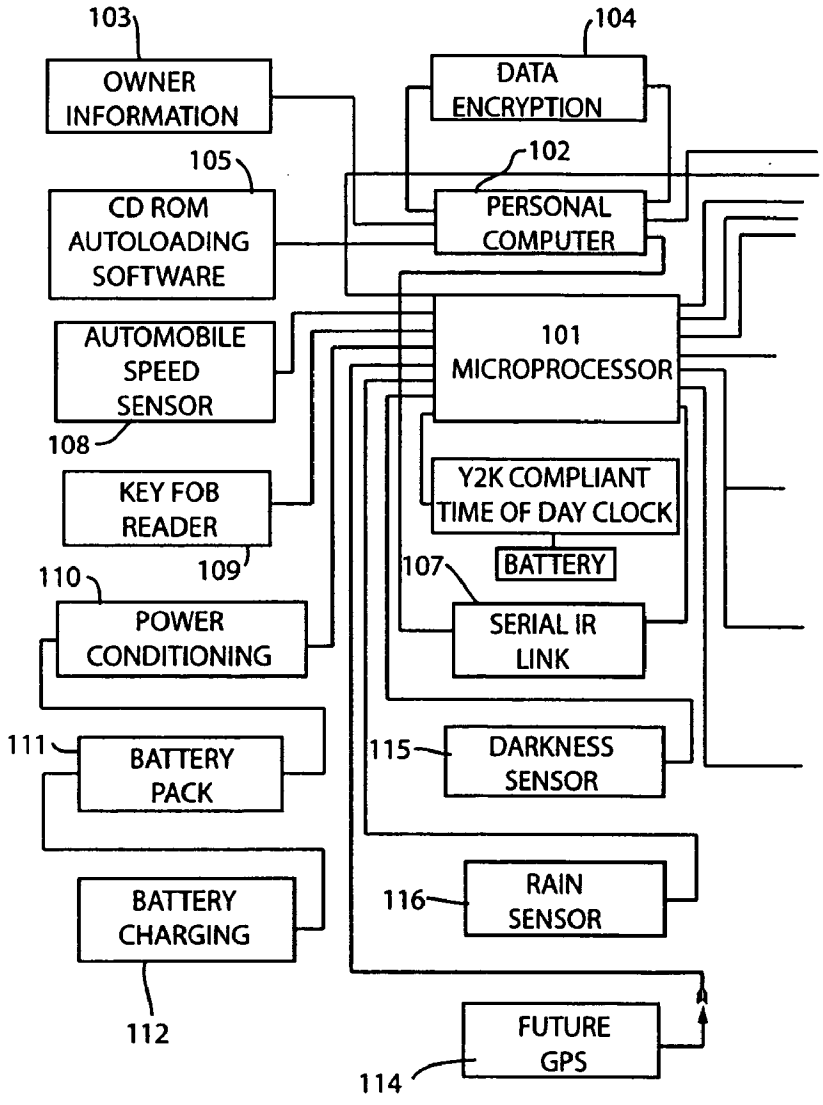
Publication Classification

(51) **Int. Cl.**
G05D 1/00 (2006.01)
B60Q 1/00 (2006.01)

(52) **U.S. Cl.** **701/1**; 340/425.5

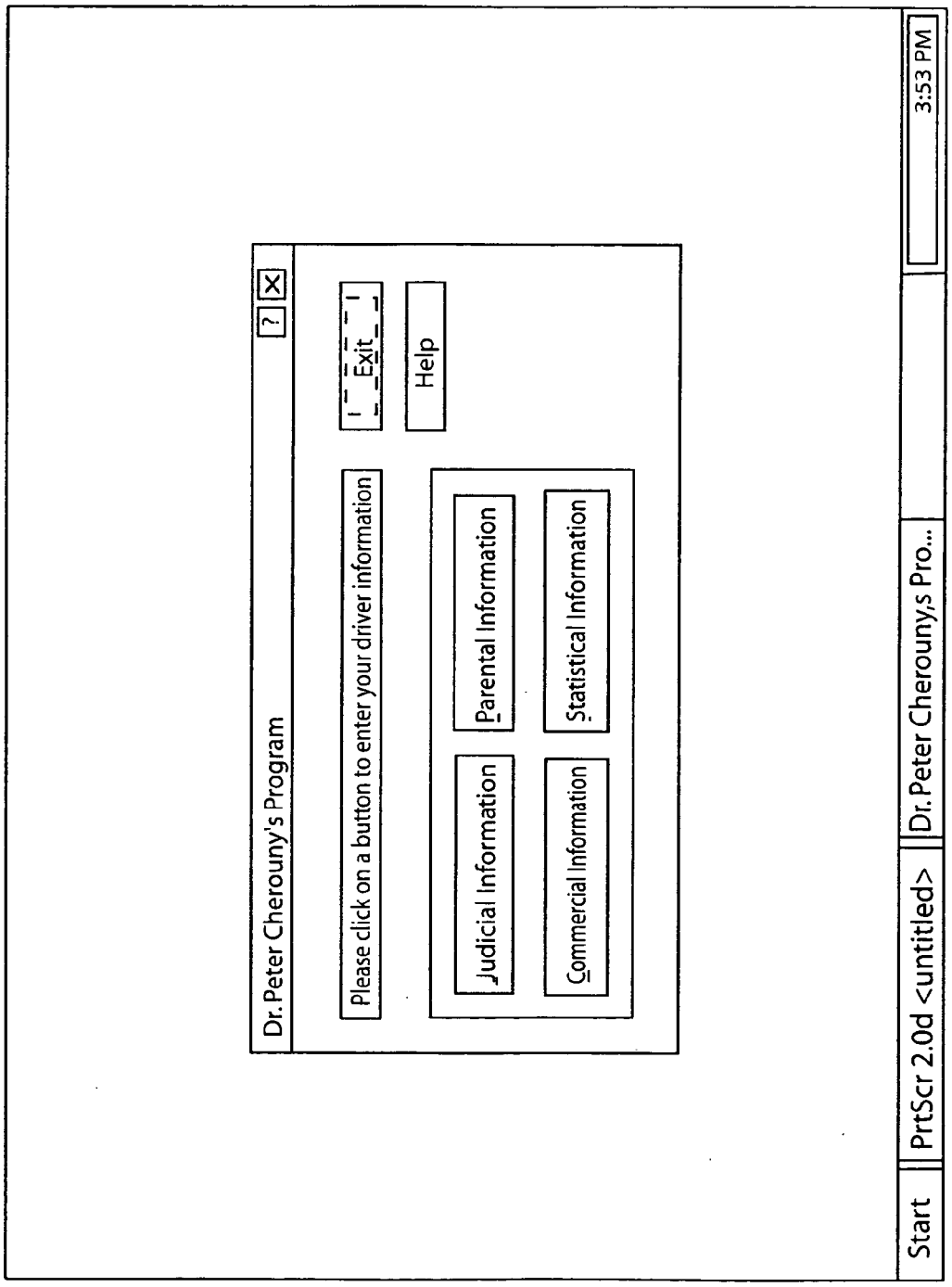
(57) **ABSTRACT**

An improved electronic programmable speed limiter for drivers of vehicles which can be preprogrammed and controlled from a remote location via a radio link to update the driver performance and adjust the controls on the speed limiter.



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FIG. 1


Dr. Peter Cherouny's Program
Please click on a button to enter your driver information
Exit
Help
Judicial Information
Parental Information
Commercial Information
Statistical Information
Start
PrtScr 2.0d <untitled>
Dr. Peter Cherouny,s Pro...
3:53 PM

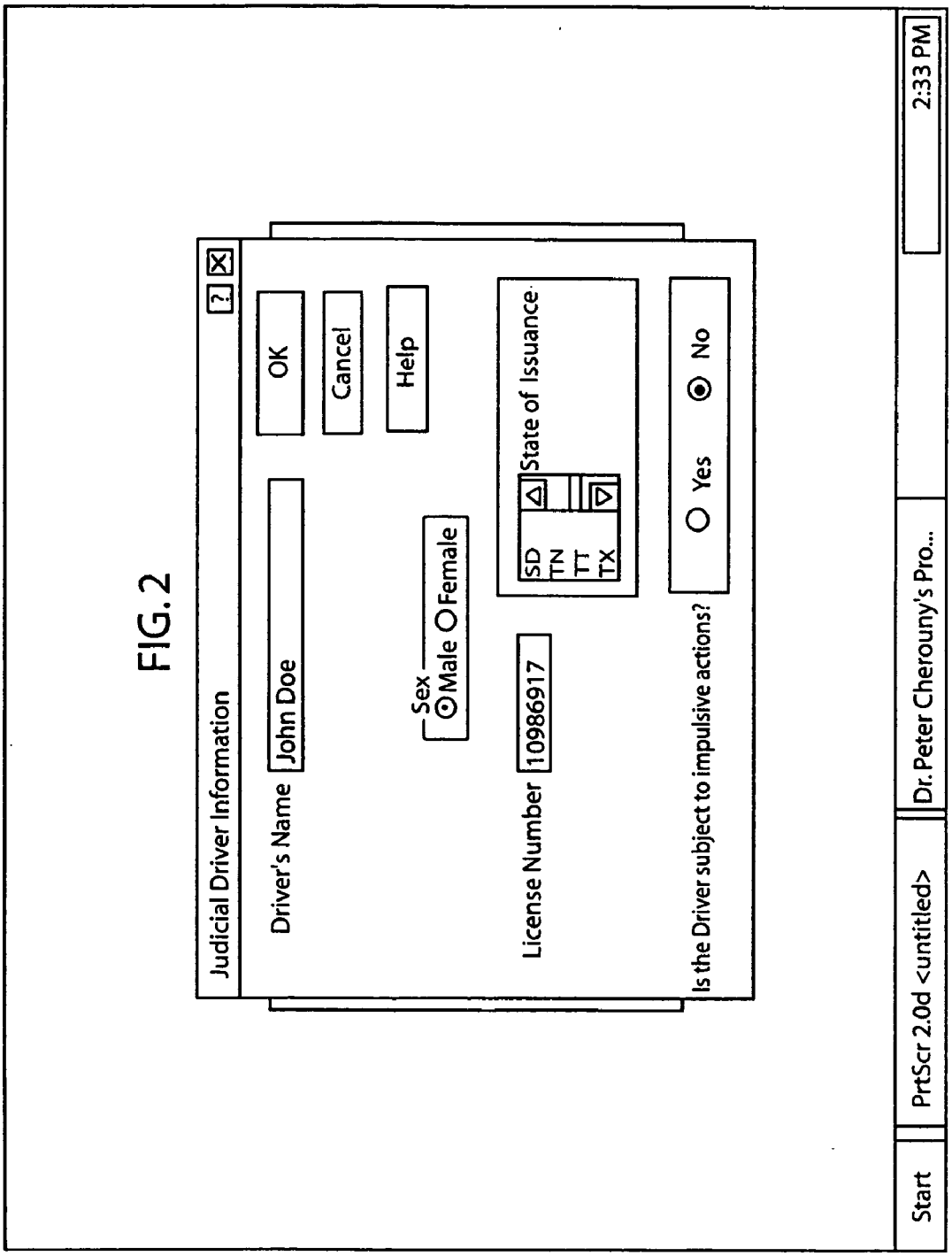

Start
PrtScr 2.0d <untitled>
Dr. Peter Cherouny's Pro...
2:33 PM
Judicial Driver Information
Driver's Name
John Doe
OK
Cancel
Help
Sex
Male
Female
License Number
10986917
State of Issuance
SD
TN
TT
TX
Is the Driver subject to impulsive actions?
Yes
No

FIG. 2

FIG. 3

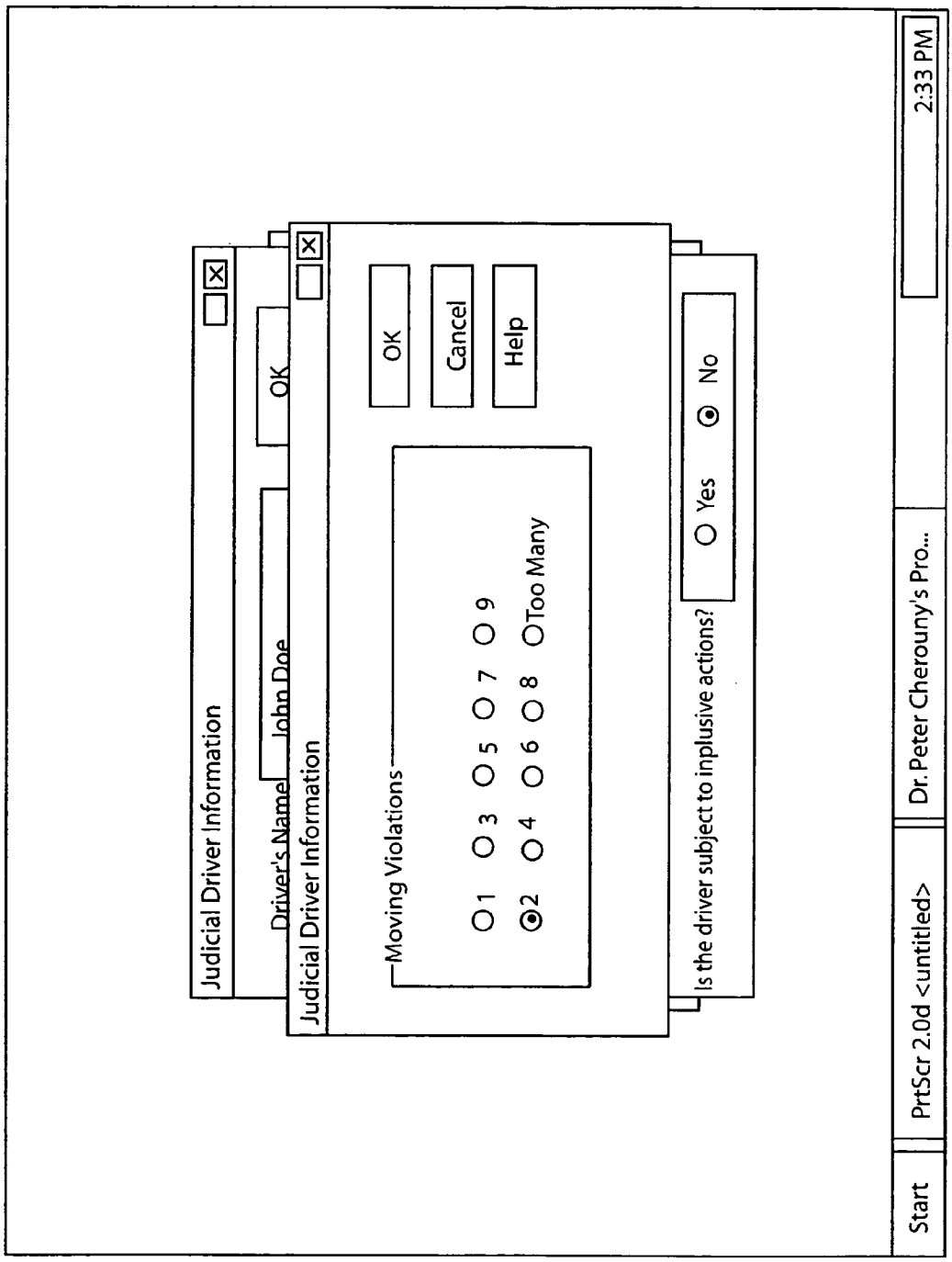

Judicial Driver Information
Driver's Name
John Doe
OK
Judicial Driver Information
OK
Cancel
Help
Moving Violations
1 3 5 7 9
2 4 6 8 Too Many
Is the driver subject to inplusive actions?
Yes
No
Start
PrtScr 2.0d <untitled>
Dr. Peter Cherouny's Pro...
2:33 PM

FIG. 4

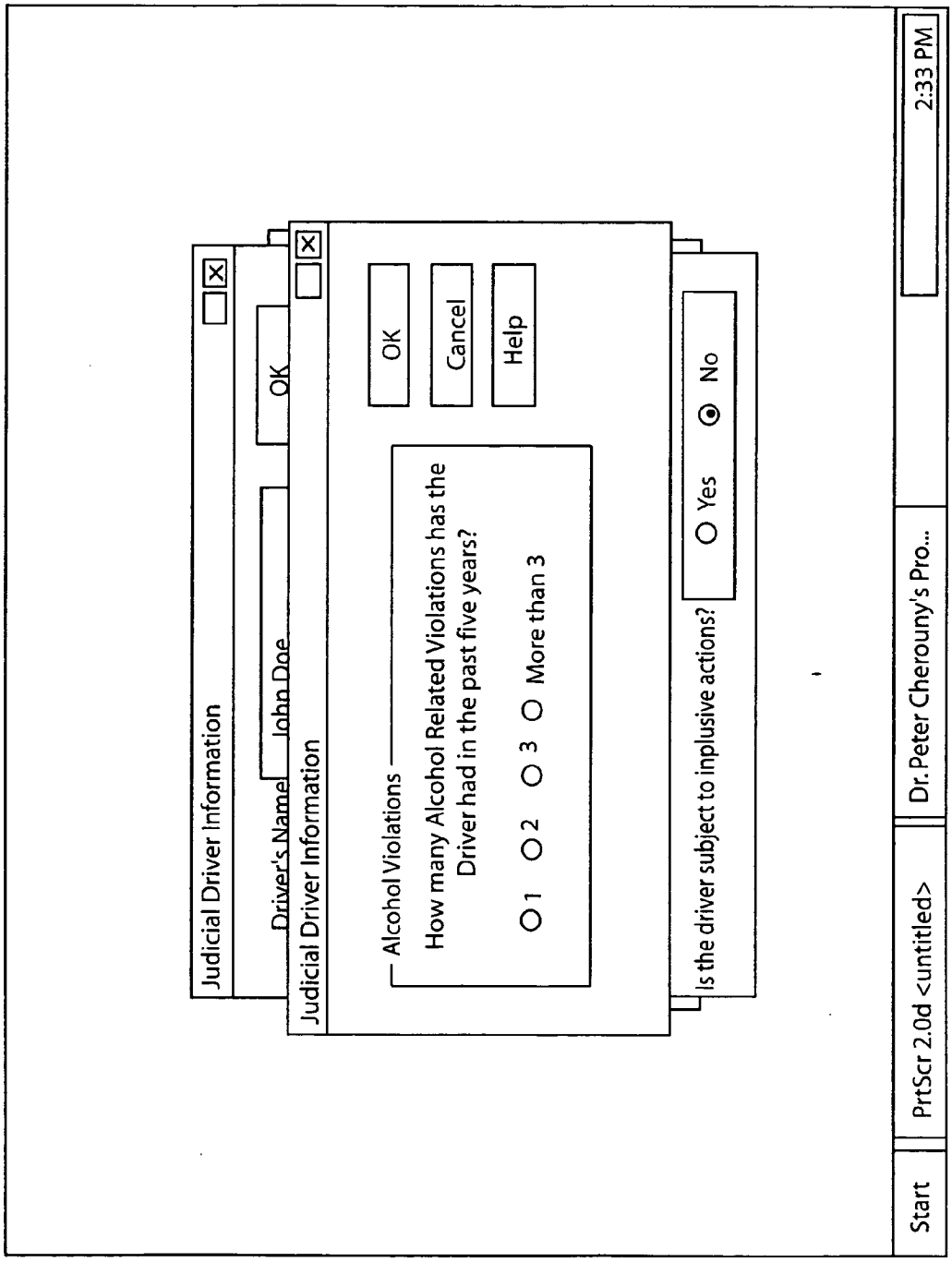

Judicial Driver Information
Driver's Name John Doe
OK
Judicial Driver Information
OK
Cancel
Help
Alcohol Violations
How many Alcohol Related Violations has the Driver had in the past five years?
1 2 3 More than 3
Is the driver subject to inplusive actions?
Yes No
Start
PrtScr 2.0d <untitled>
Dr. Peter Cherouny's Pro...
2:33 PM

FIG. 5

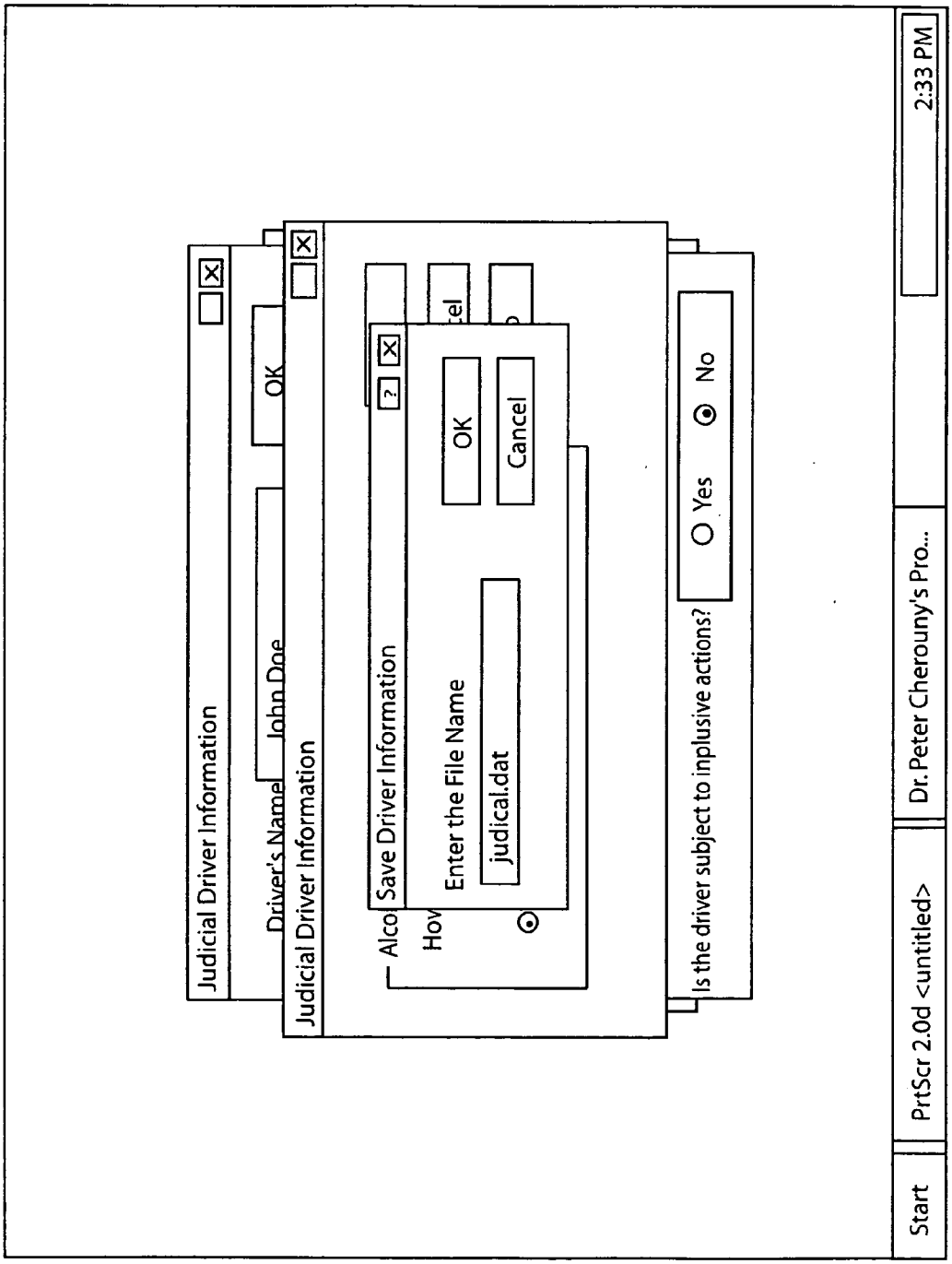

Judicial Driver Information
Driver's Name
John Doe
OK
Judicial Driver Information
Save Driver Information
Enter the File Name
judical.dat
OK
Cancel
Is the driver subject to inplusive actions?
Yes
No
Start
PrtScr 2.0d <untitled>
Dr.Peter Cherouny's Pro...
2:33 PM

FIG. 6

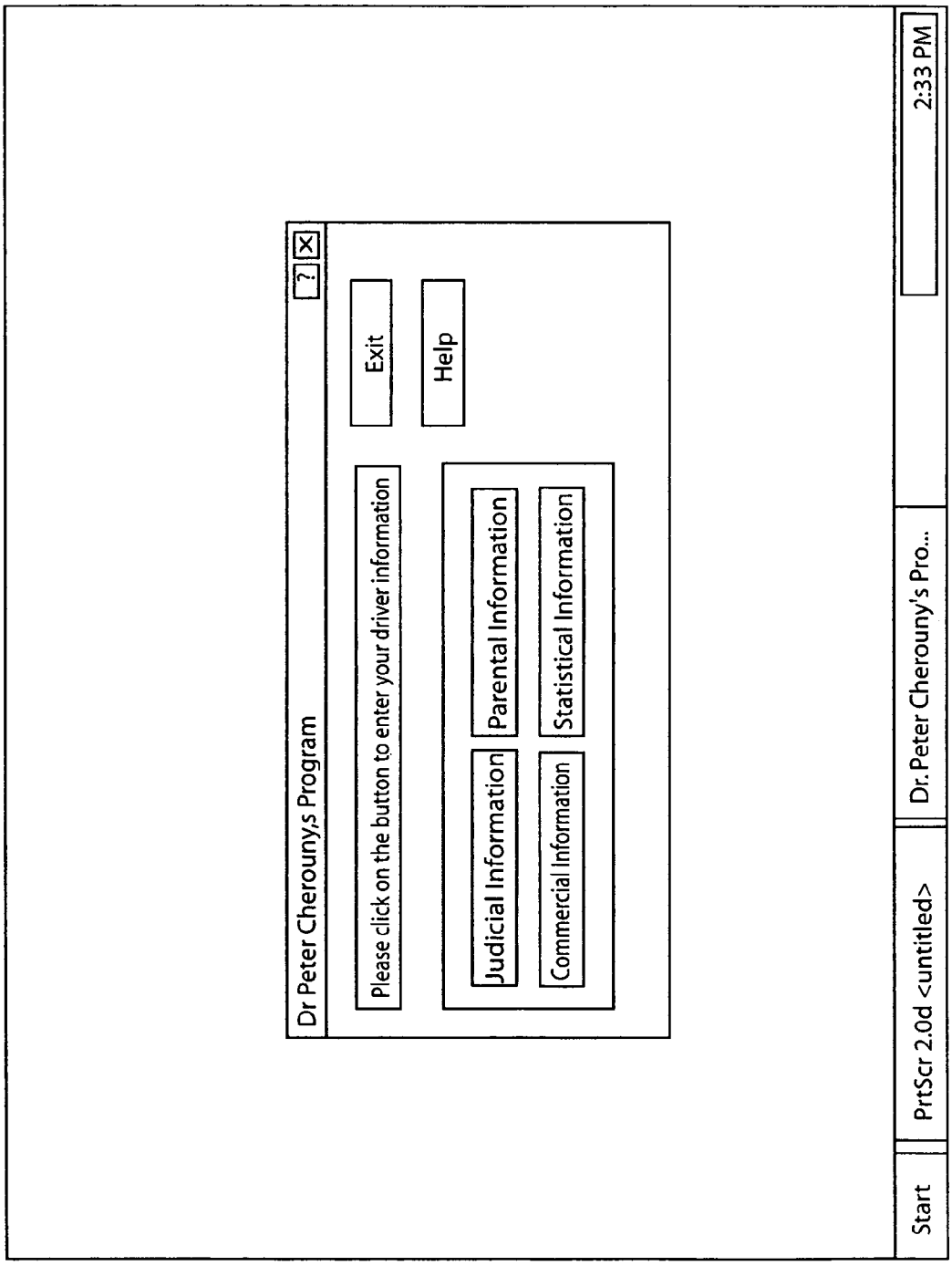

Dr Peter Cherouny,s Program
Exit
Help
Please click on the button to enter your driver information
Judicial Information
Parental Information
Statistical Information
Commercial Information
Start
PrtScr 2.0d <untitled>
Dr. Peter Cherouny's Pro...
2:33 PM

FIG. 7

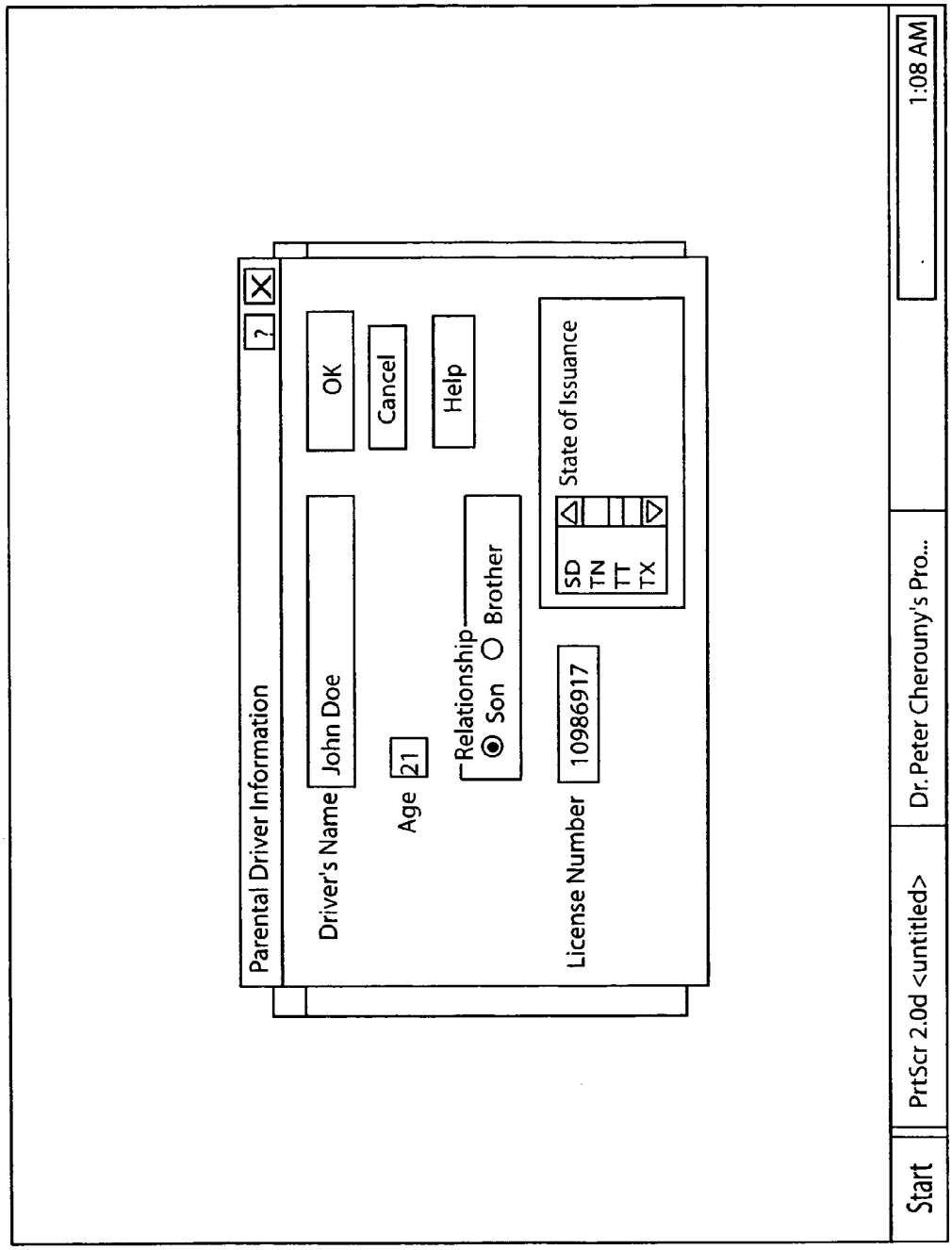
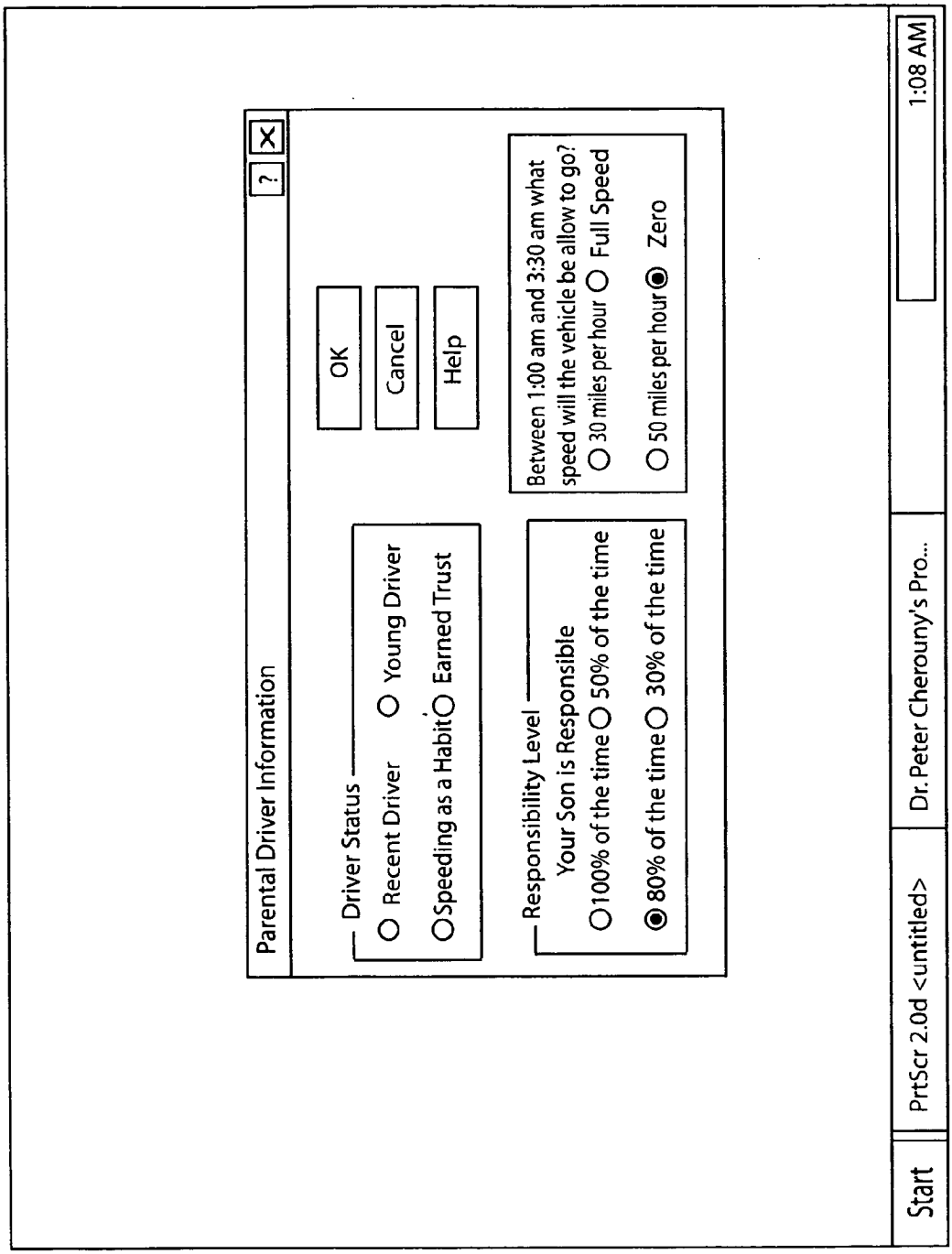

Parental Driver Information
?
OK
Cancel
Help
Driver's Name
John Doe
Age
21
Relationship
Son
Brother
License Number
10986917
State of Issuance
SD
TN
TT
TX
Start
PrtScr 2.0d <untitled>
Dr. Peter Cherouny's Pro...
1:08 AM

FIG. 8



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FIG. 9

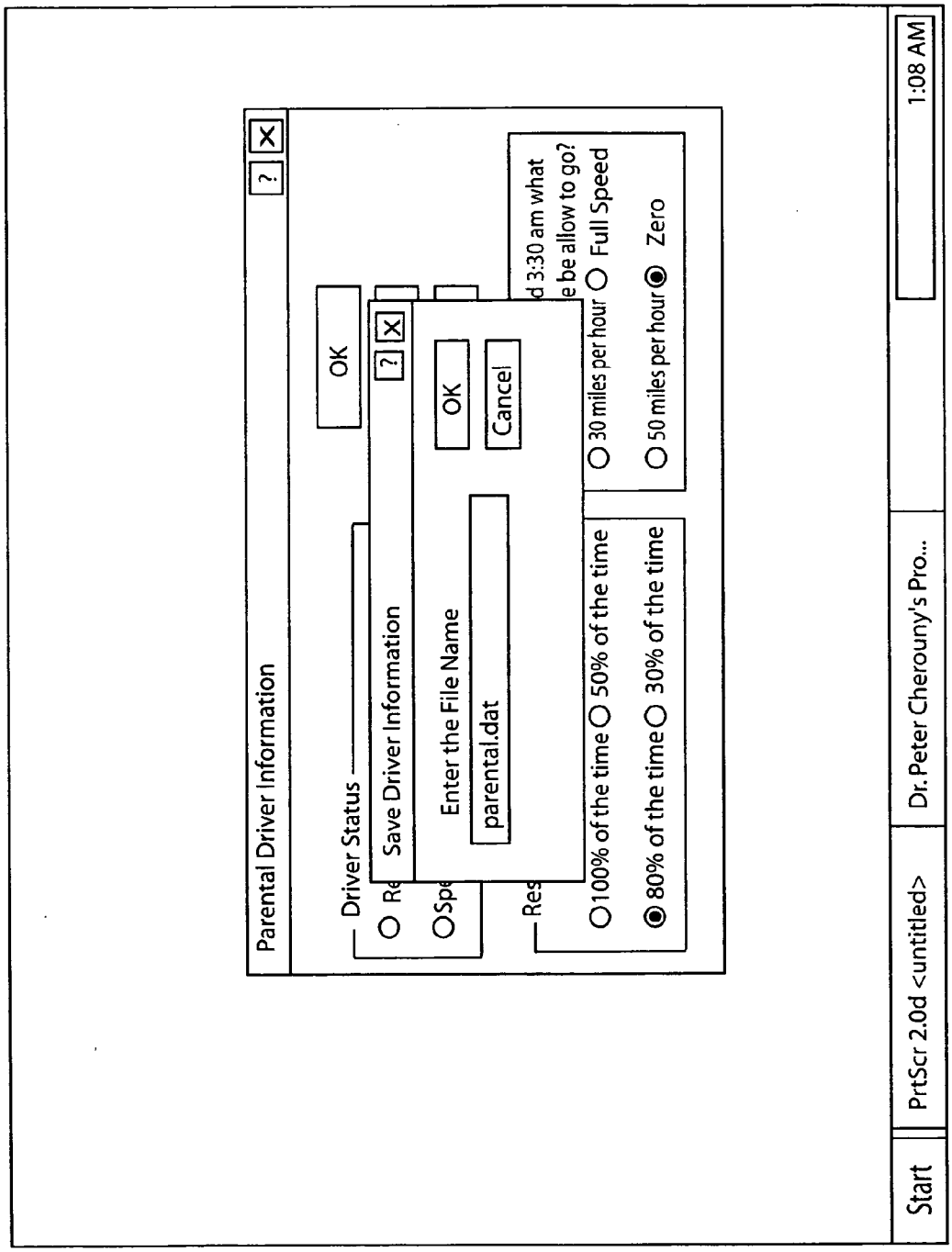

Parental Driver Information
Driver Status
Save Driver Information
Enter the File Name
parental.dat
OK
Cancel
OK
100% of the time
50% of the time
80% of the time
30% of the time
30 miles per hour
Full Speed
50 miles per hour
Zero
Start
PrtScr 2.0d <untitled>
Dr. Peter Cherouny's Pro...
1:08 AM

FIG. 10

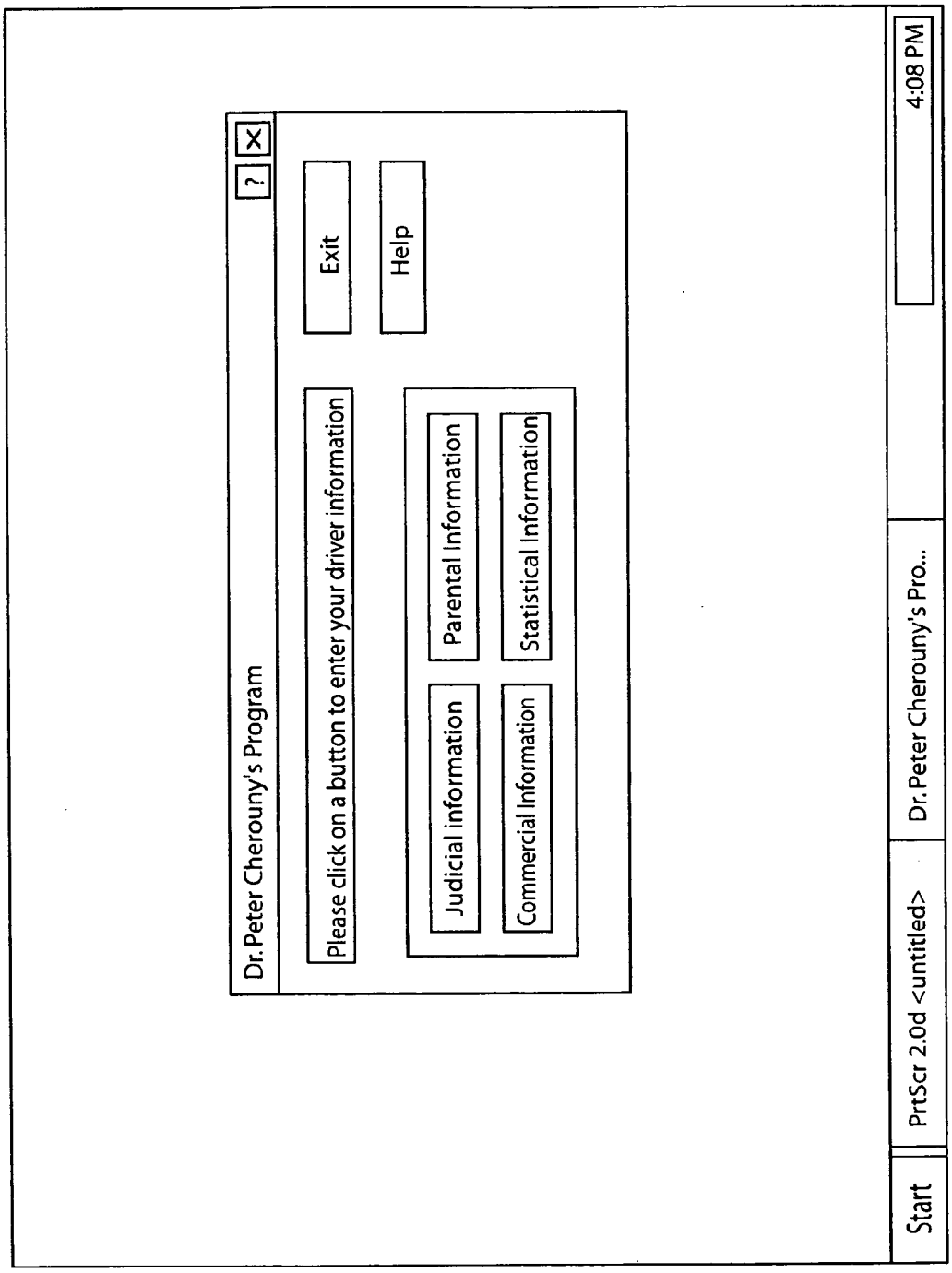

Dr. Peter Cherouny's Program
Please click on a button to enter your driver information
Exit
Help
Judicial information
Parental Information
Commercial Information
Statistical Information
Start
PrtScr 2.0d <untitled>
Dr. Peter Cherouny's Pro...
4:08 PM

FIG. 11

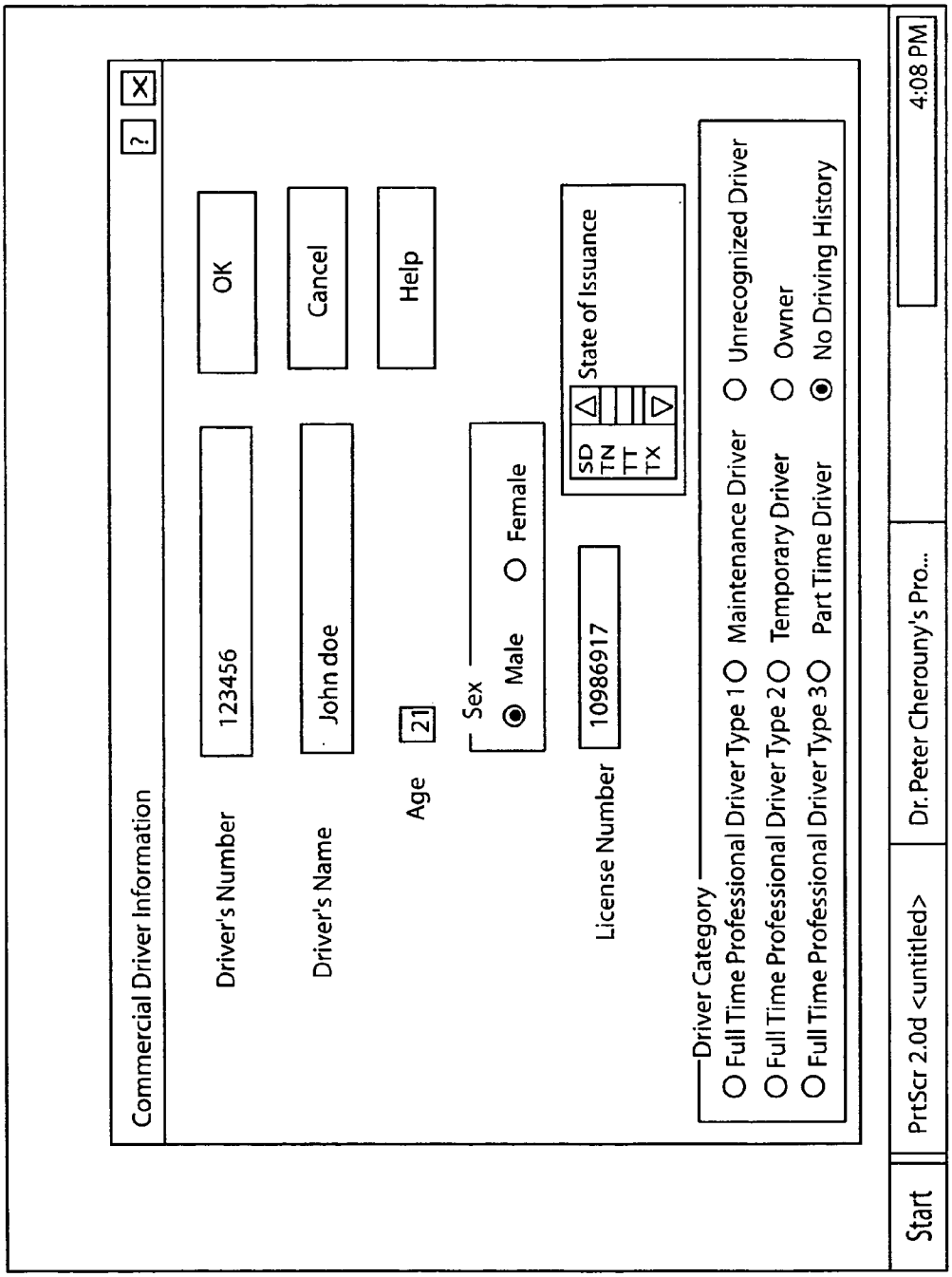

Commercial Driver Information
Driver's Number
123456
OK
Driver's Name
John doe
Cancel
Age
21
Help
Sex
Male
Female
License Number
10986917
State of Issuance
SD
TN
TT
TX
Driver Category
Full Time Professional Driver Type 1
Maintenance Driver
Unrecognized Driver
Full Time Professional Driver Type 2
Temporary Driver
Owner
Full Time Professional Driver Type 3
Part Time Driver
No Driving History
Start
PrtScr 2.0d <untitled>
Dr. Peter Cherouny's Pro...
4:08 PM

FIG. 12

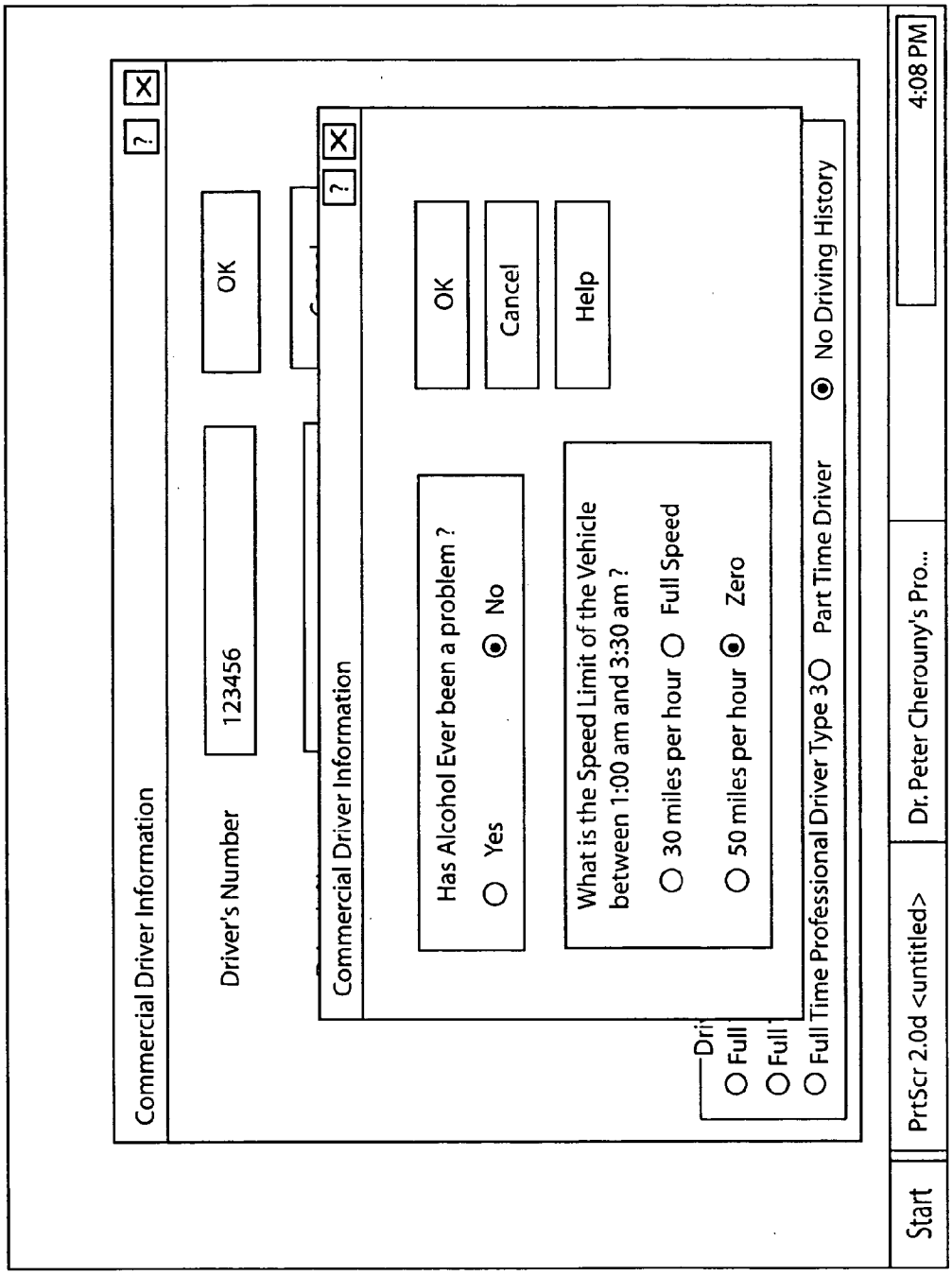
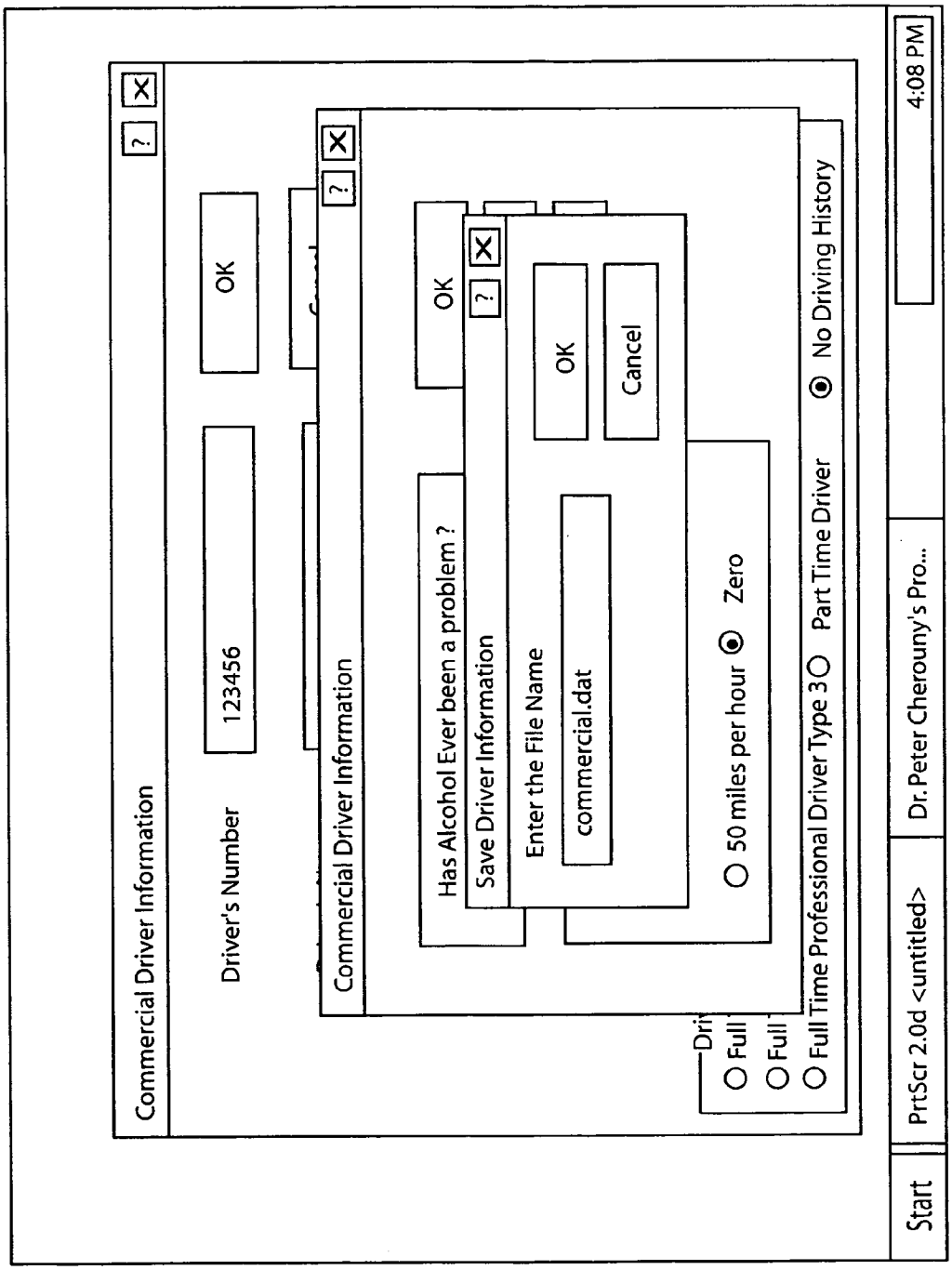

Commercial Driver Information
Driver's Number
123456
OK
Commercial Driver Information
Has Alcohol Ever been a problem ?
Yes
No
OK
Cancel
Help
What is the Speed Limit of the Vehicle between 1:00 am and 3:30 am ?
30 miles per hour
Full Speed
50 miles per hour
Zero
Full Time Professional Driver Type 3
Part Time Driver
No Driving History
Start
PrtScr 2.0d <untitled>
Dr. Peter Cherouny's Pro...
4:08 PM

FIG. 13


Commercial Driver Information
Driver's Number
123456
OK
Commercial Driver Information
Has Alcohol Ever been a problem ?
OK
Save Driver Information
Enter the File Name
commercial.dat
OK
Cancel
50 miles per hour
Zero
Full
Full
Full Time Professional Driver Type 3
Part Time Driver
No Driving History
Start
PrtScr 2.0d <untitled>
Dr. Peter Cherouny's Pro...
4:08 PM

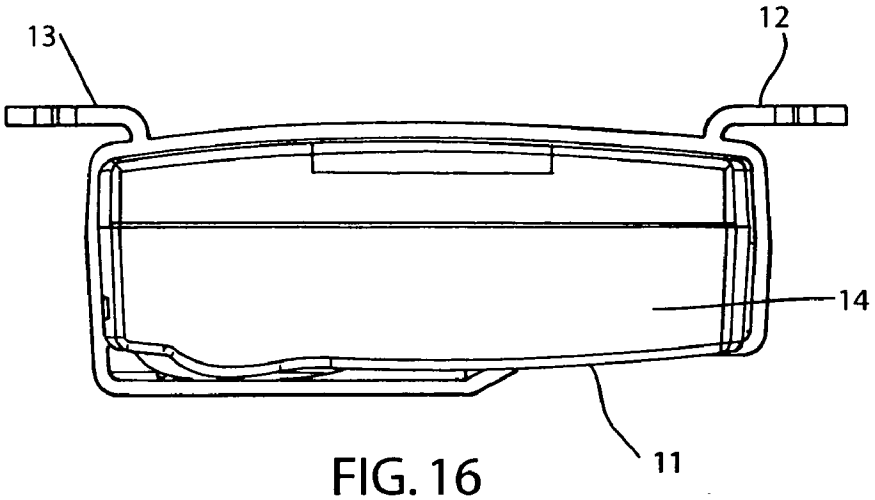


FIG. 16

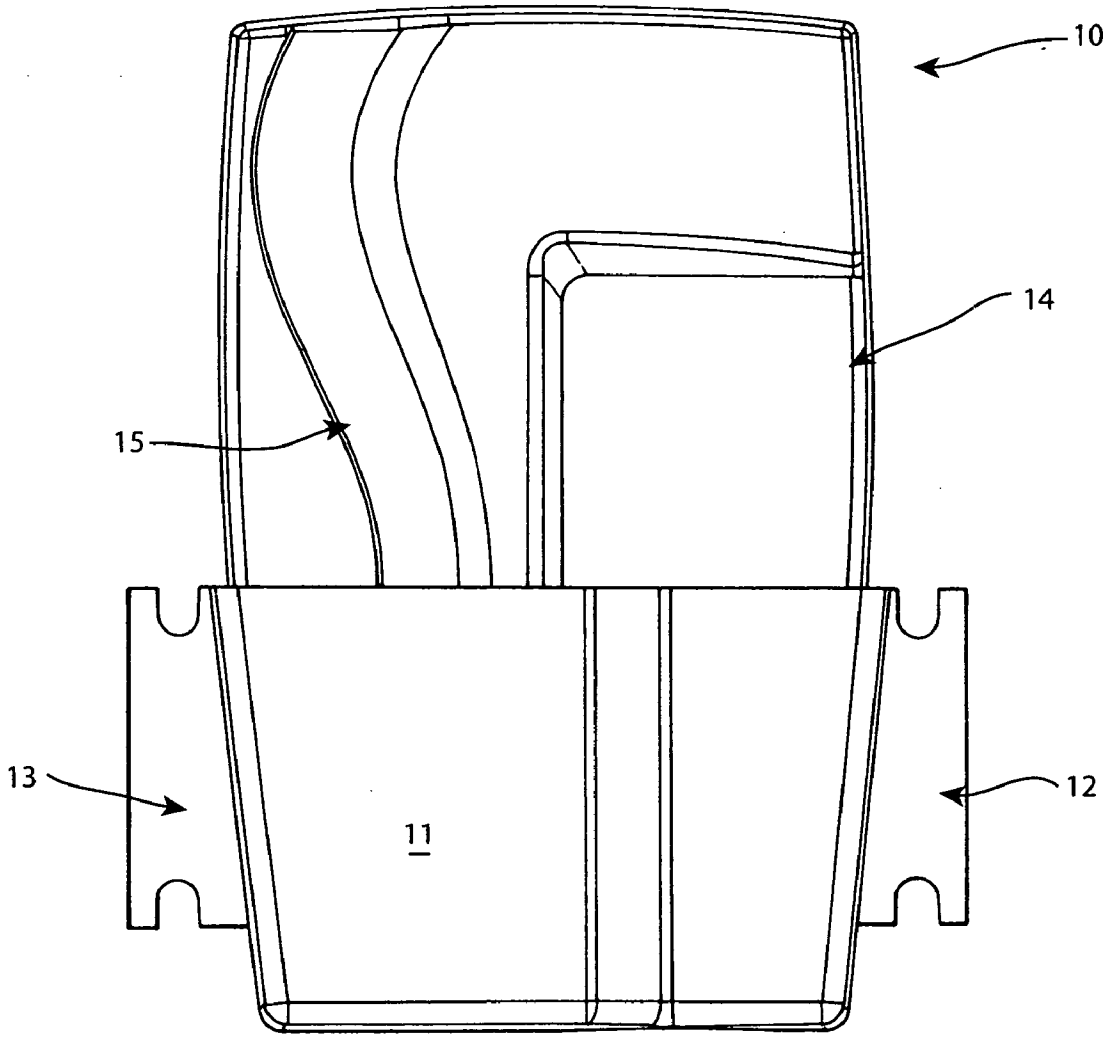


FIG. 14

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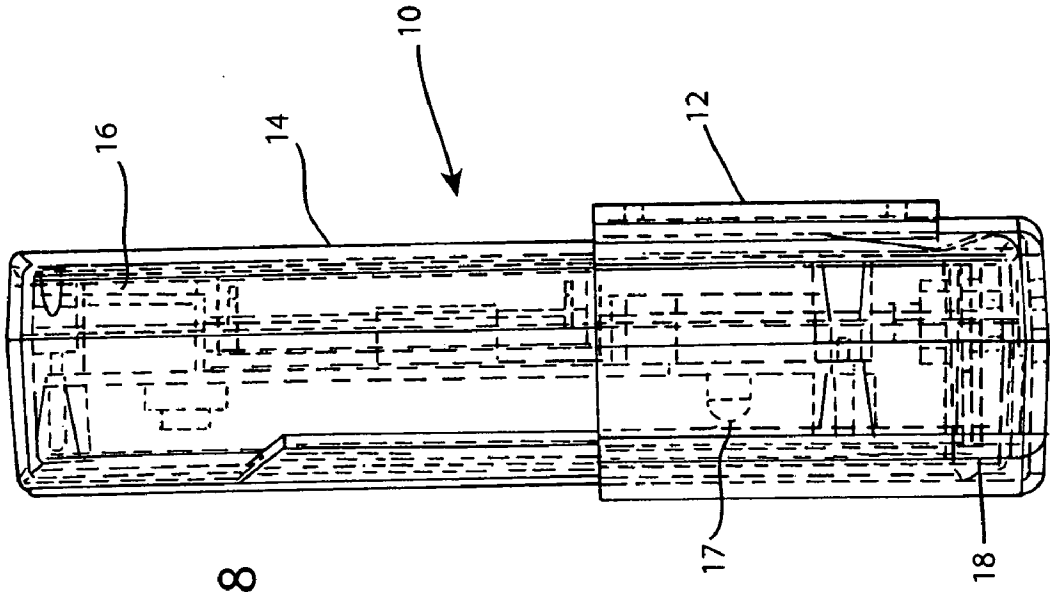


FIG. 18

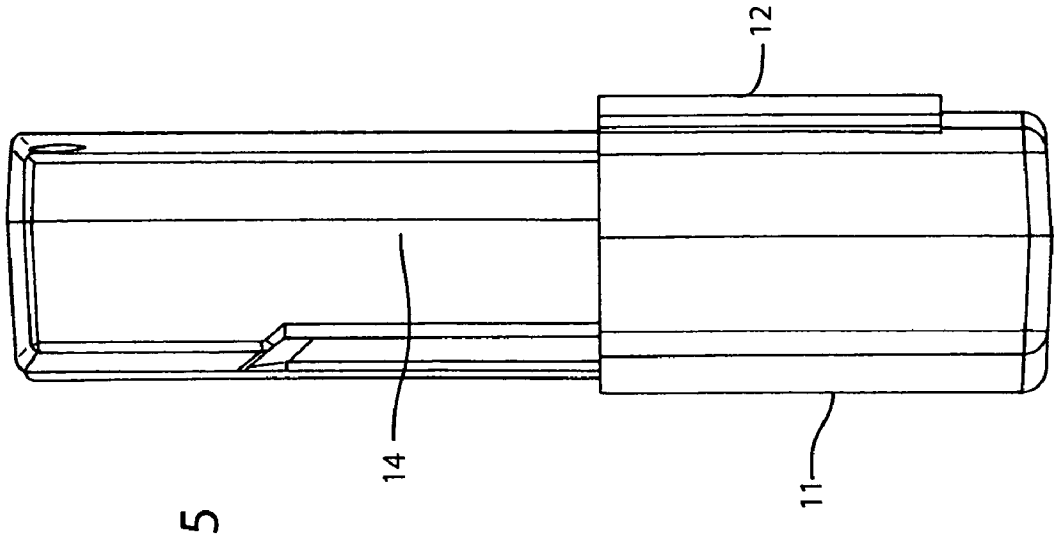


FIG. 15

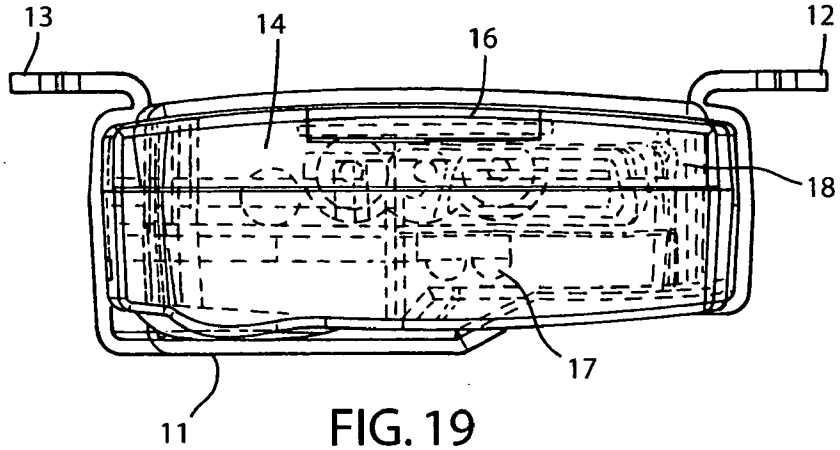


FIG. 19

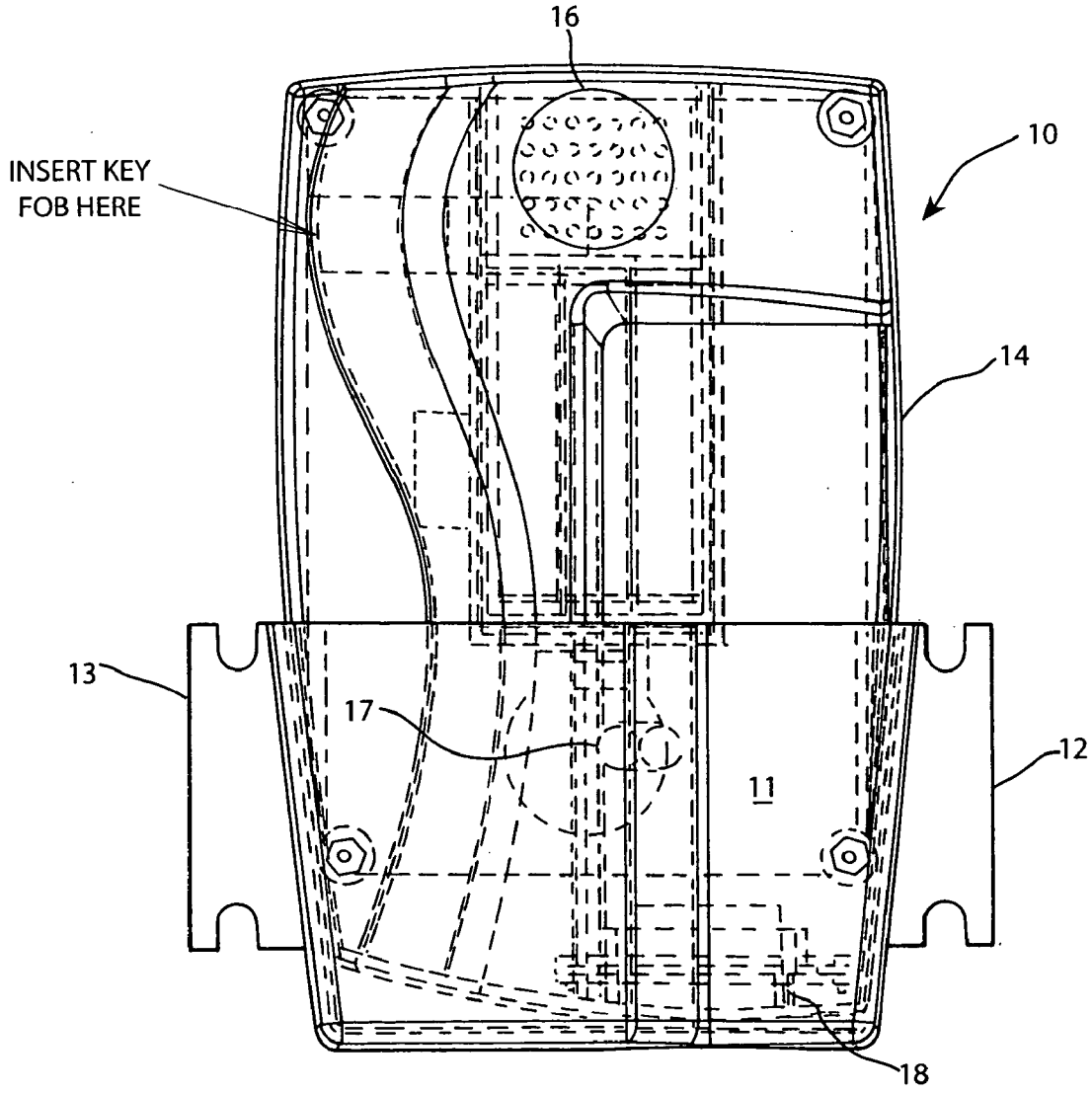


FIG. 17

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FIG. 20A

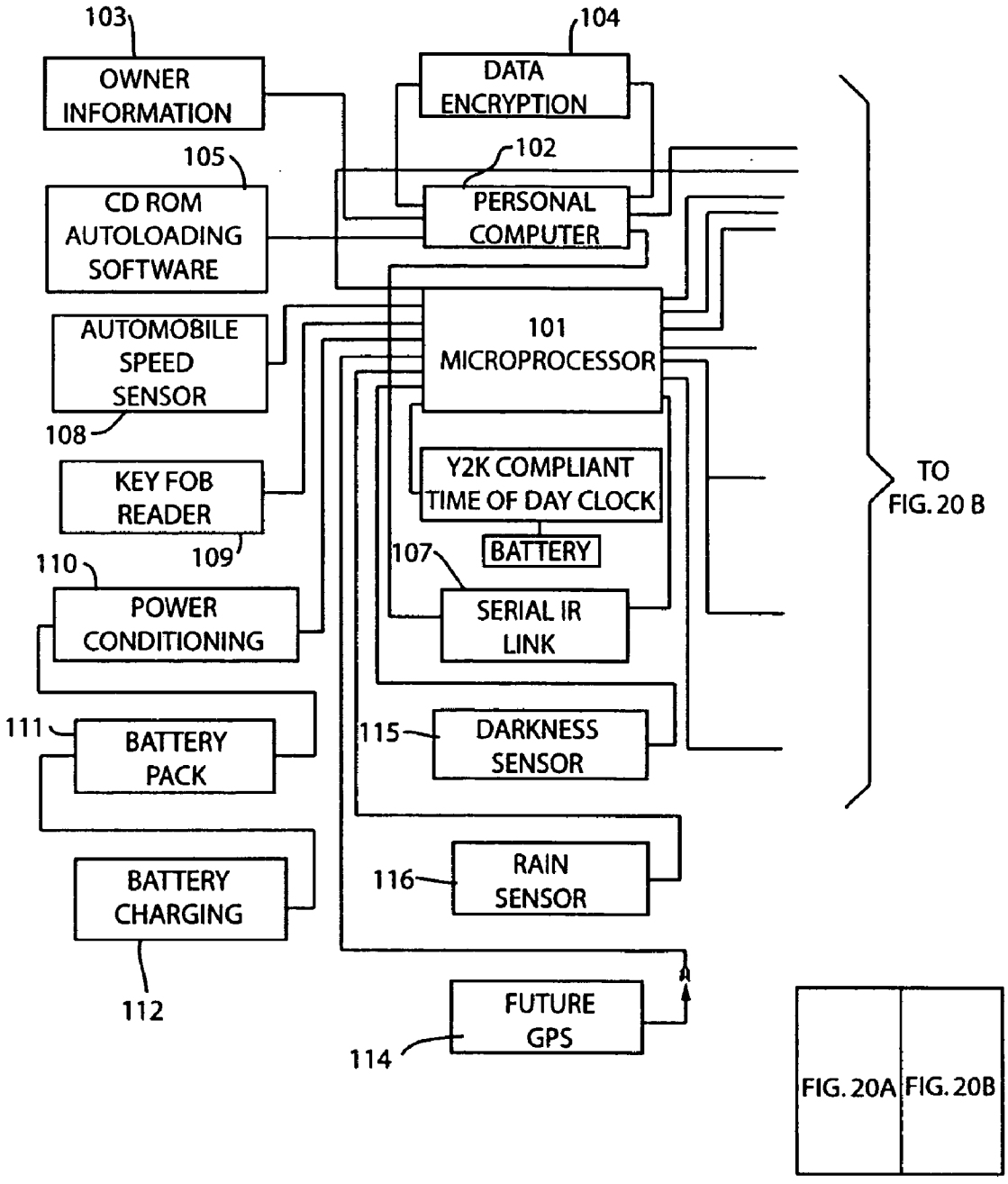


FIG. 20

FIG. 20B

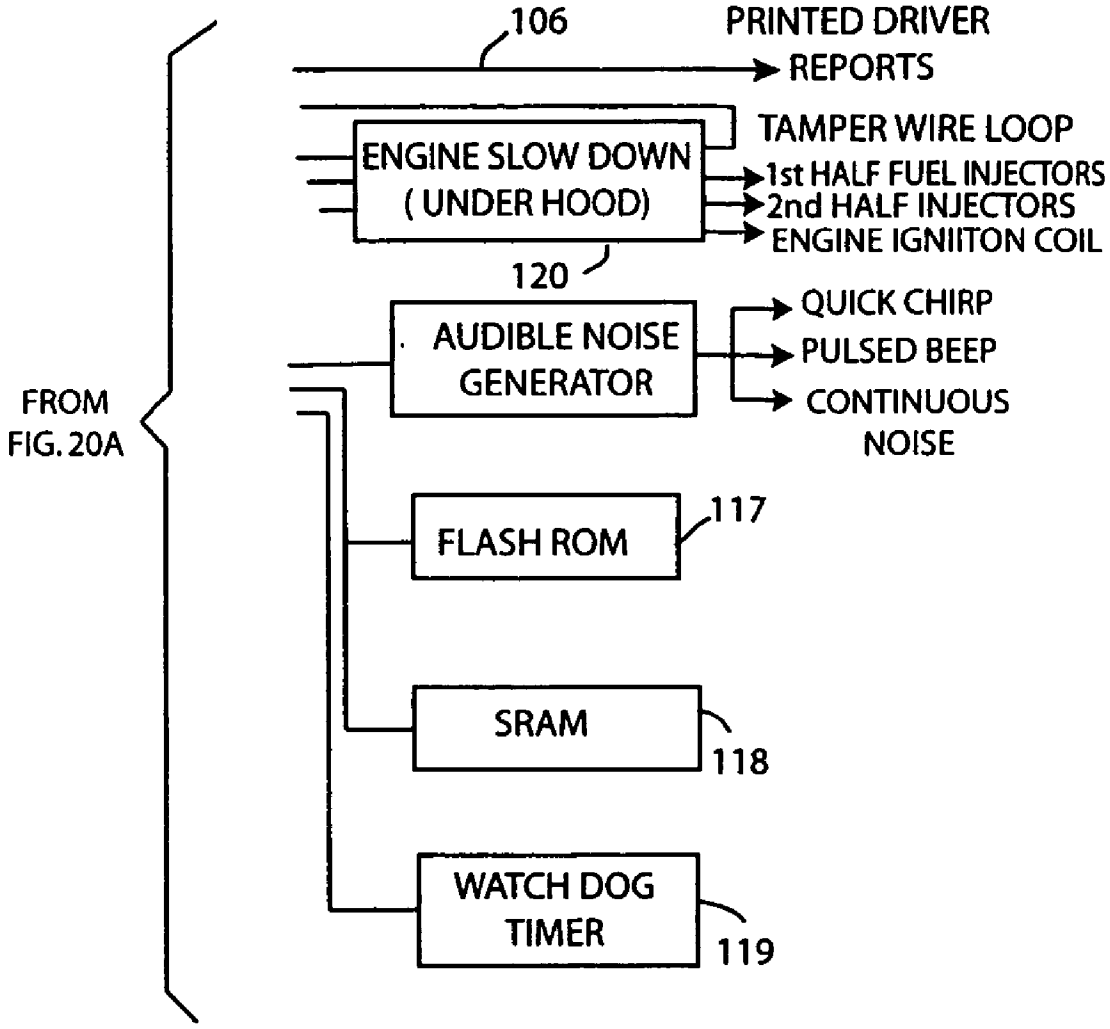
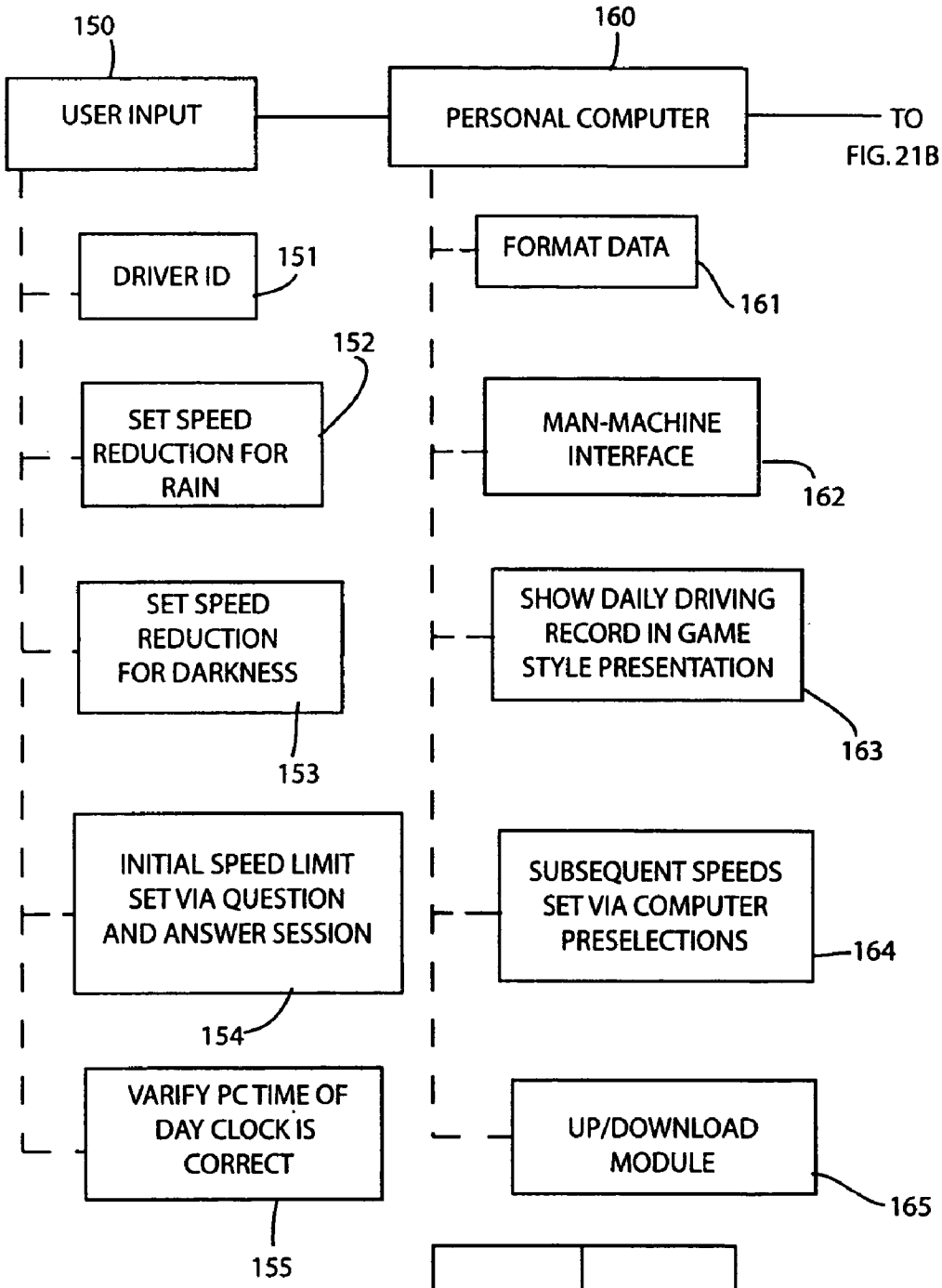

106
PRINTED DRIVER REPORTS
TAMPER WIRE LOOP
ENGINE SLOW DOWN (UNDER HOOD)
1st HALF FUEL INJECTORS
2nd HALF INJECTORS
ENGINE IGNIITON COIL
120
AUDIBLE NOISE GENERATOR
QUICK CHIRP
PULSED BEEP
CONTINUOUS NOISE
FROM FIG. 20A
FLASH ROM
117
SRAM
118
WATCH DOG TIMER
119

FIG. 21 A



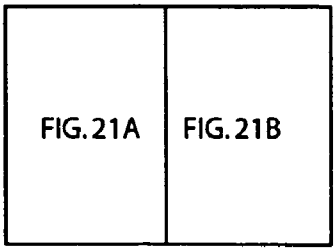


FIG. 21

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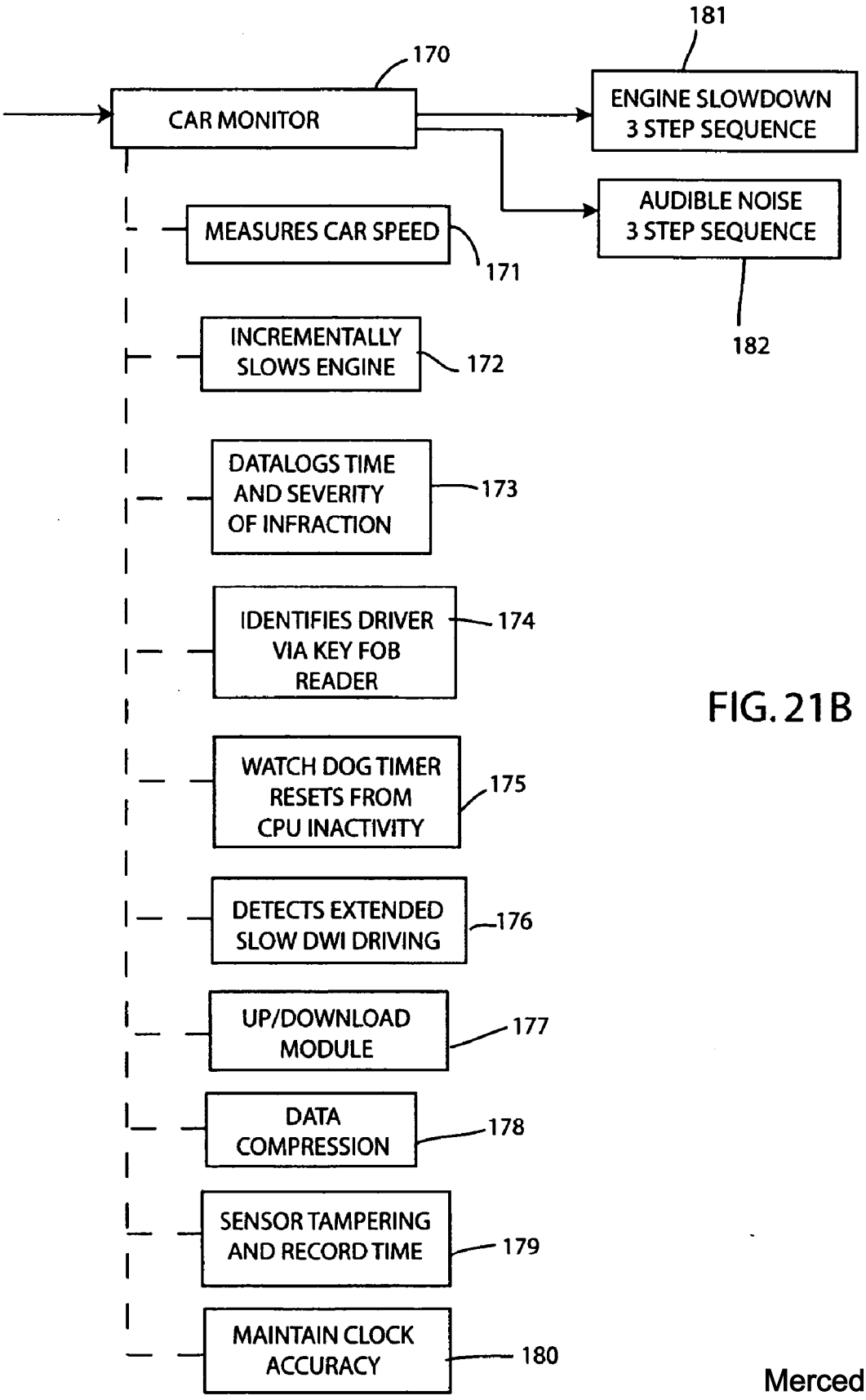


FIG. 21B

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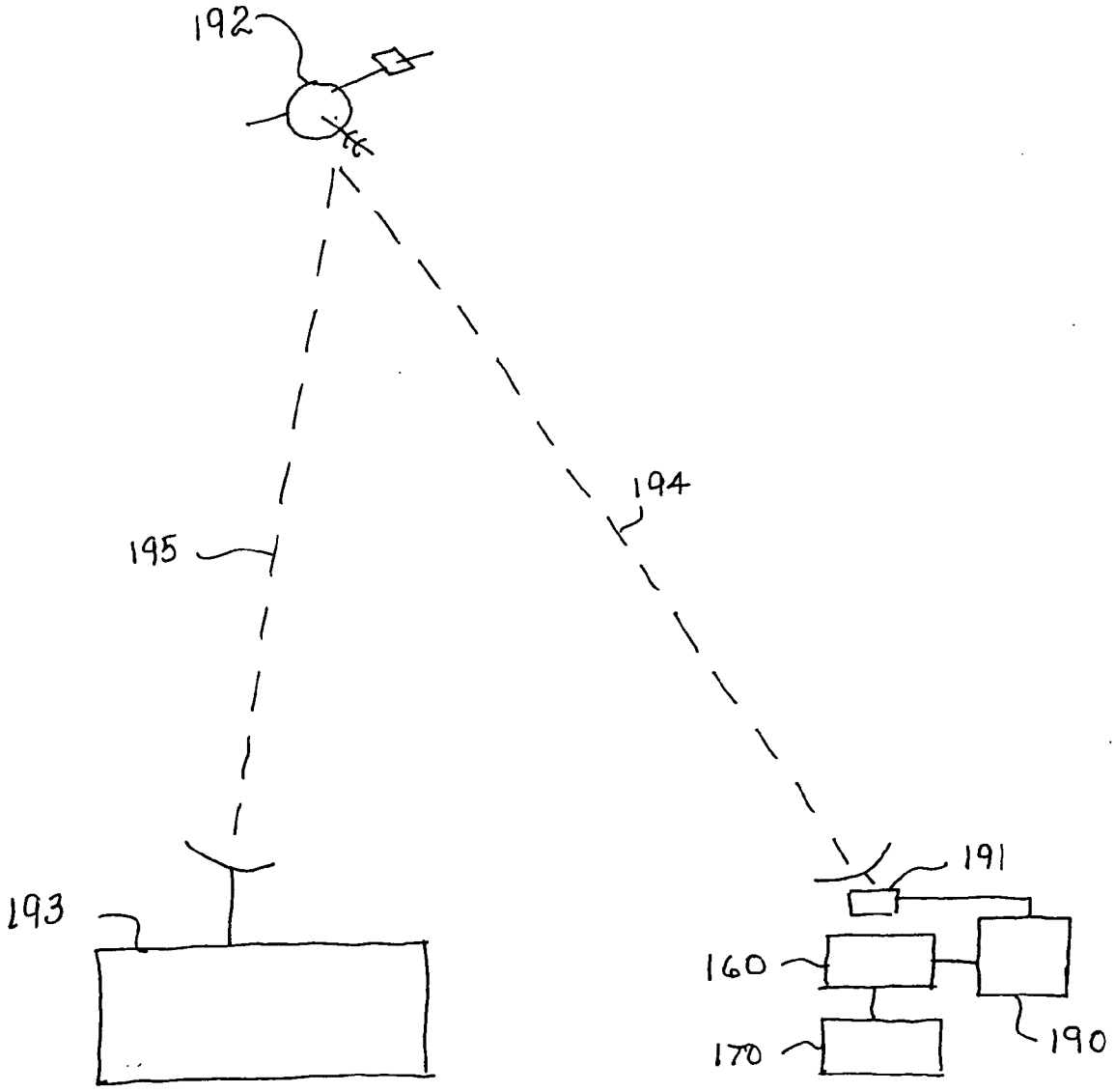


FIG. 22

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ELECTRONIC PROGRAMMABLE SPEED LIMITER

[0001] This application is a Continuation-In-Part of application Ser. No. 09/695,443, by the same two inventors, entitled "Electronic Programmable Speed Limiter" and filed Jun. 19, 2001. A claim of priority is made as to the substance and filing date of this application.

BACKGROUND

[0002] A major problem on the highways of the United States and other developed countries is the amount of vehicular traffic on the road. Not only are there an ever increasing amount of vehicles but the excessive speed at which they are traveling is increasing. This is due to political reasons, the raising of speed limits, commercial reasons, the commercial sector advocating higher speeds for interstate trucking and the very technological advances in the vehicles, both private and commercial, themselves.

[0003] The excessive speed of vehicles is the main contributor to accidents in general as well as injury and death associated with accidents when they occur. Therefore, to reduce highway accidents and deaths, this excessive speed of vehicles must be lessened. Reducing the excessive speed of vehicles, studies show, decreases the frequency and severity of accidents. There is a population segment which is at higher risk of accidents likely due to excessive speed. It is the purpose of this invention to limit the speed of vehicles of the at risk driver which will decrease accident frequency and severity within this population.

[0004] Driving faster than road conditions allow is involved in a large percentage of automobile and truck accidents. In addition, when an accident occurs at higher speed the risk of injury of the at-risk driver and others is increased. The instant invention will re-educate drivers to drive slower which will decrease accident frequency and severity. Novice drivers are especially at increased risk due to their undeveloped driving skills and their limited ability to judge risk. The novice group has been identified as significantly at risk and this is reflected in higher insurance premiums. The instant invention, a programmable speed governor, allows the vehicle owner to prospectively program a limit to the speed of the car in which it is installed. Additionally, the memory capability and driving database generated by the device allows for a review of compliance with the speed limiting governor. This review may be preferred for various reasons including insurance, liability and legal reasons and allows for an education of the driver in order to decrease speed and, hopefully, accident frequency and severity.

[0005] There is substantial research associating increased speed with an increase in the risk of collision with another vehicle or object. These higher speeds also contribute substantially to a higher risk of injury and death when an accident occurs. In a 1995 study, Cooper et al found excessive speed to be the violation most commonly involved in accidents resulting in injuries or fatalities. In the study of novice drivers, forty-one percent (41%) of those having had an accident claim had recent prior convictions for driving violations. Additionally, excessive speed was involved with sixty-nine percent (69%) of these violations with an additional seventeen percent (17%) including citations for failure to obey traffic controls (or running red lights and stop signs) which is often associated with speeding. In those accidents which produced casualties, forty-two percent (42%) of drivers had recent prior convictions for driving violations, the vast majority of which was for speeding. Cooper et al concluded that prior convictions, mostly for speeding, is a very good predictor and early warning system for novice drivers whom are likely to be involved in automobile accidents. The data strongly suggests that the prevention of speeding will lead to an immediate decrease in the accident rate as well as the cost to property. These statistics can be used to develop intervention strategies to decrease the likelihood of auto accidents resulting in injury or death. An additional finding of the study by Cooper et al was that novice drivers involved in accidents where they (as opposed to another party) were found to be at fault were likely to be driving either (i) for pleasure or (ii) to and from work in a car for which they were neither the principal operator of the car nor the owner of the car. This suggests that in most accident cases involving a novice driver, they are most likely driving their parent's car to go to or from a job or were just "cruising". The parent, whose car is being driven, thus has a vested interest in having an ability to prevent violations which result in an increase in accident risk.

[0006] The higher incidence of accidents among young drivers has been attributed to risk taking attitudes manifested as reckless driving, particularly speeding and tailgating. The urge for risk taking and sensation seeking peaks during the late adolescence and, coupled with a lack of driving experience, which prevents novice drivers from accurately calculating or perceiving the risks involved with their driving style, is clearly a deadly combination. A study in 1993 in Los Angeles found that drivers eighteen to thirty were more likely to report speeding often or most of the time than drivers in other and older age groups. Specifically, drivers aged eighteen to thirty report speeding "often" (60% of the time) with thirty-one percent (31%) reporting running a red light in the past month a violation often accompanying speeding. The study went on to report that drivers admitting they drove after drinking alcohol were significantly more likely to speed and run red lights. The inability of youth to appreciate the horrors of risk taking in a vehicle, often accentuated by alcohol, likely contributes to these attitudes. Alcohol is either a "cause" of accidents by preventing the driver from assessing the situation correctly or a "contributor" to the risk taking associated especially with younger drivers. If one can limit the speed of the vehicles, then a clearer understanding of what contributes to or causes an accident can be attained. In addition, an accident at lower speed will result In less property and personal damage and injury.

[0007] Who then can be said to be a potential user or market for the programmable speed limiter? Certainly the parent or principal vehicle owner can be said to have a vested interest in decreasing the risk of his or her son or daughter having an accident with their vehicle. Decreasing the speed of a vehicle one's own child is driving effectively reduces the chance of injury or death of said child. In addition, the ability of the parent to use the instant invention to monitor driving performance is a prerequisite to education of the child about driving risks to result in fewer violations and/or accidents and lower costs of ownership of the vehicles.

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[0008] Another use of the instant invention are owners of vehicles who have a high violation record index and are said to be "at risk" drivers. Courts can impose the restriction of having a speed governor on one's car if one has a bad driving record yet needs to keep driving to keep a job or the like. The judiciary currently imposes restrictions on these drivers such as breath analyzers, which can stop the vehicles motor, for drunk driving convictions. The National Highway Traffic Safety Administration has considered, and some states have imposed, provisional driver licensing guideline among its efforts to reduce the public safety hazard of the risk taking and novice driver. As the restriction imposed by the instant invention is on the car, not the driver, it would be easier to enforce. The authorities could demand the insertion of the programmable speed limiter and the driver could not alter it resulting in forced, reviewable compliance.

[0009] Yet another market exists for the instant invention among companies who hire drivers for commercial purposes. This ranges from couriers to interstate trailer trucks and limiting the speed of the commercial vehicles would bring a welcome sigh of relief to the segment of the population that must travel on interstates. Incredibly, motor vehicle injuries account for one third (33%) of the work related deaths and therefore, decreasing the number of accidents would directly affect worker safety. The present check on interstate rigs is for viewers of the infractions to call 800 numbers, which is estimated that only result in about 10% of the infractions being reported. In addition, the driver always can argue that the complainant was wrong and there is no factual evidence to refute it. With the instant invention, the memory capability of the speed governor allows for a permanent record of the drivers possible violations. It would identify individual driving habits which should afford the fleet owner the ability to improve driver safety, likely decrease accidents and violations resulting in significant insurance property, workman's compensation and liability insurance savings.

[0010] The instant invention also contemplates the ability to employ GPS technology in its overall control system by making it remote and location sensitive. Both the computer part of the moderator and the car monitor can be used together with the GPS technology to slow the car down in certain areas such as school zones or construction zones. A sensor can monitor special electronic warning alarms established by the highway department of the area so as to automatically limit the speed of the vehicle.

BACKGROUND ART

[0011] There have been attempts to regulate the speed of motor vehicles in the past but none have been successful. There have been attempts to sense the speed of a vehicle with a pulse width digital signal train that is fed into an analog linear circuit and a DC voltage proportional to the speed is produced. This common practice of pulse width integration to obtain a voltage proportional to speed has been around for many, many years. The method lends itself to operational amplifiers and analog computing The instant device counts clock cycles between rising edges as well as any other part, such as the falling edges or even voltage levels, of the square wave coming from an additional wheel sensor similar to the antilock ABS sensors on one of the wheels. This digital computer version of speed detection is unique when used with the other features of the device. It is contemplated to put a sensor like the ABS sensor on the same cog but around the axle axis a few degrees.

[0012] Other devices use a reference speed which is inputted to a keyboard device via thumbwheels. Devices like this use an expensive computer with sophisticated man/machine interface. The use of a remote controller to do the man/machine interface in the present application is unique because it allows for a smaller and less costly mobile unit.

[0013] One of the problems with the earlier devices is that they didn't have the computing power now available and did not foresee the need for such. The older components used did not have the sophistication of an X-scale (Intel) processor.

[0014] In U.S. Pat. No. 3,878,915 a speed-limiting device is disclosed. The device senses the speed of a vehicle with a pulse width digital train that is fed into an analog linear circuit and a DC voltage proportional to the speed is produced. It was common practice of pulse width integration to obtain a voltage proportional to speed and this idea is well know. The method lends itself to operational amplifiers and analog computing. The instant device counts clock cycles between square waves coming form an antilock type sensor on one of the vehicle wheels or axles or from another digital speed sense location on the drive chain, i.e., it is a digital detection of speed. The instant device determines the maximum speed profile by the use of the driver's unique number encoded through the key fob. With the prior art, the code entry only happens at one point, namely the beginning of the trip. It does not allow for shutting down the vehicle only after exhaustive attempts have been made to get the driver to slow the vehicle over many days. In addition, in the prior patent the code entry into the device only happens at the start of the trip as opposed to the instant invention where it intervenes at any point along the journey where excessive speed is present. Each of the drivers allowed to drive the vehicle have a table of speeds and times and conditional codes that determine the maximum speed given a set of real world conditions. The table also contains values that configure the severity and quickness with which the computer moves through the increasingly punative disincentives, the last of which is to shut down the engine. The instant invention has a remote keypad which is really the keypad of the PC. The term "predetermined timing schedule" in the prior art patent is vague and unclear. The instant invention targets several time blocks for maximum speed reduction and for vehicle operation. The use of thumbwheels on the prior art device does not function as well as the means used in the instant invention. The prior art device also requires recycling of the code whereas in the instant invention the code is selectable over a wide range. Unlike the prior art device, the invention does not produce a speed signal but rather loads a register with a count from the speed sensor that is integral with the antilock brake device or other sensor. The correction for vehicle speed versus calibrated miles per hour is a number loaded via the infrared "IR" link. As alternative to infrared link, the instant device can use a radio link in addition to the infrared capability.

[0015] The instant device allows for the authority figure to be a player in the process unlike the prior art. This is accomplished by the delayed download of the limiting information to dictate the operation of the vehicle. This limiting information is contingent on the driver successfully

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operating the vehicle reasonably under varying conditions. The idea of how many and how long these excursions out of the pre-selected boundaries are allowed will vary from driver to driver and are inputted via the home PC software. The prior art device has no ability to make such a decision nor does it have a record of the driver over time. The only way it could function is to allow the driver to drive in a "passing" mode every few seconds which is unrealistic.

[0016] In the program, the reference speed is inputted to a keyboard device. While this may appear to be similar to the instant invention it is not as the instant invention uses a keyboard entry on a more expensive and complicated computer with a more complex man/machine interface. The use of a remote computer to do the man/machine interface is novel because it takes the cost and size burden off the mobile unit. As the unit has no keyboard and visual screen it is much less complicated to build and thus has more utility per dollar. The more expensive computer can be shared with other functions and the cost amortized. It uses all the 3D graphics and the audio functions as the home PC to more effectively communicate with the user of the device by incorporating an interactive video game interface. This video game interface uses physics simulation techniques to create an imaginary 3 dimensional world on the PC screen whose purpose is to engage the young driver and use the attention gained to educate the driver in safer driving practices. The video game will have two parts. The first part will be to entertain the user and to direct the young driver to their daily driving infractions. The software then uses the cumulative daily infraction data as the basis for deciding whether the driver needs driver education. It the driver needs education, based on the infraction history, the driver is directed to watch driver education films. The last portion of the video game software will generate the next day's settings for speed and delta times between Shutdown options and the level of intervention based on its internal trust coefficient. The trust coefficient is a cumulative number that provides a steady progression from starting an untrusted driver to a fully trusted mature driver. Finally, there are two parts to the present devices software. The first part allows for setting all the parameters for vehicle operation. The second part being the video education software. Finally, U.S. Pat. No. 3,878,915 does not mention the detection of rain or darkness as additional speed controlling factors.

BRIEF DESCRIPTION OF THE INVENTION

[0017] The instant invention utilizes a programmable circuit which has an n-X-scale (Intel) micro controller therein to operate a circuit which integrates peripherals such as a memory controller, a programmable input and output, a timer and serial controller to increase system functionality and lower cost. The entire CPU circuit is mounted in a vehicle near the steering wheel where the key fob of the particular driver can be inserted for driver identification. There is an optional device that extends the key fob reader portion of the device close to the ignition location of the vehicle in cases where mounting the Moderator under the dash unit would not be acceptable aesthetically. This extension box contains the optoelectronic components necessary to read the unique number of the inserted key fob and mounts usually with industrial permanent tape or strong magnet near the ignition switch. This avoids drilling holes in the interior of the vehicle and doing permanent damage. There is an electronic box mounted forward of the firewall that contains the module specific for the brand of the vehicle. The CPU module is wired to the under the hood box and a connection to that wiring in the back of the dash mounting holder. The holder guides the CPU modules into the connector as the CPU module is inserted into the holder. The programmable unit is contained in a module which controls the speed of the vehicle and the memory function of the module itself. The unit is essentially a hand-held computer that is an integrated, low-voltage, single chip implementation of a high-performance 32 bit, X-scale compatible microprocessor with the extra logic needed for PC/AT-compatible PCs. It has a AMD386 or more advanced chip CPU core with a memory control unit, ISA bus controller and peripheral control logic.

[0018] The software has two parts. The first allows for setting all the parameters for operation. These parameters allow for multiple drivers in multiple scenarios. The detection of rain and darkness and tampering and are inputted to allow them to affect the operation of the vehicle at different times and to report to the parent or administrator the conditions at the time of an infraction. This information to the parent or administrator is invaluable in making judgment calls in training the young driver in safe driving under these conditions. The driver does not have to remember codes as that function is now performed by the key fob function which identifies to the mobile computer who was or is about to operate the vehicle. This semi-automatic identification of who was driving eliminated two main problems with codes the first of which was forgetting the code. The second problem eliminated the need for an addition of a keypad and associated electronic hardware requiring a circuit de-bounce. The key fob allows the device to be mounted in an inconspicuous place and it can be inserted by feel alone. The owner of the software to program the mobile unit has the password right to enter the code.

[0019] Maximum speeds are generally determined by the codes entered.

[0020] However, the new, improved version of the invention, called a moderator, has a global positioning receiver linked to the CPU that receives the location of the vehicle from the GPS satellite system. The Moderator uses a linked mapping capability and database, located within a central server or within the Moderator or both, that allows the location data to identify the roadway section where the vehicle is located and the speed data of that portion of the roadway. This data is compressed in code to reduce the file size of this database. If a centrally located database is used, the data is sent via a remote wireless connection between the central database and the vehicle and the Moderator. Use of the speed data uploaded through this GPS wireless connection by the Moderator is prearranged by the administrator of the Moderator software program. Otherwise, the maximum speeds are prepared and determined by the owner. The Moderator is able to make the following responses to the car going faster than the speed limit as registered in the database programmed by the software.

[0021] 1. Audible chirp

[0022] 2. Voice warning explaining the set speed limit on that section of road and the consequences to the driving record.

[0023] 3. Voice warning that the parameters were set to not allow speeding in that speed zone (i.e., in a school zone there will be no allowance for passing speeds)

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[0024] 4. Audible noise alarm at approximately 60 dB noise level (in order to annoy the driver.)

[0025] 5. Shutdown of the first half of the fuel injectors of the engine.

[0026] 6. Square wave enable to the second half of the fuel injectors to almost kill the engine.

[0027] 7. Shutoff of the ignition.

Each of these responses will be on a preset time schedule based on the driving conditions, the driver's previous experience with the Moderator (the given driver's driving record database with the Moderator), and the administrator's choices within the software program for the Moderator. The administrator may elect all or only some of the options. For instance, the default for the Moderator will be to not have the ability to shut off the ignition unless this option is specifically chosen by the administrator with verification and appropriate warning regarding ignition shut down. There is a capability to progressively shorten the time interval between the above listed seven options or even to skip some options, depending on the choices made within the software programming, with more infractions in a given driving session generally resulting in a shorter time interval between options and a more rapid enforcement of up to all seven options by the Moderator.

[0028] Measures 1 through 7 will be preset based on a given driver's driving history as recorded in the Moderator's driving record database for that driver in combination with the administrator's wishes for how to react to an infraction (the software programming noted in the paragraph above.) The goal is to modify the behavior of the driver in a more permanent way than simply putting a speed governor on the engine that limits the maximum speed. This flexibility in the software programming will allow for a different response for differently skilled drivers and personality types. The overall focus is re-training the driver while staying within a safe operating speed for the given driver's driving experience.

[0029] The instant device does not totally disable the vehicle, as that could produce a dangerous situation, but rather allows two or more "reduced power" modes of operation to take over. The car will drive in the "valet mode" (10 to 15 mph) a speed that would likely result in a significant accident. The instant device will shut down the car only after exhaustive attempts by the electronic module to get the driver to slow the car down to the prescribed driving speed profile. The present device intervenes during a journey where bad driving is present. It does not kill the engine as most cars today have power steering and power brakes, which, if rendered inoperative, would require the driver to use more strength to bring the vehicle to the highway shoulder safely and would produce an unsafe situation. The instant device also changes the speed profile at certain multiple times of the day such as at dark, when it is raining, at closing time of clubs during the weekend or at times when the driver is not given the privilege to drive.

[0030] The instant device utilizes input selector codes. The data is not coded going through the infrared link. It is literal data describing the numerous profiles of all the drivers under all the different driving conditions. The profile is set up in the instant device and inaccessible to the driver. It does not produce a speed signal rather a register is loaded with a count per pulse from the speed sensor that is integral with the antilock brake device or other sensor. This is a square wave with multiple toggles per wheel turn. The correction for vehicle speed versus calibrated miles per hour is a number loaded via the infra red or radio link. The device compares speed to a dynamic speed limit which is unique.

[0031] The instant device does not cut off the ignition but has a slow down sequence which has several levels of sophistication. The first level sounds a short burst or chirp but does not record the infraction. The second level of this is that the excess speed of the driver is recorded so that it can be reported to an authority figure. That authority figure is the driving force behind altering the activity of the driver. This allows the authority figure to provide back up to his or her decision making on the drivers' performance. Another incentive provided the driver is the provision of an annoying sound or noise when the speed desired is exceeded for the pre programmed time. The sound level of this annoyance is 60-65 db so that a real incentive is produced to stop speeding. A quick beep is followed by a buzzing or alarm which goes from intermittent to continuous through the remaining steps to slow the driver down. The next escalation is to turn off half of the fuel injectors to the engine which will automatically slow the vehicle down while maintaining sufficient power to maneuver and drive the vehicle at slower speeds. The next step involves shutting off the remaining fuel injectors with a prescribed on/off cycle which allows the vehicle to be pulled over to the side of the road and burn the hydrocarbons still in the engine. This step is a last resort after all the prior steps have been employed. The ignition can ultimately be turned off. This renders a completely intoxicated driver harmless to others and the vehicle inoperable. The power of the stored data is the power of the instant device. The information recorded by the device allows the authority figure to alter the future behavior.

[0032] The use of full power digital computer negates the need for a reference signal as found in the prior art devices. The information of the speed and desired speed is contained in ASCII form or is downloaded wirelessly in real time and is not subject to all the problems that were associated with old analog computers such as drift, stray capacitance, signal degradation due to thermal shifts of the operational amplifier and electrical cross-talk 60 cycle noise from the local environment.

[0033] In the prior art devices, there was no way to make a record to guide decisions about future programming. The present device allows for a driver to pass a controlled number of occurrences but at some point that ability will be curtailed. If the driver has a bad record the ability to "pass" will be limited or denied. In addition, it would be easy to by-pass the prior art system by hot wiring around it. In the instant invention, the wiring harness has decoy wiring that forms a loop through all the various electronic modules. If the looped wire that threads through all of the modules is broken for even a moment the event is recorded and documented.

[0034] While the instant device does accept a pulse train as the input, the approach of how it deduces the speed of the vehicle is much different. The instant system does not depend on the pulse width only in the time interval between rising edges of the square wave. This method is superior in that the frequency of the wave can increase beyond that of the earliest prior art. In earlier prior art devices, an analog

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computer is present which integrates the square wave and produces a voltage proportional to it.

OBJECT OF THE INVENTION

[0035] Accordingly, it is an object of this invention to provide an electronic programmable speed limiting device for motor vehicles, and

[0036] It is another object of this invention to provide a programmable electronic device for motor vehicles which also records the driving speed over a given period of time, and

[0037] It is another object of this invention to provide a means by which a parent can govern the speed of his or her car when it is being driven by a novice driver, and

[0038] A further object of this invention is to provide a safety device for the "at risk" segment of the driving public by limiting the speed of the motor vehicle they are driving by programming in a speed limit, by adjusting for driving history, by reassessing allowable speed during rain or darkness

[0039] A still further object of this invention is to use a remote computer to do the man/machine interface on a programmable electronic speed limiter for motor vehicles,

[0040] Yet another object of this invention is to provide a programmable speed controller which is partially governed by a GPS system, allowing for identification of the road and location of the vehicle for adjusting speed limits according to vehicle location in real time.

[0041] These and other objects of the invention will become apparent when reference is had to the accompanying drawings which;

[0042] **FIG. 1** is a screen showing the main control of the program with the emphasis on judicial information.

[0043] **FIG. 2** is the screen of **FIG. 1** now displaying judicial driver information such as the license number,

[0044] **FIG. 3** is a screen displaying judicial information such as moving violations,

[0045] **FIG. 4** is a screen displaying judicial information such as alcohol related violations,

[0046] **FIG. 5** is a screen displaying the "save driver information" key,

[0047] **FIG. 6** is a screen displaying the screen of **FIG. 1** with the emphasis on parental information,

[0048] **FIG. 7** is a screen displaying parental information and license information,

[0049] **FIG. 8** is a screen displaying parental information as to preprogrammed status of driver and vehicle,

[0050] **FIG. 9** is a screen displaying saving parental information,

[0051] **FIG. 10** is a screen of **FIG. 1** and emphasizing commercial information,

[0052] **FIG. 11** is a screen displaying commercial driver information,

[0053] **FIG. 12** is a screen displaying commercial driver record information,

[0054] **FIG. 13** is a screen displaying saving the commercial driver information,

[0055] **FIG. 14** is a top view of the module for containing the mobile unit of this invention,

[0056] **FIG. 15** is a side view of the module of **FIG. 14**,

[0057] **FIG. 16** is a front view of the module of **FIG. 15**,

[0058] **FIG. 17** is a top view of the module similar to **FIG. 14** but showing the location of the wiring, alarm and infrared communications component

[0059] **FIG. 18** is a side view of **FIG. 17**.

[0060] **FIG. 19** is a front view of **FIG. 17**.

[0061] **FIG. 20** is a functional diagram of the operating system of this invention showing the various components in a diagrammatic view, and

[0062] **FIG. 21** is a functional diagram of the system of the instant invention showing the user input, personal computer, car monitor and warning and slowdown function relationship and

[0063] **FIG. 22** is a diagram of the moderator of this invention showing it receiving signals from a GPS satellite which provides location data to the computer.

DETAILED DESCRIPTION OF THE DRAWINGS

[0064] **FIGS. 1-13** show the operating program on a PC used by the operator of this system to preprogram the operating scenario for the various drivers and conditions. The system show four data bases, namely Judicial Information, Parental Information, Commercial Information and Statistical Information.

[0065] **FIG. 2** shows the screen for input of Judicial driver Information. As shown, the information can take the form of name, age, gender, operator's permit number and state of issuance.

[0066] **FIG. 3** shows a continuing screen for other information such as the number of moving violations that driver has received within the last five years.

[0067] **FIG. 4** shows a continuing screen showing the number of alcohol related violations the driver has received with the last five years and **FIG. 5** is a SAVE function screen for saving the inputted information of **FIGS. 2-4**.

[0068] **FIG. 6** shows the screen of **FIG. 1** again with the emphasis on "Parental Information" this time. **FIG. 7** shows the relationship of the driver to the parent as father and son and **FIG. 8** shows an input for the parent to make to help the system arrive at a pre-programmed operation for the son. Note that a lot of "fine tuning" is available such as speed limiters for certain late hours and accommodation for certain demonstrated responsibility levels. **FIG. 9** shows the SAVE function screen for the date entered under Parental Information. **FIG. 10** shows the screen of **FIG. 1** again with emphasis on Commercial Information. Like in the situation with a Judicial driver information, **FIG. 11** shows the input for a commercial driver including status and driving history. It also notes whether the driver is full time or part time.

[0069] **FIG. 12** shows an added input screen for entering alcohol history of driver into program as well as driving

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speed at certain hours of the day. **FIG. 13** is the SAVE screen for entering the data of **FIGS. 11 and 12**.

[**0070**] **FIG. 14** shows the basic module of this invention which is secured near the steering wheel within the car and is generally denoted as **10**. It consists of a permanently mounted lower portion **11** with securing flanges **12** and **13** and a removable portion **14** which contains certain programmable components. A design **15** is on the front cover of the removable portion. A microprocessor (not shown) is placed inside the unit **10** and the wiring therefore is located within the removable portion **14** as shown in **FIG. 17** which shows the wiring and internal shape of the unit. Holes **16** are located in the front cover and serve to allow the sound from a 70 dB alarm to escape from the unit to warn the driver of programmed limitations on his or her exceeding them. Also located in the base unit is the connection **18** to the electrical system of the automobile. Depending on the preprogrammed instructions the connection can transmit instructions to slowly shut down the injector banks, about half at a time. It also carries the signals that sense rain and darkness, any attempt at tampering and the information form reading the shaft speed with a pulse train. **FIGS. 18 and 19** show the side and front views, respectively, of the unit with the holes **16** and connection **18**. **FIG. 15** shows the side view of the unit of **FIG. 14** and the unit is mounted, by bolts, U-bolts or other suitable fastening means near the steering wheel of the vehicle it is being placed in. Referring now to **FIGS. 20 and 21** there is shown an overall diagrammatic view of the functional circuit that operates the system.

[**0071**] **FIG. 20** shows the overall component diagrammatic layout of the system. The system is designated overall as **100**. It utilizes a central microprocessor **101** which can be one of the E86 microcontrollers from AMD. Essentially it would be an AM 186 EM high performance unit with enhanced peripherals with a highly integrated design, integrated PC/AT compatibility. Enhanced AM 386 CPU core and built-in power management.

[**0072**] A personal computer **102** is used to input information into the unit. Owner information **103** is placed into the unit along with information on CD ROM auto loading software **105**. A data encryption function **104** is used and output from the PC **102** can be downloaded into personal driver reports at **106**. The PC **102** is connected to the microprocessor **101** by serial infrared link **107**.

[**0073**] Connected to the microprocessor **101** are automobile speed sensors **108** which sense the actual speed of the automobile when in use. Also connected to **101** is a key fob reader which checks the identity of the user of the automobile to insure the instant user's data table is used. Components **110**, **111**, and **112** are the power conditioning unit, the battery pack and a battery charger. These components can be used to charge up the unit.

[**0074**] A clock unit **113** is also connected to the microprocessor and provision is also made for a GPS unit **114** for instant location information on the position of the vehicle on a predetermined grid.

[**0075**] Darkness sensor **115** and Rain sensor **116** are also connected to the microprocessor to supply data on the amount of light and whether the conditions are wet.

[**0076**] Also connected to the microprocessor are Flash Memory **117**, SRAM **118** and a watch dog timer **119**. The functions of these components have been described.

[**0077**] To facilitate needed action based on the actual sensor data and the preprogrammed driving program and engine slow down module **120** is provided which can initially cut our one half of the engine fuel injectors, the remaining half of the injectors and totally cut off the ignition coil to slow and/or stop the vehicle.

[**0078**] An audible noise generator **121** is also connected to the microprocessor for provision of various warning noises such as a quick chirp, a pulsed beep and a continuous noise. These provide warnings of increasing severity to the driver of the vehicle.

[**0079**] **FIG. 21** shows the diagrammatic view of the functions of the drivers input, personal computer and car monitor. As shown the driver inputs of **150** include the drivers ID **151**, the set speed reduction for rainy conditions **152**, the set speed reduction for darkness **153**, the initial speed limit setting **154** as a result of the question and answer session and a verification means **155** to verify the PC time of day.

[**0080**] The personal computer **160** is used to enter Format Data **161**, to provide a man-machine interface **162**, to show the daily driving record **163** in game style presentation, to provide data **164** for subsequent speeds set via computer preselections and to provide function **165** upload/download the module.

[**0081**] The car monitor **170** includes the functions of measuring car speed **171**, incrementally slowing the car engine **172**, providing data logs of time and severity of infraction **173**, identifying driver via key fob reader **174**, provisions of a watch dog time reset **175** from CPU activity, to detect extended slow DUI driving **176**, to upload and download the module **177**, to provide data compression **178**, to sense tampering and record times **179** and to maintain clock assembly **180**.

[**0082**] The output of the system provides an engine slowdown **181** in a three step sequence and corresponding audible noise alarms **182**.

[**0083**] **FIG. 22** shows the monitor **170** and the computer **160** connected to receiver/transmitter **191** which can receive signals **194** from a GPS satellite which is also adapted to receive/transmit signals **195** from a central ISP unit **193**. The monitor **170** broadcasts locations signals to the satellite which checks with the central ISP unit **193** to ascertain whether it should slow down the vehicle or, in the alternative, give a warning of some kind. This feature helps the driver in a construction zone or school zone to react that much faster and before he or she is actually in the zone. If the driver does not notice the zone the alarm insures he or she is made cognizant of it. If the driver still does not slow the moderator can affect a slowing of the vehicle by itself.

[**0084**] Having described the preferred embodiment of the invention, it will be obvious to those of ordinary skill in the art to design other versions of this invention which are fully contemplated by the scope of the appended claims.

1. A system for specifically regulating the driving performance of a given individual by use of a computer from a server in a central location, said system comprising

a monitoring moderator means adapted to be attached to the vehicle the given individual is to drive,

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a data processing means having performance criteria preprogrammed therein and which relates to the driving performance history of said given individual associated with said moderator, said processing means operatively connected to said central server,

wireless transmitting means associated with said moderator to send signals representing location and speed data of said vehicle at any given time to said central server

engine control means associated with said data processing means and adapted to regulate operation of the engine of a vehicle in response to signals received from said central server via a GPS satellite system,

whereby the operation of a vehicle by said given individual can be preprogrammed, recorded and closely monitored remotely from a central server location by automatically curtailing operation of the vehicle when the received data exceeds preset or personalized limits of said individual driver.

2. A system as in claim 1 wherein said data processing means performance criteria includes a settable speed reduction for rainy conditions.

3. A system as in claim 1 wherein said data processing means performance criteria includes a maximum speed based on historical information on said given individual including his legal driving record.

4. A system as in claim 1 wherein said data processing means performance criteria includes a settable speed reduction for darkness.

5. A system as in claim 1 and including a monitoring means module which is comprised of two sections, one section containing a micro controller with an infrared link and/or radio link for a direct linkage with a PC and the other section being adapted to be permanently attached to the interior of a vehicle, said first section being removable from said vehicle and said second section.

6. A system as in claim 1 wherein said monitoring means includes an antilock type sensor and said data processing means includes a clock.

7. A system as in claim 1 wherein said monitoring means includes means to monitor the speed of said vehicle by counting clock cycles as an assessment of part of a square wave coming from an antilock type sensor on said vehicle.

8. A system for remotely monitoring and controlling the operation of a motor vehicle, said system including;

an electronic moderator means adapted to be mounted on a vehicle to be controlled and monitored,

sensor means connected to said moderator means and adapted to sense the speed of said vehicle,

data-link means on said electronic moderator by which control program data specific to a driver may be downloaded into a central database to create driving parameters for multiple drivers per vehicle,

wireless transmission means for transmitting the data on a vehicle and its location and speed back to said central database to create driving parameters for any given driver of said vehicle,

whereby the operation of said vehicle may be limited to preprogrammed parameters in terms of speed and other factors including the operators driving history or may be remotely set at the remote location.

9. A system as in claim 8 wherein said sensor means is also adapted to sense the presence of rainy conditions and said control program data is responsive to said rainy conditions being sensed by further limiting the parameters of the operation of said vehicle by said driver.

10. A system as in claim 8 wherein said sensor means is also adapted to sense darkness and said control program data is responsive to said data darkness being sensed by further limiting the parameters of the operation of said vehicle by said driver.

11. A system as in claim 8 including antilock type sensors and wherein said speed sensor means counts clock cycles at a point of the square wave coming from the antilock sensor on one of the vehicle wheels to give a digital detection of speed and loads a register integral with wheel speed sensor.

12. A system as in claim 8 wherein said electronic module means and said speed sensor means are programmed so that previously loaded vehicle operational limiting data is not downloaded into the PC based data screen until said driver has exceeded preprogrammed vehicle operation parameters.

13. A system as in claim 12 wherein said system additionally includes means to initially slow down said vehicle's operation by disabling a portion of its motor function when said initial vehicle operating parameters are exceeded by the driver.

14. A system as in claim 13 wherein said means to slow down said vehicle operation also is capable of stopping said vehicle if other preprogrammed parameters are not attained such as driving response time.

15. A system as in claim 13 wherein said system additionally includes means to provide an alarm prior to slowing down said vehicle by disabling a portion of it's motor.

16. A system as in claim 15 wherein said alarm takes the form of a human voice.

17. A system as in claim 8 wherein said system also includes means to automatically slow down the vehicle if the transmitted data indicates it is in a restricted area such as a school zone.

18. A system as in claim 8 wherein said moderator includes means to shut down up to and including one half of the vehicle's engines fuel injectors.

19. A system as in claim 18 wherein said means to slow down the motor operation includes means to turn off the remaining fuel injectors.

20. A system as in claim 15 wherein said means to provide an alarm has several levels, the first being to warn the driver with a quick sound or chirp before a date stamp is recorded, the second being adapted to warn of an impending shut off of a portion of the motor's fuel injectors, and at least one other adapted to warn the driver of a total shut off of the motor and/or ignition.

20. The method of remotely controlling a driver's operation of a motor vehicle by use of a preprogrammed moderator mounted on said vehicle and connected to the control circuit and motor of said vehicle, said method comprising

preprogramming said moderator with information relating to one or more of the following data groups,

judicial information on the designated driver, to include age, license type, and entire violation record and court history

parental information on the designated driver, to include parental inputs as to curfew times, maximum speeds at various times of the day and night

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commercial information on the designated driver, to include type of license, experience with the particular vehicle type, past training on the vehicle and total number of hours spent on vehicle type,

statistical information on the designated driver, to include age, gender, and length of driving time,

providing an identification function to enable the designated driver to start and operate said motor vehicle,

transmitting location and performance data on the vehicle as it is being driven,

continuously downloading the data corresponding to the operation of said motor vehicle by the driver during the operation of said motor vehicle, and

making any changes to said preprogramming necessitated by the previous driving record and/or providing alarms or shut down command to said driver and vehicle if the vehicle exceeds preset or location limits,

whereby a designated driver's continued operation of a motor vehicle may be monitored over time and corrective operation parameters programmed as needed.

* * * * *

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(12) **Patent Application Publication**

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(54) **ELECTRONIC DRIVER LOGGING SYSTEM AND METHOD**

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Related U.S. Application Data

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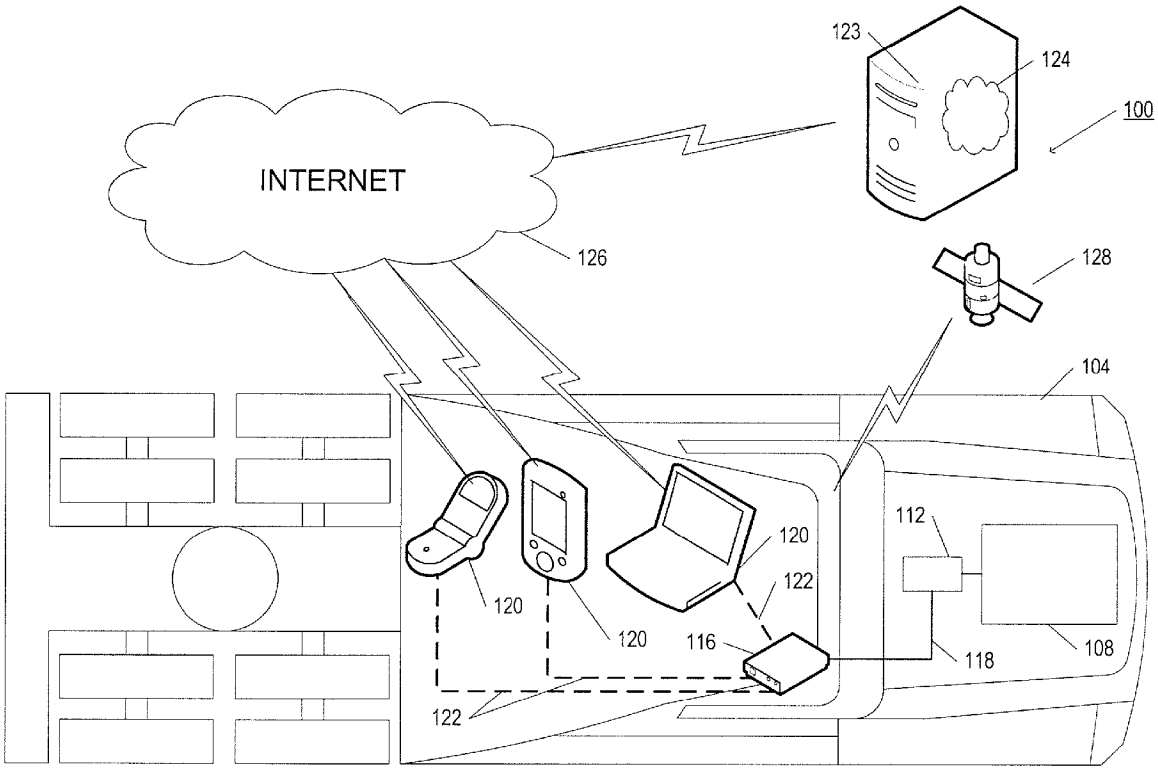
Publication Classification

(51) **Int. Cl.**
H04Q 7/22 (2006.01)

(52) **U.S. Cl.** **455/426.1**

(57) **ABSTRACT**

A system for logging performance of a driver operating a vehicle that has a vehicle information system from which least one vehicle operating parameter may be obtained. The vehicle operating parameter collected through the vehicle information system and operator information collected from a portable device are wirelessly communicated to a remote host through a network such as the Internet.



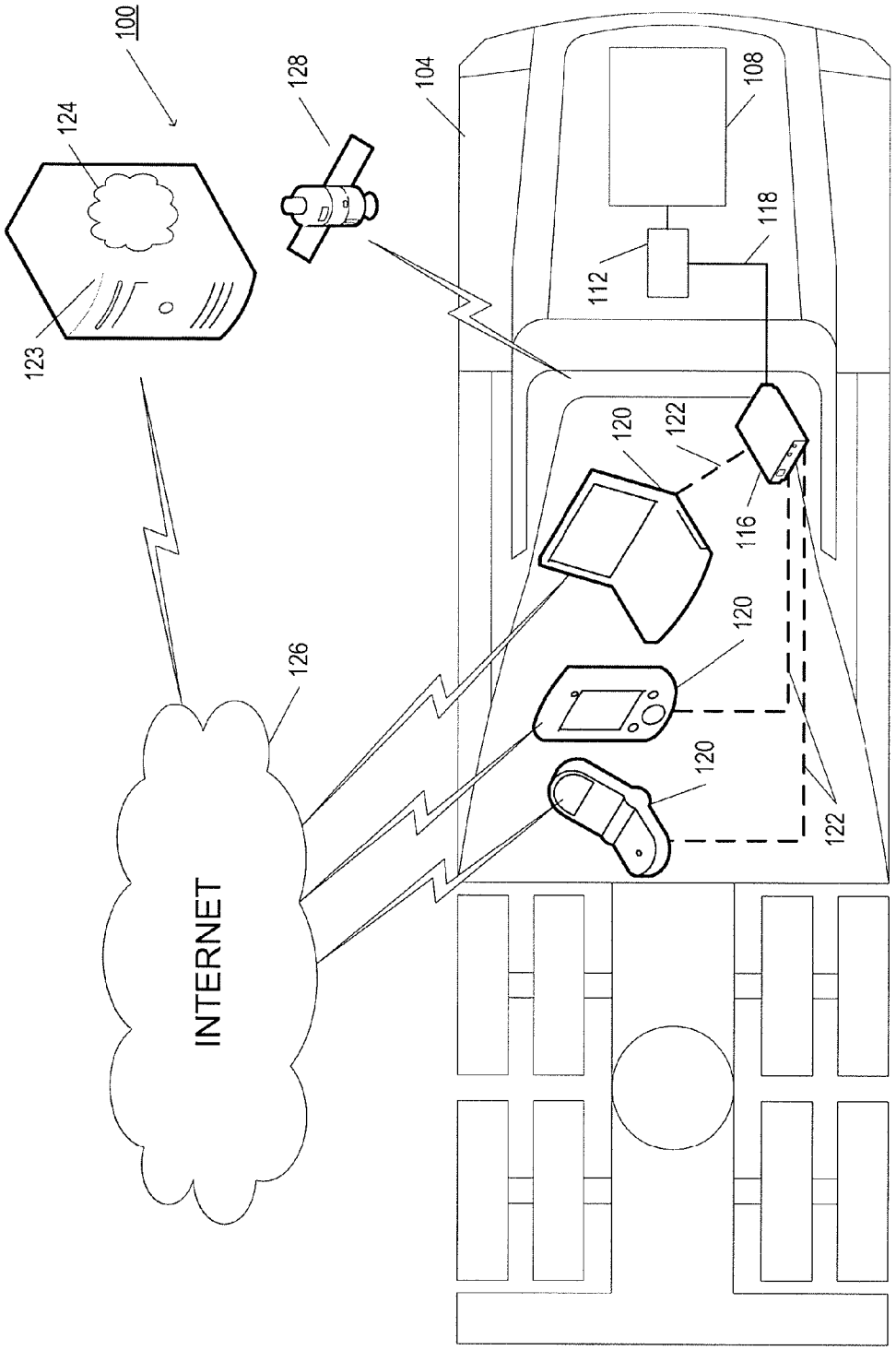

100
124
128
104
108
118
112
123
120
122
116
120
126
120
122
INTERNET

FIG. 1

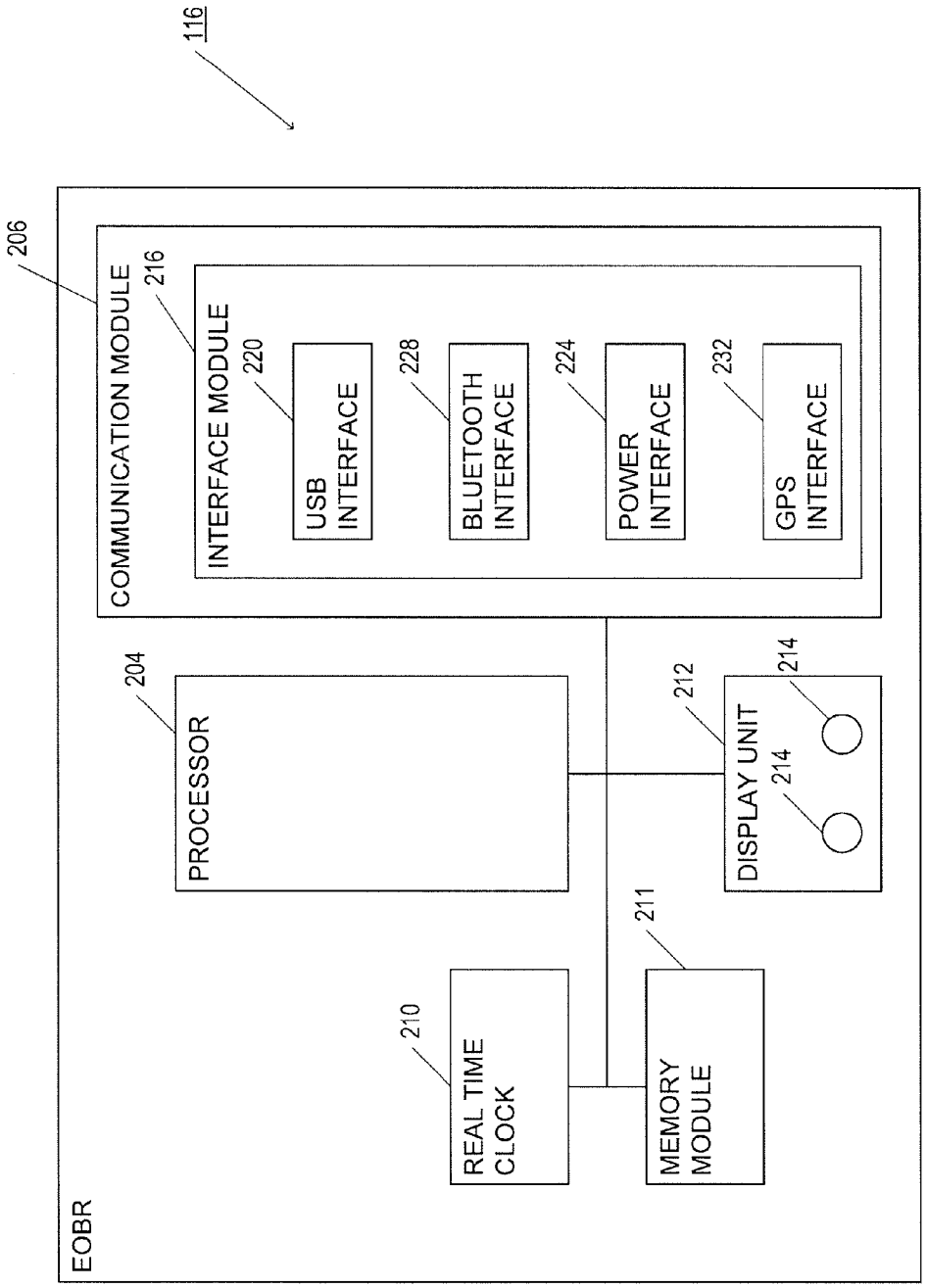

116
206
EOBR
COMMUNICATION MODULE
216
INTERFACE MODULE
220
USB INTERFACE
228
BLUETOOTH INTERFACE
224
POWER INTERFACE
232
GPS INTERFACE
204
PROCESSOR
212
DISPLAY UNIT
214
214
211
210
REAL TIME CLOCK
MEMORY MODULE

FIG. 2

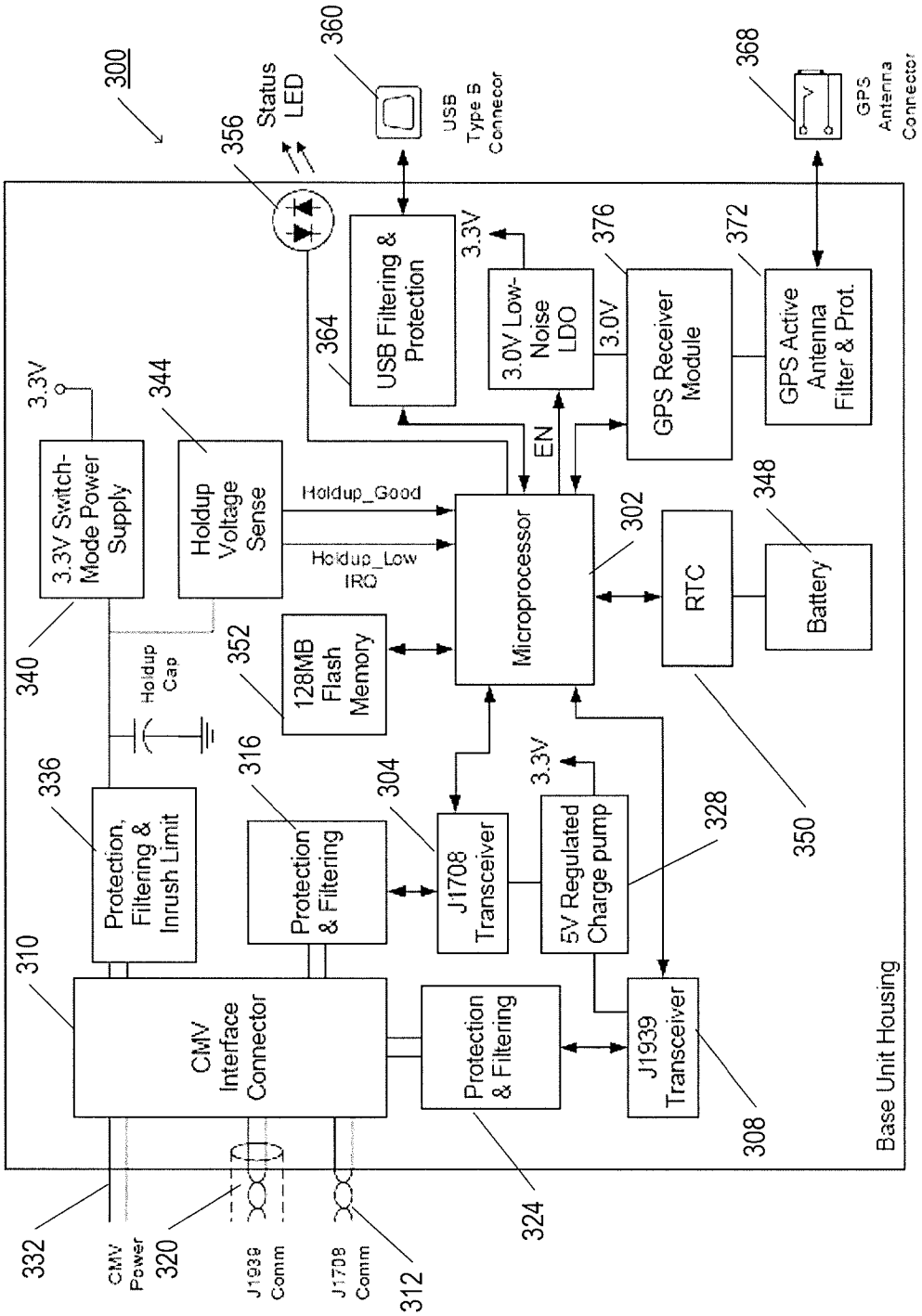

300
Status LED
356
360
USB Type B Connector
368
GPS Antenna Connector
USB Filtering & Protection
364
3.3V
3.0V Low-Noise LDO
376
3.0V
GPS Receiver Module
372
GPS Active Antenna Filter & Prot.
3.3V
344
3.3V Switch-Mode Power Supply
340
Holdup Voltage Sense
Holdup_Good
Holdup_Low IRQ
EN
Microprocessor
302
RTC
348
Battery
Holdup Cap
352
128MB Flash Memory
336
Protection, Filtering & Inrush Limit
316
Protection & Filtering
304
J1708 Transceiver
3.3V
5V Regulated Charge pump
328
350
310
CMV Interface Connector
Protection & Filtering
J1939 Transceiver
308
Base Unit Housing
332
CMV Power
320
J1939 Comm
J1708 Comm
312
324

FIG. 3

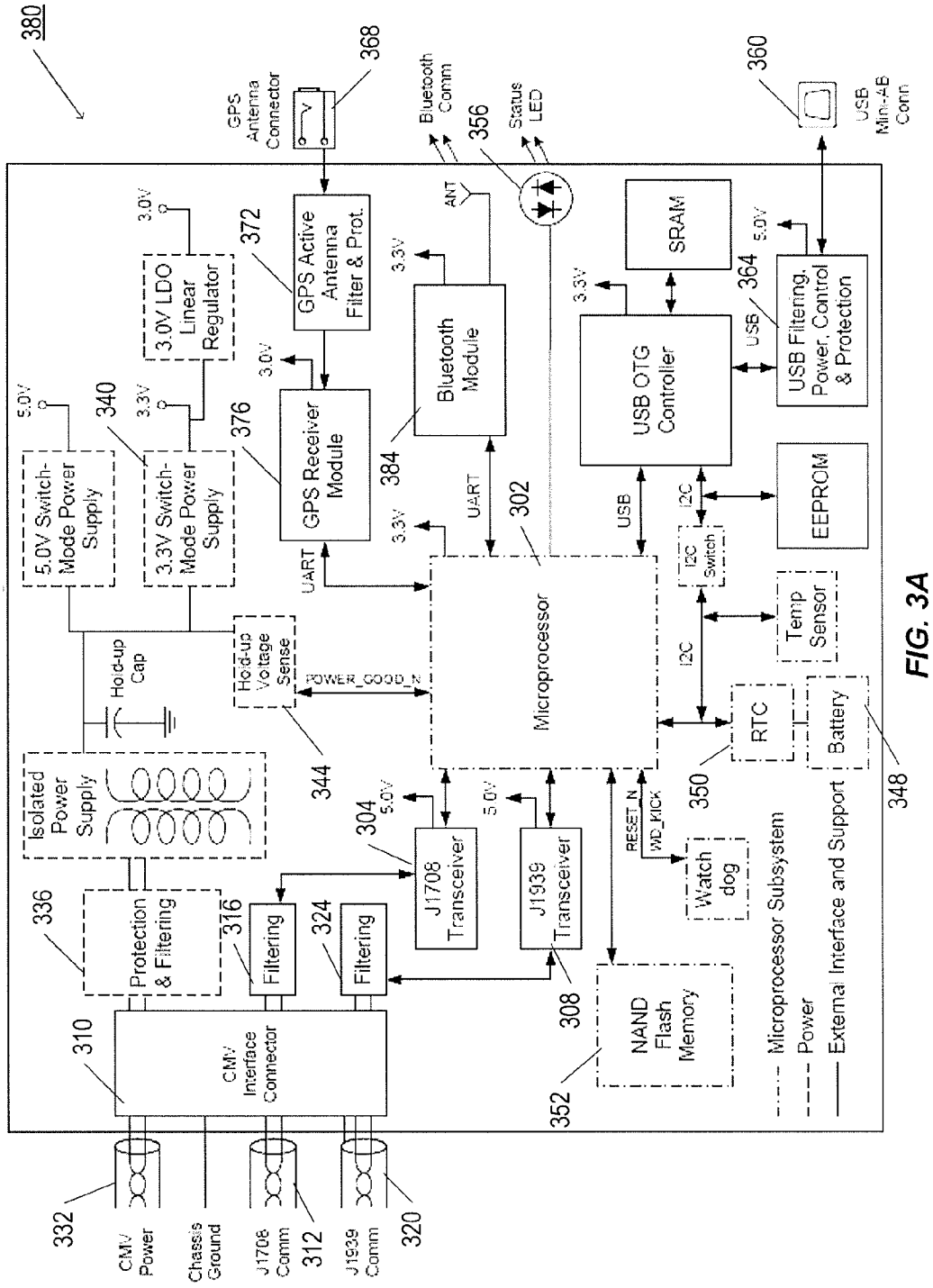

380
GPS Antenna Connector
368
Bluetooth Comm
Status LED
356
360
USB Mini-AB Conn
3.0V LDO Linear Regulator
372
GPS Active Antenna Filter & Prot.
ANT
Bluetooth Module
SRAM
USB OTG Controller
USB Filtering, Power, Control & Protection
5.0V Switch-Mode Power Supply
340
3.3V Switch-Mode Power Supply
376
GPS Receiver Module
384
UART
302
USB
I2C
I2C Switch
EEPROM
Hold-up Cap
Hold-up Voltage Sense
POWER_GOOD_IZ
344
Microprocessor
Temp Sensor
Isolated Power Supply
304
J1708 Transceiver
J1939 Transceiver
RESET_N
WD_KICK
Watch dog
RTC
350
Battery
348
336
Protection & Filtering
316
Filtering
324
Filtering
310
CMV Interface Connector
308
NAND Flash Memory
352
Microprocessor Subsystem
Power
External Interface and Support
332
CMV Power
Chassis Ground
J1708 Comm
312
J1939 Comm
320

FIG. 3A

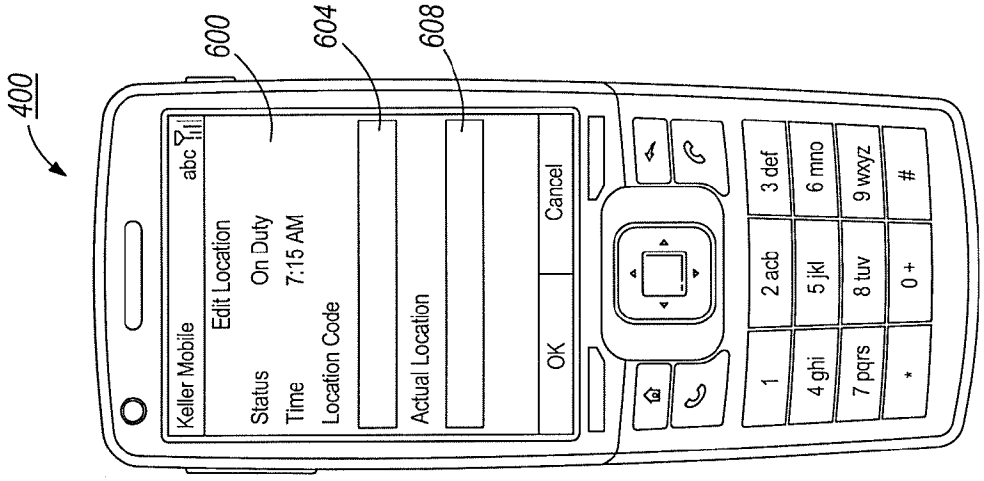


FIG. 6

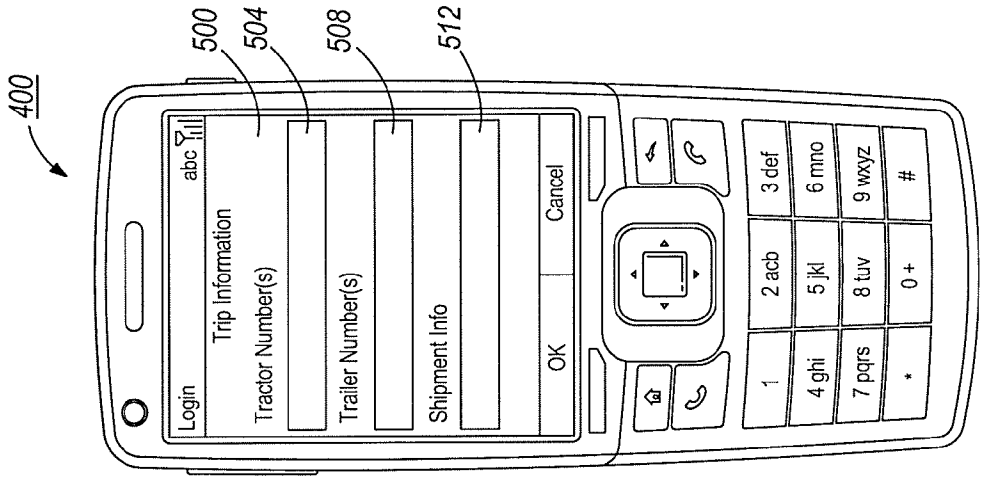


FIG. 5

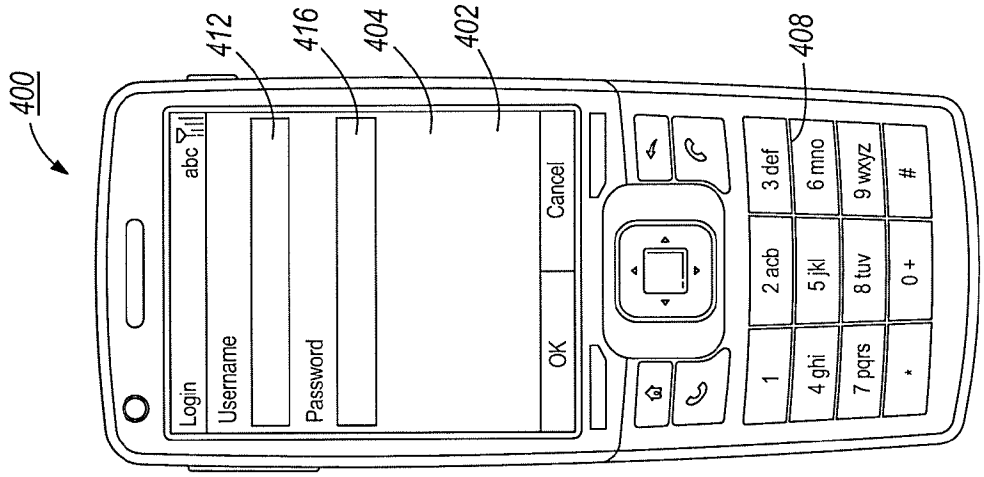


FIG. 4

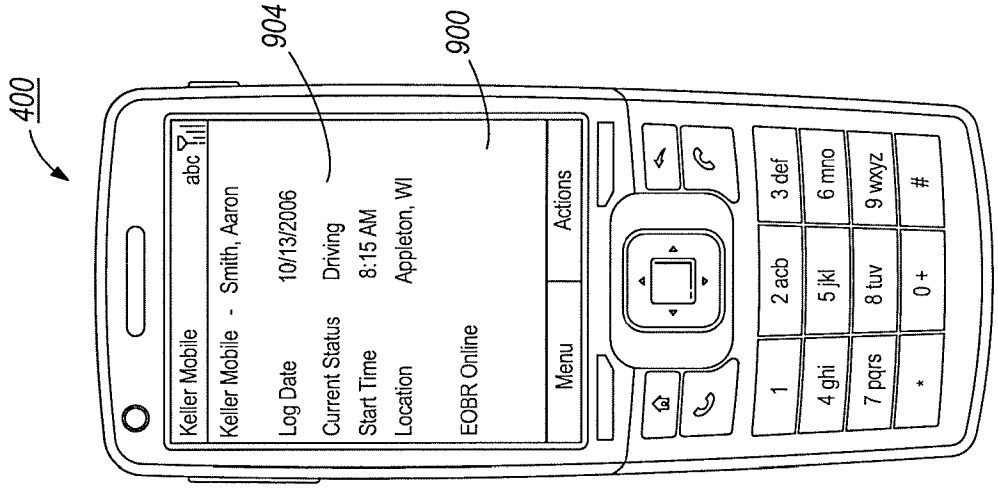


FIG. 9

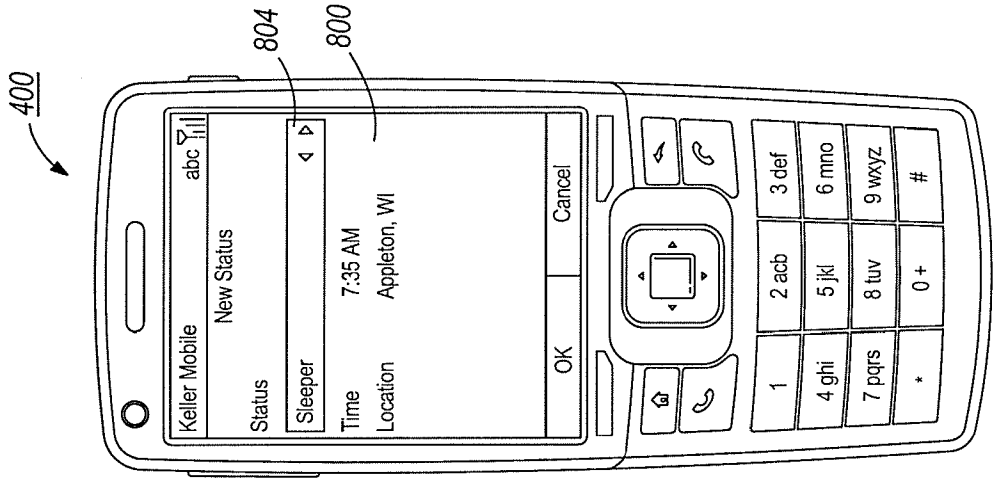


FIG. 8

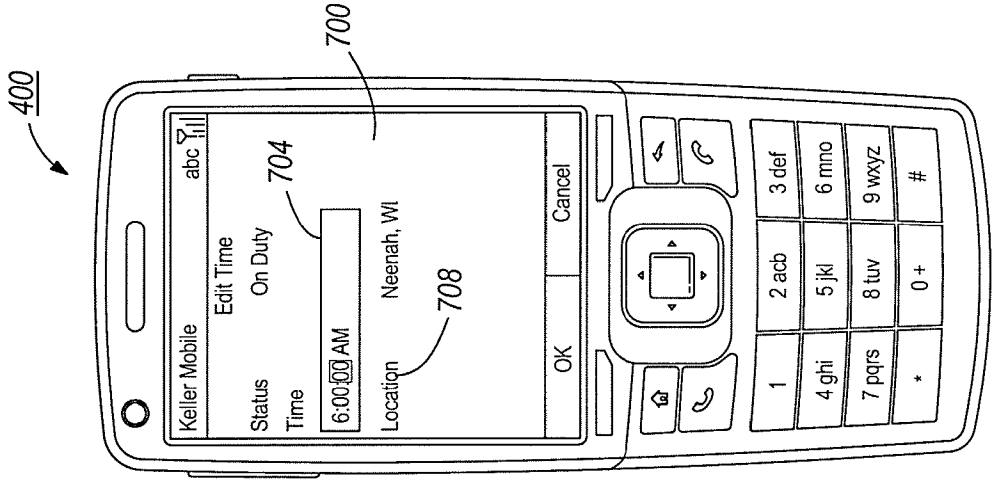


FIG. 7

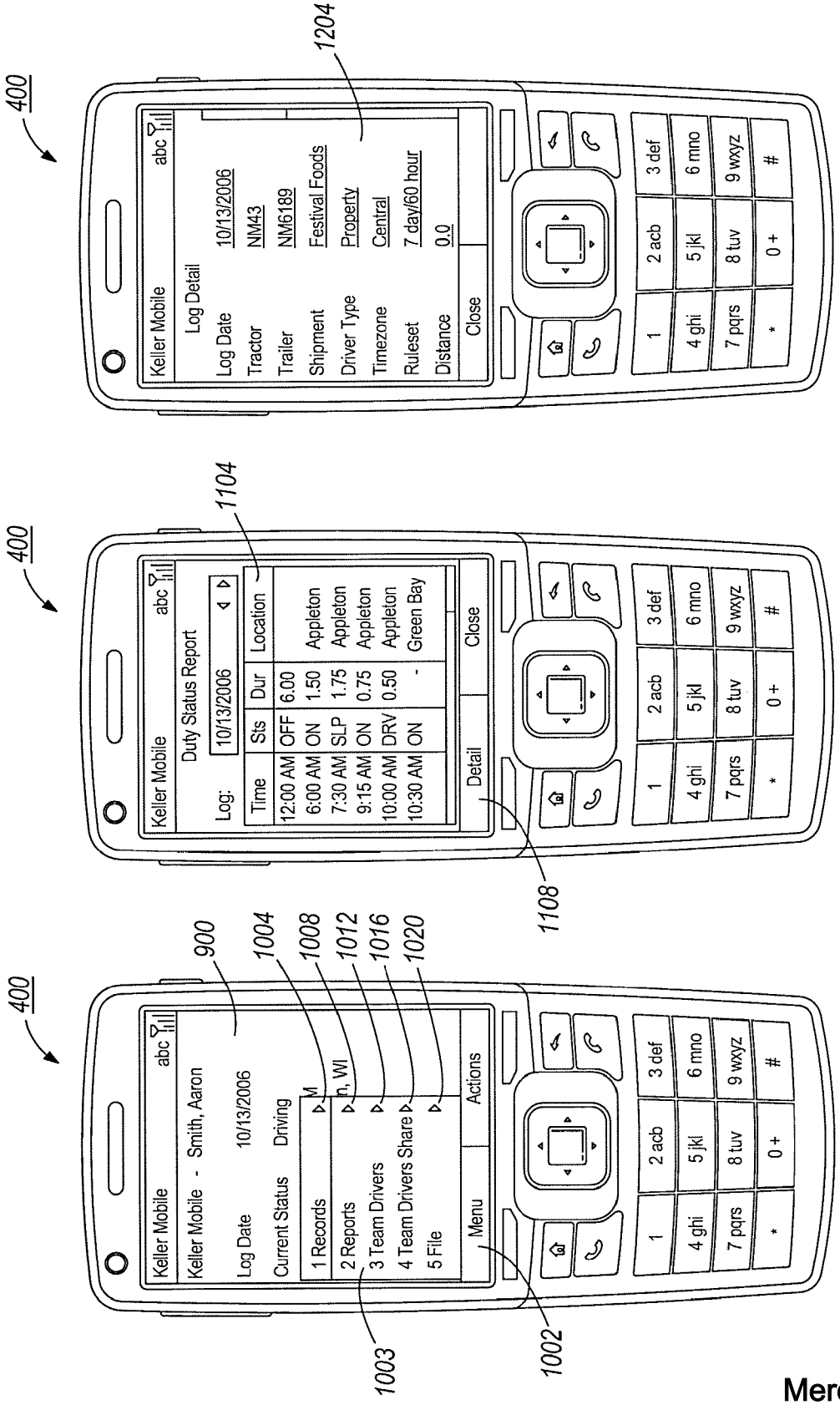


FIG. 10

FIG. 11

FIG. 12

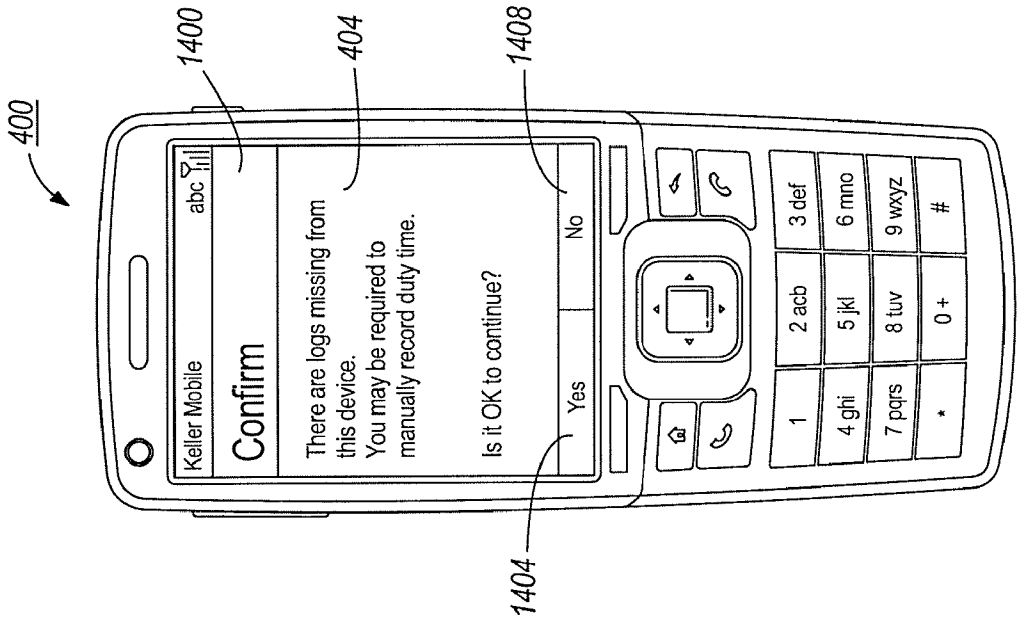

400
1400
404
1408
1404
Keller Mobile
abc
Confirm
There are logs missing from this device.
You may be required to manually record duty time.
Is it OK to continue?
Yes
No
1
2 acb
3 def
4 ghi
5 jkl
6 mno
7 pqrs
8 tuv
9 wxyz
*
0 +
#

FIG. 14

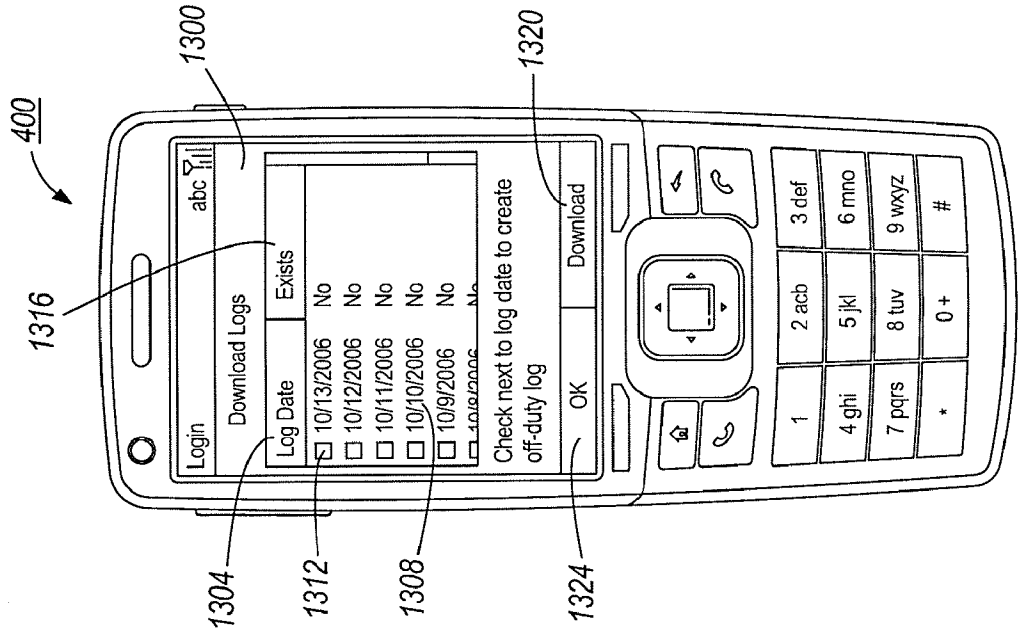

400
1300
1316
1320
1304
1312
1308
1324
Login
abc
Download Logs
Log Date
Exists
10/13/2006 No
10/12/2006 No
10/11/2006 No
10/10/2006 No
10/9/2006 No
Check next to log date to create off-duty log
OK
Download
1
2 acb
3 def
4 ghi
5 jkl
6 mno
7 pqrs
8 tuv
9 wxyz
*
0 +
#

FIG. 13

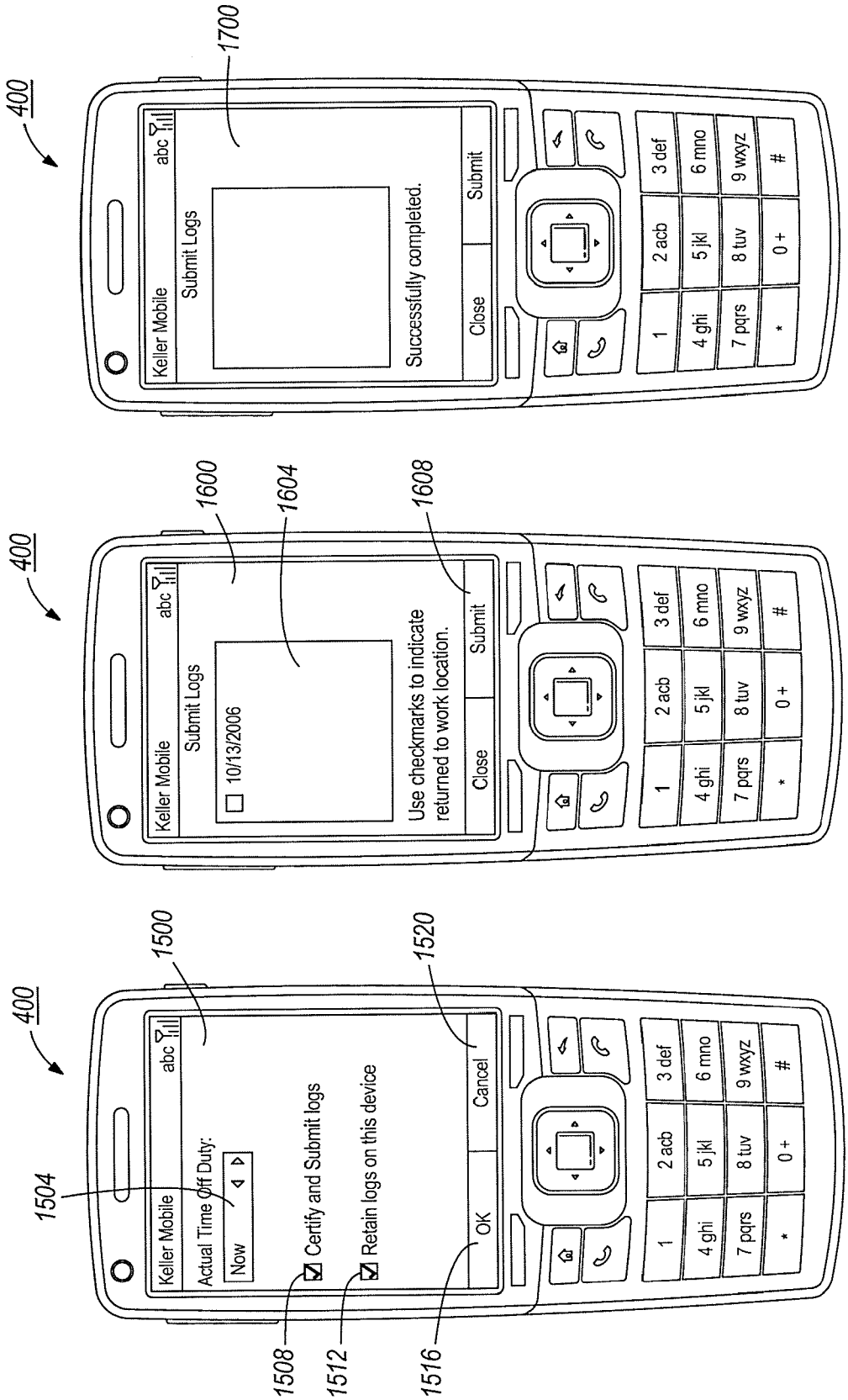


FIG. 17

FIG. 16

FIG. 15

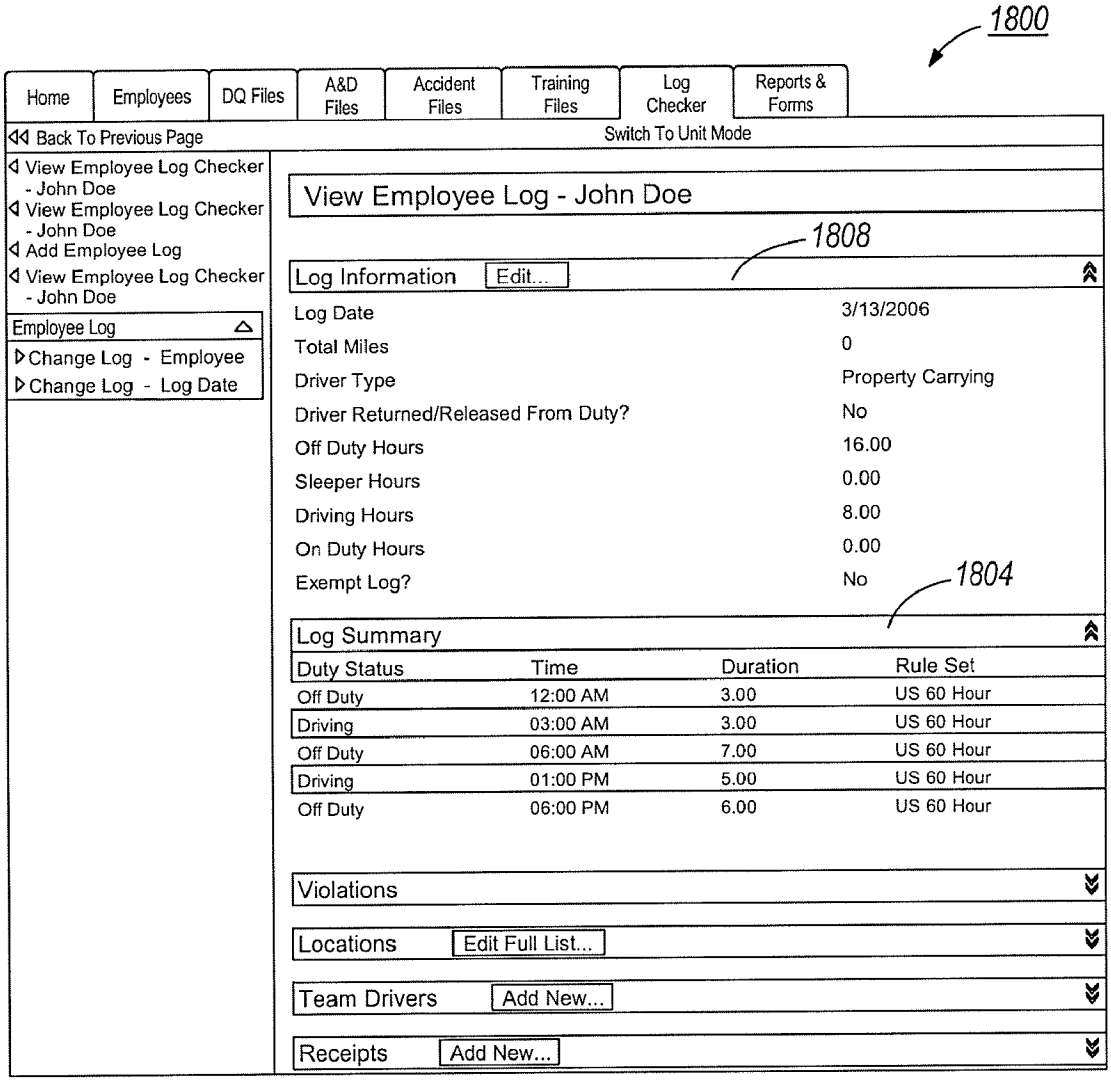

1800
Home
Employees
DQ Files
A&D Files
Accident Files
Training Files
Log Checker
Reports & Forms
Back To Previous Page
Switch To Unit Mode
View Employee Log Checker - John Doe
View Employee Log Checker - John Doe
Add Employee Log
View Employee Log Checker - John Doe
Employee Log
Change Log - Employee
Change Log - Log Date
View Employee Log - John Doe
1808
Log Information
Edit...
Log Date 3/13/2006
Total Miles 0
Driver Type Property Carrying
Driver Returned/Released From Duty? No
Off Duty Hours 16.00
Sleeper Hours 0.00
Driving Hours 8.00
On Duty Hours 0.00
Exempt Log? No
1804
Log Summary
Duty Status | Time | Duration | Rule Set
Off Duty | 12:00 AM | 3.00 | US 60 Hour
Driving | 03:00 AM | 3.00 | US 60 Hour
Off Duty | 06:00 AM | 7.00 | US 60 Hour
Driving | 01:00 PM | 5.00 | US 60 Hour
Off Duty | 06:00 PM | 6.00 | US 60 Hour
Violations
Locations
Edit Full List...
Team Drivers
Add New...
Receipts
Add New...

FIG. 18

ELECTRONIC DRIVER LOGGING SYSTEM AND METHOD

RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Application Ser. No. 60/888,458 filed on Feb. 6, 2007, the entire contents of which are incorporated by reference herein.

BACKGROUND

[0002] Embodiments of the invention relate to systems and methods for computerized management of operators of commercial vehicles.

[0003] Operators of commercial motor vehicles ("CMV's") are required to meet certain specific performance standards and regulations for operating such vehicles. For example, some operators of the CMV's are required to meet hours-of-service regulations.

[0004] The U.S. Department of Transportation, Federal Motor Carrier Safety Administration ("FMCSA") has established a comprehensive list of regulations that professional operators of CMV's must comply with. These regulations govern drivers, CMV or trucking companies (sometimes called "carriers") and the CMV's belonging to the carriers. Professional operators must comply with the obligations imposed under federal and state requirements in these areas. The regulations not only include physical and age requirements, but also define the ways an operator can lose his commercial driving privileges. Trucking companies and companies having trucking operations that support their core business are typically required to evaluate and track many aspects of truck operators and their abilities to perform job tasks such as driver qualifications (such as operator licensing and renewal); alcohol and drug testing; accident reporting; driver training; and hiring and screening of applicants.

[0005] Many CMV's are equipped with electronic-on-board-recorders to record information relating to the CMV's. The information generally includes names of the carriers, and the U.S. Department of Transportation number of the CMV's. For compliance purposes, operators of the CMV's are also frequently required to collect other relevant information of the drivers such as name, duty status, date and time, locations of the CMV's, and distance traveled. As part of the standards and/or regulations, the operators are required to submit the collected information. Operators frequently submit the collected information on paper. Paper-based processes are often slow. As a result, important compliance information might not be received in time to enforce certain regulatory requirements or to take other relevant actions based on the information.

SUMMARY

[0006] Although, various paper-based systems and software are available to assist CMV carriers with some of the areas noted above, such systems are not completely satisfactory. Continued growth and regulation of the carrier industry as well as the increasingly sophisticated logistical mechanisms used to ensure timely and efficient delivery of goods has increased the need of operators to manage their drivers and fleets. As such, it is useful for carriers to have systems available for collecting and communicating information relating to tasks which must be performed under various regulations in order for the company to show that it and its drivers are in compliance. In addition, such information can be used for several management purposes and by the operators of such CMV's.

[0007] In one embodiment, the invention provides a logging system that includes a vehicle, a portable device, and a remote host. The vehicle includes a controller and a base unit. The controller is positioned in the vehicle, and monitors one or more operating parameters of the vehicle. The base unit is mounted in the vehicle, and is connected to the controller to receive and store the one or more operating parameters from the device. The portable device, typically carried by the driver, can be coupled to the base unit. Once coupled, the portable device receives identifying information from the driver, receives the one or more operating parameters from the base unit, determines compliance data based, at least in part, on the identifying information and the one or more operating parameters, and wirelessly transmits signals based on the compliance data. The remote host is configured to wirelessly receive the signals from the portable device, and to wirelessly manage the portable device based, at least in part, on the received signals.

[0008] In another embodiment, the invention provides a system for logging performance of a driver operating a vehicle. The system includes a base unit, a portable device, and a remote host. The base unit is mounted in the vehicle and is configured to monitor one or more operating parameters of the vehicle. The portable device can be coupled to the base unit to receive identifying information from the driver, to receive the one or more operating parameters from the base unit, to determine compliance data based, at least in part, on the identifying information and the one or more operating parameters, and to wirelessly transmit signals based on the compliance data. The remote host can wirelessly receive the signals from the portable device, and wirelessly manage the portable device based, at least in part, on the received signals.

[0009] In yet another embodiment, the invention provides a method for logging performance of a driver operating a vehicle. The method includes receiving identifying information from the driver at a portable device, verifying the identifying information from the driver at the portable device, and receiving one or more operating parameters from the vehicle at the portable device once the identifying information has been verified. The method also includes determining compliance information based, at least in part, on the identifying information and the one or more operating parameters at the portable device, wirelessly transmitting compliance signals indicative of the compliance data from the portable device, and wirelessly receiving the compliance signals at a remote host from the portable device. The method also includes generating managing signals based on the received signals at the remote host, wirelessly transmitting the managing signals from the remote host to the portable device, wirelessly receiving the managing signals at the portable device, and managing performance of the driver and the vehicle based on the received managing signals.

[0010] Other aspects of the invention will become apparent by consideration of the detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. **1** is a schematic illustration of a system structured in accordance with an embodiment of the invention.

[0012] FIG. **2** illustrates a base unit of the system in FIG. **1** in a block diagram format.

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[0013] FIG. **3** is a circuit diagram for one embodiment of the base unit of FIG. **2**.

[0014] FIG. **3**A is a circuit diagram for an alternative embodiment of the base unit of FIG. **2**.

[0015] FIG. **4** shows a portable device in the form of a smart phone displaying a login screen.

[0016] FIG. **5** shows the smart phone of FIG. **4** displaying a trip login screen.

[0017] FIG. **6** shows the smart phone of FIG. **4** displaying a location edit screen.

[0018] FIG. **7** shows the smart phone of FIG. **4** displaying a time edit screen.

[0019] FIG. **8** shows the smart phone of FIG. **4** displaying a status edit screen.

[0020] FIG. **9** shows an exemplary status screen of a CMV operated by a CMV driver.

[0021] FIG. **10** shows the smart phone of FIG. **4** displaying a plurality of menu functions in the status screen of FIG. **9**.

[0022] FIG. **11** shows the smart phone of FIG. **4** displaying a duty status report screen.

[0023] FIG. **12** shows the smart phone of FIG. **4** displaying a log detail screen detailing a specific log entry of FIG. **1**.

[0024] FIG. **13** shows the smart phone of FIG. **4** displaying a log download screen.

[0025] FIG. **14** shows the smart phone of FIG. **4** displaying a confirmation screen

[0026] FIG. **15** shows the smart phone of FIG. **4** displaying a logout screen.

[0027] FIG. **16** shows the smart phone of FIG. **4** displaying a log submission screen.

[0028] FIG. **17** shows the smart phone of FIG. **4** displaying a log submission complete screen.

[0029] FIG. **18** shows an exemplary screen of the remote host application of FIG. **1**.

DETAILED DESCRIPTION

[0030] Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways.

[0031] In one particular embodiment, the invention provides a system for logging performance of a driver operating a vehicle having a vehicle information system from which at least one vehicle operating parameter may be obtained in a performance monitoring process. The vehicle operating parameter collected through the vehicle information system and information such as operator identity from a portable device are wirelessly communicated to a remote host through a network such as the Internet.

[0032] FIG. **1** shows a performance monitoring system **100** for use with a commercial motor vehicle ("CMV") **104**. Although the CMV **104** illustrated is a tractor configured to tow a trailer (not shown), the performance monitoring system **100** can also be implemented in other types of CMV's such as construction vehicles and agricultural equipment. The CMV **104** includes an engine **108** that drives the CMV **104**, and is controlled by an electronic control unit ("ECU") **112** that determines operating information or parameters from the engine **108**, and other parts of the CMV **104**. Operating parameters monitored by the ECU **112** include speed, hours of service, operating status, ignition switch status, trip distance, total vehicle distance, and the like.

[0033] The performance monitoring system **100** also includes an electronic on-board recorder ("EOBR") base unit **116** that communicates with the ECU **112** through an information bus **118** conforming to standards such as SAE J1939 and SAE J1708 network buses. The base unit **116** has a plurality of functions including, but not limited to, time keeping and data logging. In one implementation, the base unit **116** records and stores CMV information or data necessary to comply with FMSCA regulations such as those mentioned above from the ECU **112**. The performance monitoring system **100** also includes a portable device **120** such as a mobile phone, a personal-digital-assistant ("PDA"), a laptop computer, or the like, that communicates with the base unit **116**. The base unit **116** communicates with the portable device **120** through a cable or wireless link **122**. The link **122** may be a serial cable, such as a USB cable. Other exemplary links include a wireless personal-area-network such as Bluetooth, and the like. The portable device **120** generally supports multiple platforms such as Windows Mobile 5 cell phones, Pocket PC 2003 (or better) PDA's, and computers such as laptops. The performance monitoring system **100** also includes a remote host server **123** running a remote host application **124** that wirelessly communicates with the portable device **120** via a network such as the Internet, detailed hereinafter. In some embodiments, a global position satellite ("GPS") system **128** also communicates with the ECU **112** and/or the base unit **116** so that information from the GPS system **128** (such as time and location) is available to the CMV **104**. In some embodiments, at least a portion of the information stored in the base unit **116** or information communicated to and from the base unit **116** is encrypted.

[0034] FIG. **2** shows the base unit **116** in a block diagram format. As shown, the base unit **116** includes a processor (such as a microprocessor, controller or application-specific-integrated-circuit ("ASIC")) **204**. The base unit **116** also includes a communication module **206**, a real-time clock **210**, and a display unit **212**. In some embodiments, the base unit **116** includes a memory module **211** that stores CMV information. In some embodiments, the display unit **212** includes a plurality of LED's **214** to indicate the status of the base unit **116**, such as, a connection status that indicates whether a portable device has been connected to the base unit **116**, a system status that indicates whether the base unit **116** is properly functioning, a communication status that indicates if signals are communicated between the base unit **116** and the ECU **112**, and a portable device communication status that indicates whether signals are communicated between the base unit **116** and a connected portable device such as the portable device **120**.

[0035] In some embodiments, the memory module **211** stores a log of data retrieval history. For example, when a portable device such as the portable device **120** sends a request for data from the base unit **116**, the base unit **116** logs the request, retrieves the data from the memory module **211**, and communicates or delivers the data to the connected device. The memory module **211** also logs other information related to the request, such as the time span over which data was retrieved, the time the data was retrieved or time stamped, and the size of the data that was delivered. In some embodiments, once the portable device has retrieved the data

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the memory area that stored the retrieved data is marked extracted, transmitted, or downloaded, and is re-used, if necessary.

[0036] The communication module **206** includes an interface module **216** that includes a plurality of interfaces such as a USB interface **220**, a vehicle power interface **224**, an optional Bluetooth interface **228**, and a GPS interface **232**. In some embodiments, the USB interface **220** includes a B-type USB socket connector into which a USB cable can be inserted to allow the base unit **116** to communicate with devices such as the portable device **120**. The power interface **224** provides power filtering and conditioning to support operations from power obtained from the CMV **104**. Furthermore, the USB interface **220** also allows the base unit **116** to be field-programmable, that is, the base unit **116** can be reconfigured, modified, or upgraded via the USB interface **220**. The GPS interface **232** supports a connection between an additional GPS board or device and the base unit **116**. In some embodiments, the GPS interface **232** also includes an antenna input to accommodate an antenna that may be required.

[0037] FIG. **3** shows an exemplary base unit **300** (**116** of FIG. **2**), wherein like reference numerals refer to like parts. The base unit **300** includes a microprocessor **302** (**204** of FIG. **2**) that processes and outputs data as described. For example, the microprocessor **302** is coupled to first and second transceivers **304**, **308**, respectively, to receive external data. The first transceiver **304** conforms to a J1708 standard, and transmits and receives data through a CMV interface connector **310** (**224** of FIG. **2**), a J1708 communication bus **312**, and a protection and filtering module **316**. The protection and filtering module **316** filters the received data so that data noise can be reduced or eliminated. The protection and filtering module **316** also ensures that the received data has a predetermined amplitude range that is acceptable to the microprocessor **302**. In this way, amplitude surges in data can be detected, and the microprocessor **302** can be protected.

[0038] Similarly, the J1939 transceiver **308** transmits and receives data through the CMV interface connector **310**, a J1939 communication bus **320**, and a second protection and filtering module **324**. The second protection and filtering module **324** filters out noise from the received data, and limits an amplitude range of the received data. Both of the transceivers **304** and **308** are regulated by a charge pump **328**. In the embodiment shown, the base unit **300** receives its power from the CMV **104** through the CMV interface connector **310** and a CMV power bus **332**. The power is regulated and surge-protected with a protection, filtering, and inrush limit circuitry **336**, a power supply circuit **340**, and a voltage holdup circuit **344**.

[0039] A battery **348** supplies power to the real-time clock ("RTC") **350** (**210** of FIG. **2**) which provides a real-time clock function to allow software to accurately determine a time with a predetermined resolution. In the embodiment shown, the resolution is 1 ms. In some embodiments, the RTC **350** is required to remain operational while the CMV **104** does not provide power to the base unit **300**.

[0040] In the embodiment shown, a flash memory **352** (**211** of FIG. **2**) is connected to the microprocessor **302** to log a data retrieval history as described earlier. The flash memory **352** also logs other information related to the request, such as the time span over which data was retrieved, the time the data was retrieved or time-stamped, and the size of the data that was delivered. The microprocessor **302** also displays the status of the base unit **300** with a plurality of status light-emitting-diodes **356** (**212** of FIG. **2**). The base unit **300** also includes a USB type B connector **360** (**220** of FIG. **2**) to transmit and receive data through a USB connector of an external portable device. The received data is also filtered and protected with a USB protection and filtering module **364**. To receive a GPS signal, the base unit **300** also includes a GPS antenna connector **368** (**232** of FIG. **2**) to be connected to a GPS antenna. Data received through the GPS antenna connector **368** is similarly filtered and protected with a GPS protection and filtering module **372**. A GPS receiver module **376** then prepares the received data for further processing by the microprocessor **302**.

[0041] FIG. **3**A shows an alternative embodiment of a base unit **380** (**116** of FIG. **2**), wherein like numerals refer to like parts. The base unit **380** includes the CMV interface connector **310** that connects to the CMV power bus **332**, and communicates to the ECU **112** (of FIG. **1**) with the J1708 communication bus **312** and the J1939 communication bus **320**, via the first and second transceivers **304**, **308**, respectively. The microprocessor **302** processes and outputs data from the first and second transceivers **304**, **308**. In the embodiment shown, the base unit **380** also includes the flash memory **352**, and a Bluetooth interface **384** (**228** of FIG. **2**) that communicates with the mobile devices **120** that are capable of Bluetooth wireless communications. Also, the USB interface **360**, as shown, includes a USB Mini-AB connector.

[0042] FIG. **4** shows an example of the portable devices **120** in the form of a smart phone **400** displaying a login screen **402**. In such cases, the smart phone **400** wirelessly connects to the base unit **116** via Bluetooth or other wireless connections, or is wired to the base unit **116** via one or more cables. The smart phone **400** includes a display **404** and generates a graphical user interface on the display **404**. The graphical user interface prompts operators for information and displays information such as an hours-of-service of a particular operator and other information, as detailed hereinafter. The smart phone **400** also includes an input keyboard **408** to allow operators to enter operator or driver, and trip information. The display **404**, as shown in FIG. **4**, via a software application installed in the smart phone **400** shows the login screen **402**, and prompts the operator for login or identifying credentials such as identity or username at a username entry **412** and a password at a password entry **416**. Once the username and the password have been entered and verified, the CMV driver or operator starts a performance monitoring process. Initially, if there is no log entry attributed to the operator, the portable device **120** attempts to establish a network connection with the remote host application **124**. In turn, the remote host application **124** verifies the identifying credentials, detailed hereinafter. After the remote host application **124** has verified the identifying credentials, the remote host application **124** passes back via a return parameter a validation signal to the portable device **120**.

[0043] As shown in FIG. **5**, after receiving a validation signal from the remote host application **124**, the smart phone **400** (via the software application), in a trip login screen **500**, prompts the operator for trip information such as a tractor identification number at a tractor number entry **504**, a trailer number at a trailer number entry **508**, and shipment information at a shipment info entry **512**. Similarly, as shown in FIG. **6** in a location edit screen **600**, the operator is prompted for a location code at a entry **604**, and/or an actual location at entry **608**.

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[0044] FIG. **7** shows a time edit screen **700**. Once logged on, the operator is also allowed to edit a time entry **704**, and/or a location entry **708** in the time edit screen **700**. FIG. **8** shows a status edit screen **800** in which the operator is allowed to add a new duty by selecting a new duty entry **804** using the display **404** and the keyboard **408**. After selecting the new duty entry **804**, a status screen appears that allows the operator to further modify or update the status of his or her activities (for example, in sleeper, driving, and the like), detailed hereinafter.

[0045] After CMV **104** is in motion, e.g., traveling down a road, the ECU **112** monitors the distance traveled. As shown in an exemplary status screen **900** of FIG. **9**, once the CMV **104** has traveled a predetermined amount of time and/or distance, it is assumed the CMV **104** is being driven to a desired destination rather than, for example, being moved from one parking spot to another. Subsequently, the smart phone **400** displays a current status in the status field **904** to reflect changes in the operator status (now "driving"). After the CMV arrives at a destination and stops, the smart phone **400** prompts the operator for a new destination location in the location entry **708** (of FIG. **7**). This information is then stored in the memory module **211**.

[0046] As shown in FIG. **10**, the status screen **900** also includes a menu tab **1002**. When the menu tab **1002** is activated, the smart phone **400** displays a menu **1003**. In the embodiment shown, the menu **1003** includes a "Records" option **1004**, a "Reports" option **1008**, a "Team Driver" option **1012**, a "Team Driver Share" option **1016**, and a "File" option **1020**. In some embodiments, the "Records" option **1004** allows a driver to access records such as trip information, employee rules, and the like, and also allows a driver to download records, certify and submit logs, identify unassigned driving periods, and edit log locations, detailed hereinafter. In some embodiments, the "Reports" option **1008** allows a driver to generate or access information such as, for example, duty status, daily hours, failure reports such as vehicle failure reports, and location codes, some of which are detailed hereinafter. The "File" option **1020** allows a driver to change his or her password, enter the performance monitor process into a road-side inspection mode, and check for updates such as trip updates, rule set updates, and the like.

[0047] When a driver activates the "Report" option **1008** and selects to display the duty status, the smart phone **400** displays the duty status as discussed, as shown in an exemplary duty status report screen **1104** of FIG. **11**. In the embodiment shown, the duty status report screen **1104** summarizes all entries collected thus far. When the operator activates a "Detail" tab **1108** on the duty status report screen **1104**, the smart phone **400** displays details of the entries, as shown in a log detail screen **1204** of FIG. **12**. In the embodiment shown, the status report screen **1108** lists information such as log date, tractor, trailer, shipment, driver type, time zone, rule set, and distance traveled.

[0048] In some cases, a regulation enforcement officer can ask a CMV driver for his or her driving logs for a predetermined number of days, such as, for example, seven days, prior to the day of inquiry, or for a predetermined amount of time, such as, for example, 168 hours, prior to the time of inquiry. However, when the smart phone **400** is new, the smart phone **400** may not have been configured to include existing logs of a particular driver and/or a particular CMV. When the logs of interest are not stored in the smart phone **400**, a CMV driver can use the smart phone **400** to download the logs of interest from other places, such as, for example, the remote host server **123** via the Internet, and/or from the base unit **116**.

[0049] FIG. **13** shows the smart phone of FIG. **4** displaying a log download screen **1300** which prompts a user to download one or more logs to the smart phone **400**. Particularly, in the embodiment shown, the log download screen **1300** includes a log date column **1304** which lists a plurality of logs **1308** that are available for download, and their corresponding dates. Each of the available logs **13** has a corresponding check box **1312** to accept an input selection from a user. In the embodiment shown, logs **1308** from the last few days are available to be downloaded to the smart phone **400**. In other embodiments, logs from additional periods of time are also available to be downloaded to the smart phone **400**. The log download screen **1300** also includes an "Exists" column **1316** which indicates whether each of the logs **1308** in the log date column **1308** exists, or has already been stored in the smart phone **400**. In the embodiment shown, none of the available logs **1308** is stored in the smart phone **400**. Once a user has checked one or more of the check boxes **1312** and tabbed a download button **1320**, the selected logs are downloaded to the smart phone **400**.

[0050] If the user tabs an OK button **1324** or the download button **1320** without selecting any of the logs **1308**, the user is required to confirm that the user has elected not to store any of the available and downloadable logs **1308** to the smart phone **400**. FIG. **14** shows the smart phone of FIG. **4** displaying a confirmation screen **1400**. In the embodiment shown, the confirmation screen **1400** indicates that logs are missing, and prompts the user to select between a "Yes" tab **1404** which confirms no logs are downloaded, and a "No" tab **1408** which returns the display **404** from screen **1400** back to screen **1300**.

[0051] When a CMV driver logs out of the performance monitoring process, he or she is given an option of submitting any available logs in a certification process. In this way, the CMV driver can legally submit the logs for regulation compliance purposes. Particularly, FIG. **15** shows the smart phone of FIG. **4** displaying a logout screen **1500** of the certification process on the smart phone **400**. The logout screen **1500** includes an "Actual Time Off Duty" dialog box **1504** allowing the CMV driver to select an actual time that the CMV driver is off duty. In the embodiment shown, the CMV driver has selected to complete the submission "Now" in the dialog box **1504**. Other options of the dialog box **1504** include, but are not limited to, one hour, two hours, and the like. The additional time allows the CMV driver to conduct a post trip inspection, for example. After selecting a time for the dialog box **1504**, the CMV driver has to manually select on the logout screen **1500** to certify and submit logs by tapping a certify check box **1508**, and/or to retain the logs in the smart phone **400** by tapping a retain check box **1512**. After selecting to certify the logs and/or to retain the logs, the CMV driver then taps an "OK" tab **1516** to continue the certification process, or a "Cancel" tab **1520** to cancel the certification process.

[0052] After the driver has tapped the OK tab **1516** to continue the certification process, the smart phone **400** displays a plurality of logs that are available for submission and certification. FIG. **16** shows the smart phone **400** of FIG. **4** displaying an exemplary log submission screen **1600** which lists an available log in a log list box **1604**. When the CMV driver taps a "Submit" tab **1608**, the smart phone **400** submits the available logs listed in the log list box **1604** and indicates that the certification process is complete. FIG. **17** shows the

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smart phone **400** of FIG. **4** displaying an exemplary log submission complete screen **1700**.

[0053] FIG. **18** shows an exemplary screen **1800** of the remote host application **124**. Once the log is received at the remote host application **124**, the remote host application **124** stores and calculates parameters such as hours-of-service information of the operator and alerts the operator or the carrier of any violations of predetermined FMCSA rules. For example, a log summary area **1804** lists all duty entries the operator submitted through the portable device **120**. A log information area **1808** lists other driver and vehicle parameters collected. The remote host application **124** thus can rearrange the entries collected and generates different reports as needed. Furthermore, if an operator has a non-compliance violation, the remote host application **124** will also transmit a signal back to the portable device **120** to alert the operator of the violation.

[0054] In the embodiment shown, the log information area **1808** lists a plurality of log entries, such as, for example, a "Log Date" indicating a log date of the received log, a "Total Miles" indicating a total mileage driven by the operator, a "Driver Type" indicating a type of qualifications or restrictions on a driver, for example, whether the driver is licensed to drive a property-carrying vehicle or a passenger-carrying vehicle or restrictions apply based on the type of shipment or cargo, a "Drive Returned/Release From Duty" indicating whether the operator has returned from duty or the operator has been released from duty, an "Off Duty Hours" identifying an amount of time that the CMV driver is off duty, a "Sleeper Hours" indicating an amount of time that the CMV driver has been on sleeper hours, a "Driving Hours" indicating an amount of time that the CMV driver has been driving for the trip, an "On Duty Hours" indicating an amount of time that the CMV driver has been on duty, and an "Exempt Log" indicating if the submitted log can be exempted from logging. Similarly, the log summary area **1804** summarizes log entries for a trip administered by the CMV driver. For example, the summary area **1804** lists entries such as, for example, a duty status, a time, a duration, and a rule set used by the CMV driver. In the embodiment shown, the rule set is "US 60 hour." The CMV driver was off duty from 12:00 AM to about 3:00 AM for about three hours. Afterwards, the CMV driver was driving from 3:00 AM to about 6:00 AM for about three hours. The CMV driver was again off duty from 6:00 AM to about 01:00 PM for about seven hours, and drove from 01:00 PM to about 06:00 PM for about six hours. As such, the CMV driver drove for a total of about eight hours, as displayed in the Driving Hours entry of the log information area **1808**. The screen **1800** is also expandable to display other information such as, violations, locations (which indicates locations the CMV driver has traveled during the trip), team drivers (which indicates a list of operators involved in the trip), and receipts (which indicates a list of receipts collected during the trip).

[0055] Various features and aspects of embodiments of the invention are set forth in the following claims.

What is claimed is:

1. A logging system for a commercial motor vehicle ("CMV") operated by a driver, the logging system comprising:

a controller configured to be located in the CMV, and to monitor at least one operating parameter of the CMV;

a base unit configured to be located in the CMV, connected to the controller, and to receive and store the at least one operating parameter from the device;

a portable device configured to be coupled to the base unit, and configured to receive identifying information from the driver, to receive the at least one operating parameter from the base unit, to determine compliance data based, at least in part, on the identifying information and the at least one operating parameter, and to wirelessly transmit signals based on the compliance data, the portable device having a display, the portable device configured to generate a graphical user interface on the display, the graphical user interface having features to prompt the driver for the identifying information, trip information, and log submission and certification information, the graphical user interface having features to display a status of the CMV based, at least in part, on the identifying information and trip information, to list a plurality of logs based, at least in part, on the received operating parameter, and the identifying information and trip information, and to list at least one log unavailable in the portable device; and

a remote host configured to wirelessly receive the signals based on the compliance data, the identifying information, and the trip information, from the portable device, and to wirelessly manage the portable device based, at least in part, on the received signals.

2. The system of claim **1**, wherein the portable device comprises at least one of a computer, a personal-digital-assistant ("PDA"), and a smart phone.

3. The system of claim **1**, wherein the portable device is wirelessly coupled to the base unit via at least one of a personal area network connection and a cellular connection.

4. The system of claim **1**, wherein the trip information includes at least one of a tractor identification, trailer number, shipment information, and location code.

5. The system of claim **1**, wherein the portable device is further configured to list at least one of a log date, driver type, time zone, rule set, and distance traveled by the CMV on the display.

6. The system of claim **1**, wherein the compliance data includes an hour-of-service log of the driver.

7. The system of claim **1**, wherein the portable device is configured to selectively download the at least one log unavailable in the portable device.

8. The system of claim **1**, wherein the graphical user interface is further configured to prompt the driver for a new destination location when the CMV reaches a destination based, at least in part, on information from the controller and the base unit.

9. The system of claim **1**, wherein the remote host is further configured to generate an alert for noncompliant performance of the driver.

10. The system of claim **1**, wherein a controller-area-network bus couples the base unit to the controller.

11. The system of claim **1**, wherein the remote host is configured to wirelessly transmit signals indicative of a type of operating parameter to be monitored by the base unit.

12. The system of claim **1**, wherein the remote host is configured to wirelessly communicate with the portable device via the Internet.

13. A system for logging performance of a driver operating a commercial motor vehicle ("CMV"), the system comprising:

a base unit configured to be mounted in the CMV to receive at least one operating parameter from the CMV, and to store the at least one operating parameter;

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a portable device configured to be coupled to the base unit, and configured to receive identifying information from the driver, to receive the at least one operating parameter from the base unit, to determine compliance data based, at least in part, on the identifying information and the at least one operating parameter, and to wirelessly transmit signals based on the compliance data;

the portable device having a display, the portable device configured to generate a graphical user interface on the display, the graphical user interface having features to prompt the driver for the identifying information, trip information, and log submission and certification information, to display a status of the CMV based, at least in part, on the identifying information and trip information, to list a plurality of logs based, at least in part, on the received operating parameter, and the identifying information and trip information, and to list at least one log unavailable in the portable device; and

a remote host configured to wirelessly receive the signals from the portable device, and to wirelessly manage the portable device at least in part based on the received signals.

14. The system of claim **13**, wherein the portable device comprises at least one of a computer, a personal-digital-assistant ("PDA"), and a smart phone.

15. The system of claim **13**, wherein the portable device is wirelessly coupled to the base unit with at least one of a wireless personal area network connection and a cellular connection.

16. The system of claim **13**, wherein the trip information includes at least one of a tractor identification, trailer number, shipment information, and location code.

17. The system of claim **13**, wherein the graphical user interface is further configured to list at least one of a log date, driver type, time zone, rule set, and distance traveled by the CMV.

18. The system of claim **13**, wherein the compliance data includes an hour-of-service log of the driver.

19. The system of claim **13**, wherein the portable device is configured to selectively download the at least one log unavailable in the portable device.

20. The system of claim **13**, wherein the graphical user interface is further configured to prompt the driver for a new destination location when the CMV reaches a destination based, at least in part, on information from the base unit.

21. The system of claim **13**, wherein the remote host is further configured to generate an alert for noncompliant performance of the driver.

22. The system of claim **13**, wherein the remote host is configured to wirelessly transmit signals indicative of a type of operating parameter to be monitored by the base unit.

23. The system of claim **13**, wherein the remote host is configured to wirelessly communicate with the portable device via the Internet.

24. A method for logging performance of a driver operating a commercial motor vehicle ("CMV"), the method comprising:

receiving identifying information from the driver at a portable device;

verifying the identifying information from the driver at the portable device;

receiving at least one operating parameter from the CMV at the portable device once the identifying information has been verified;

determining compliance data based, at least in part, on the identifying information and the at least one operating parameter at the portable device;

wirelessly transmitting compliance signals indicative of the compliance data from the portable device;

wirelessly receiving the compliance signals at a remote host from the portable device;

generating managing signals based on the received signals at the remote hose;

wirelessly transmitting the managing signals from the remote host to the portable device;

wirelessly receiving the managing signals at the portable device; and

managing performance of the driver and the vehicle based on the received managing signals.

25. The method of claim **24**, wherein the portable device comprises at least one of a computer, a personal-digital-assistant ("PDA"), and a smart phone.

26. The method of claim **24**, further comprising:

prompting the driver for the identifying information, trip information, and log submission and certification;

displaying status of the CMV based, at least in part, on the identifying information and trip information;

listing a plurality of logs based, at least in part, on the received operating parameters, and the identifying information and trip information; and

listing at least one log unavailable in the portable device.

27. The method of claim **26**, wherein the trip information includes at least one of a tractor identification, trailer number, shipment information, and location code.

28. The method of claim **26**, further comprising selectively downloading the least one log unavailable in the portable device.

29. The method of claim **24**, further comprising wirelessly coupling the portable device to the vehicle with at least one of a wireless personal area network connection, and a cellular connection.

30. The method of claim **24**, further comprising listing at least one of a log date, driver type, time zone, rule set, and distance traveled by the CMV.

31. The method of claim **24**, wherein the compliance data includes hours-of-services of the driver.

32. The method of claim **24**, further comprising prompting the driver for a new destination location when the CMV reaches a destination based, at least in part, on data received from the controller and the base unit.

33. The method of claim **24**, wherein the remote host is configured to wirelessly communicate with the portable device via the Internet.

* * * * *

EXHIBIT 1006

U.S. Patent 6,577,937 ("Shuman")

US006577937B1

(12) **United States Patent**
Shuman et al.

(10) **Patent No.: US 6,577,937 B1**
(45) **Date of Patent: Jun. 10, 2003**

(54) **METHOD AND SYSTEM FOR AN IN-VEHICLE COMPUTING ARCHITECTURE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/210,292**

(22) Filed: **Aug. 1, 2002**

Related U.S. Application Data

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(51) **Int. Cl.**[7] **B60R 22/00**; G05F 15/00; G05D 1/00; G05D 3/00; G06F 17/00; G05F 7/00

(52) **U.S. Cl.** **701/48**

(58) **Field of Search** 701/48, 300, 23, 701/25, 202, 205, 210, 33, 36; 340/988, 436, 901

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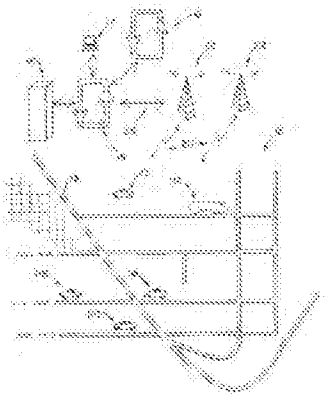
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Primary Examiner—Yonel Beaulieu
(74) *Attorney, Agent, or Firm*—Frank J. Kozak; Jon D. Shutter; Lawrence M. Kaplan

(57) **ABSTRACT**

A computing architecture for a motorized land-based vehicle is disclosed. The computing architecture includes a data network comprised of a plurality of interconnected processors, a first group of sensors responsive to environmental conditions around the vehicle, a second group of sensors responsive to the vehicle's hardware systems, and a map database containing data that represent geographic features in the geographic area around the vehicle. A vehicle-environment modeling program, executed on the data network, uses the outputs from the first and second groups of sensors and the map database to provide and continuously update a data model that represents the vehicle and the environmental around the vehicle, including geographic features, conditions, structures, objects and obstacles around the vehicle. Vehicle operations programming applications, executed on the data network, use the data model to determine desired vehicle operation in the context of the vehicle's environment. A driver interface receives the vehicle driver's input. Vehicle control programming, executed on the data network, receives outputs from the vehicle operations programming applications and the driver interface, determines a resolved operation for the vehicle's hardware systems and provides output commands indicative thereof. The vehicle operations programming applications may include adaptive cruise control, automated mayday, and obstacle and collision warning systems, among others. Also disclosed is a new computing architecture that organizes the applications and systems in the vehicle into two groups: driver assistance systems and mobile services and information systems. Also disclosed is a drive recorder that maintains records of the statuses of all vehicle systems and of the driver.

24 Claims, 29 Drawing Sheets



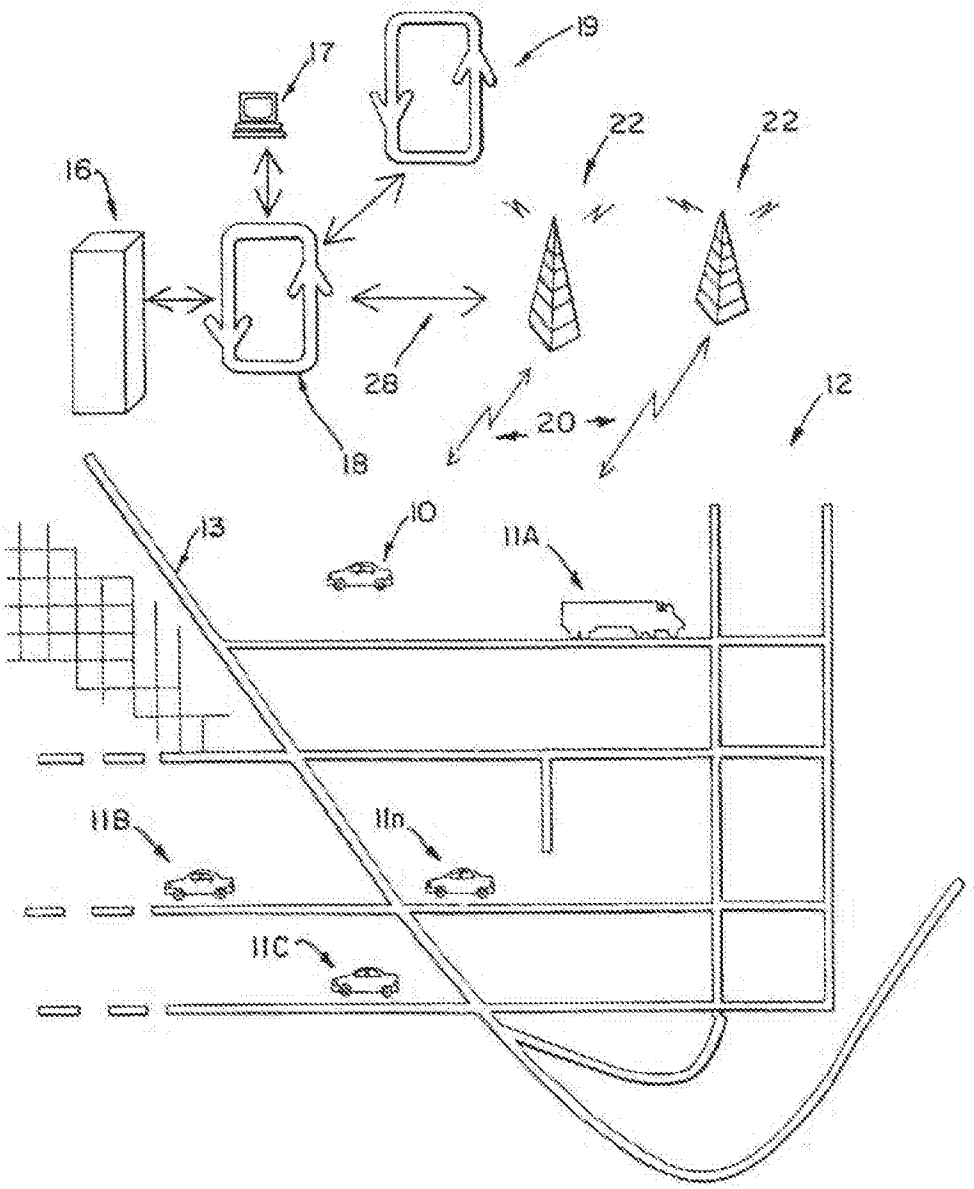
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FIG. 1



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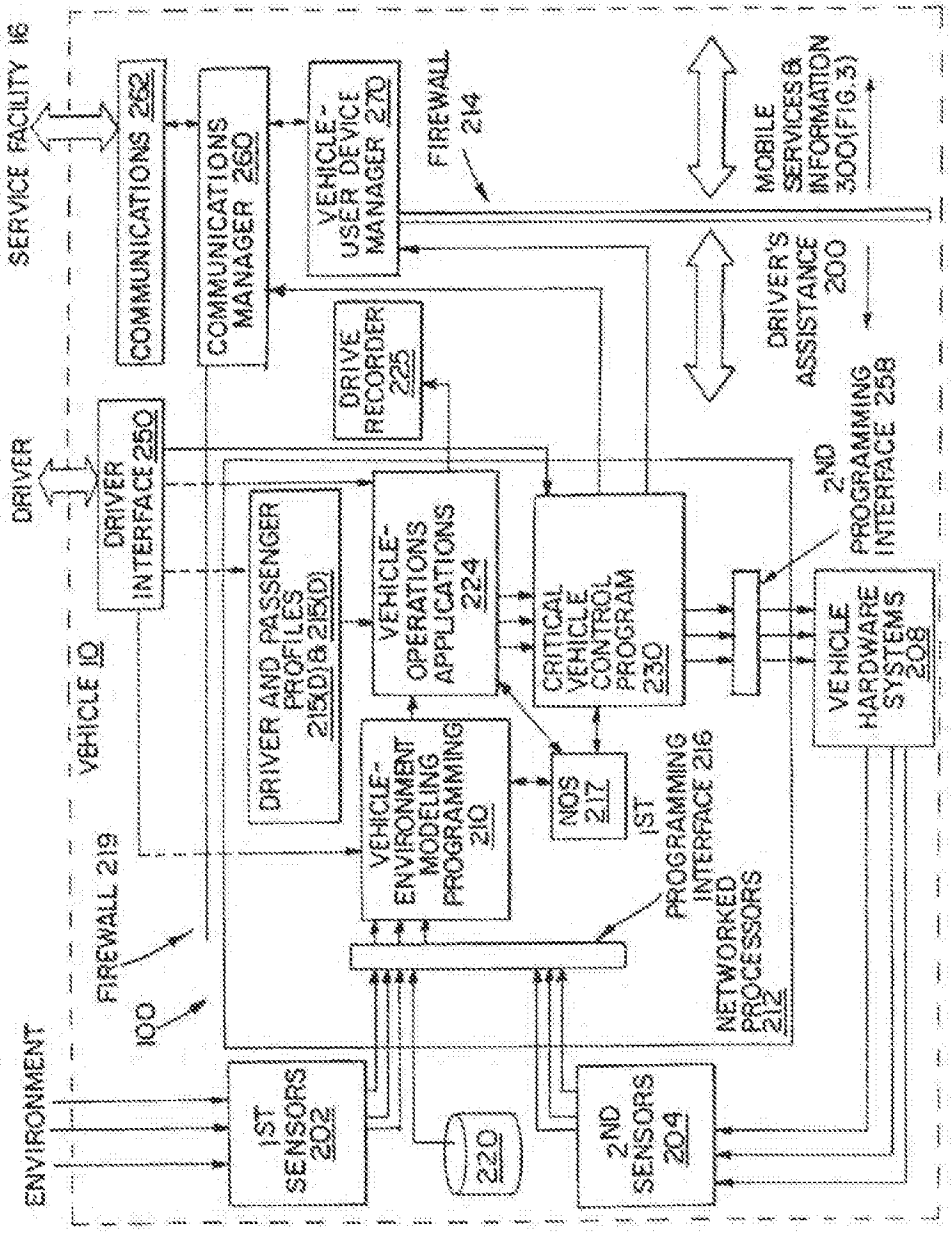


FIG. 2

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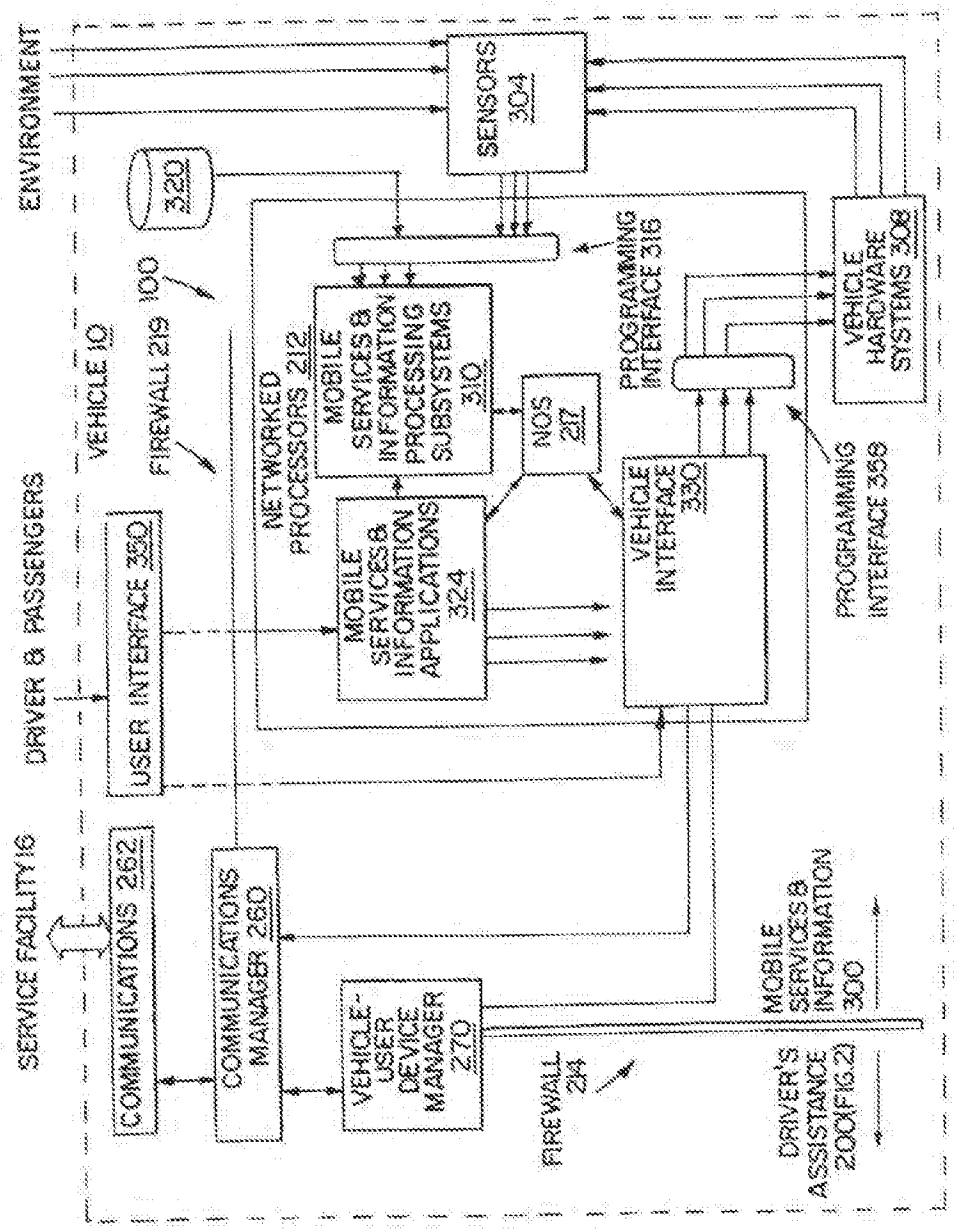
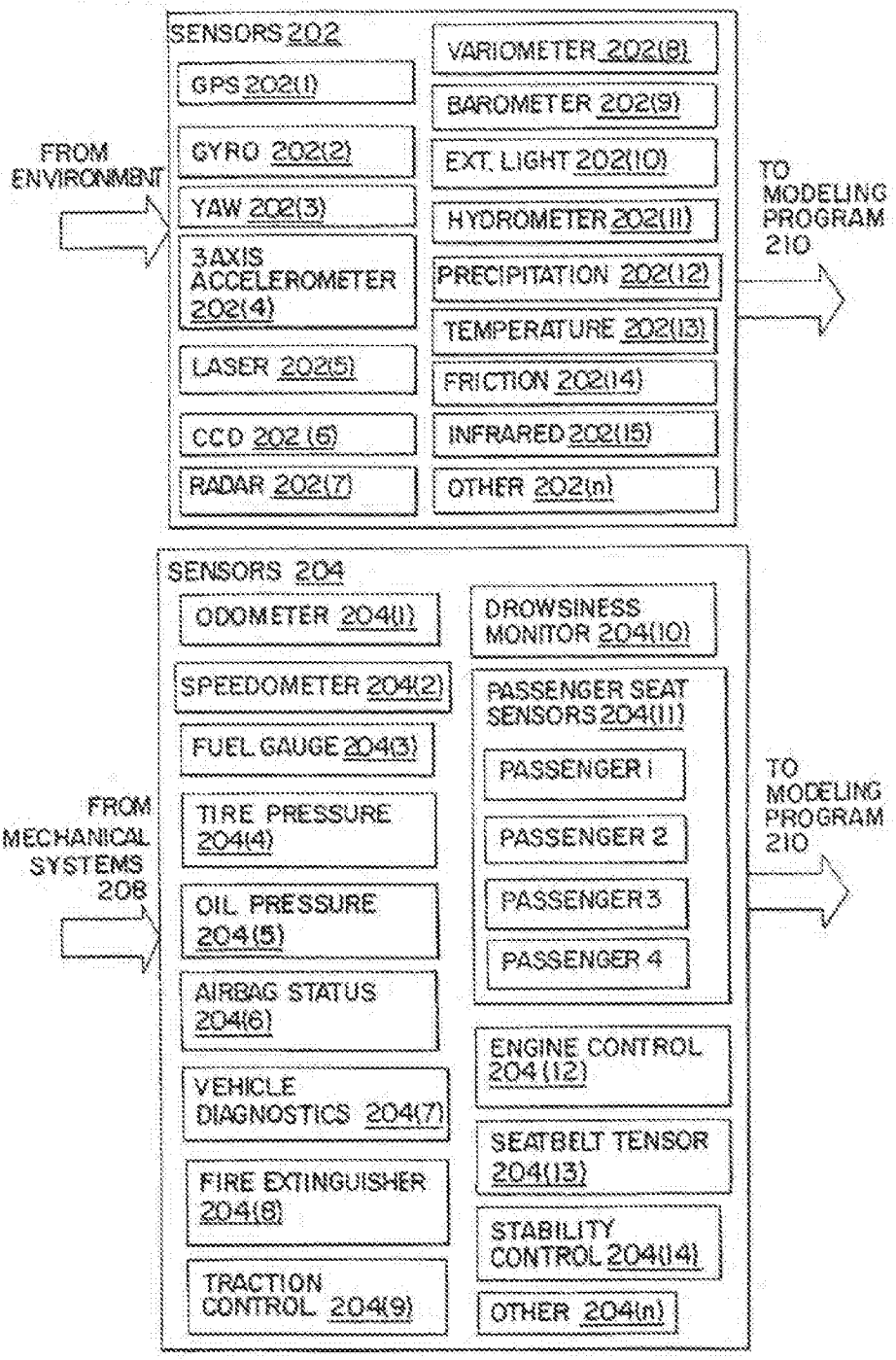


FIG. 3

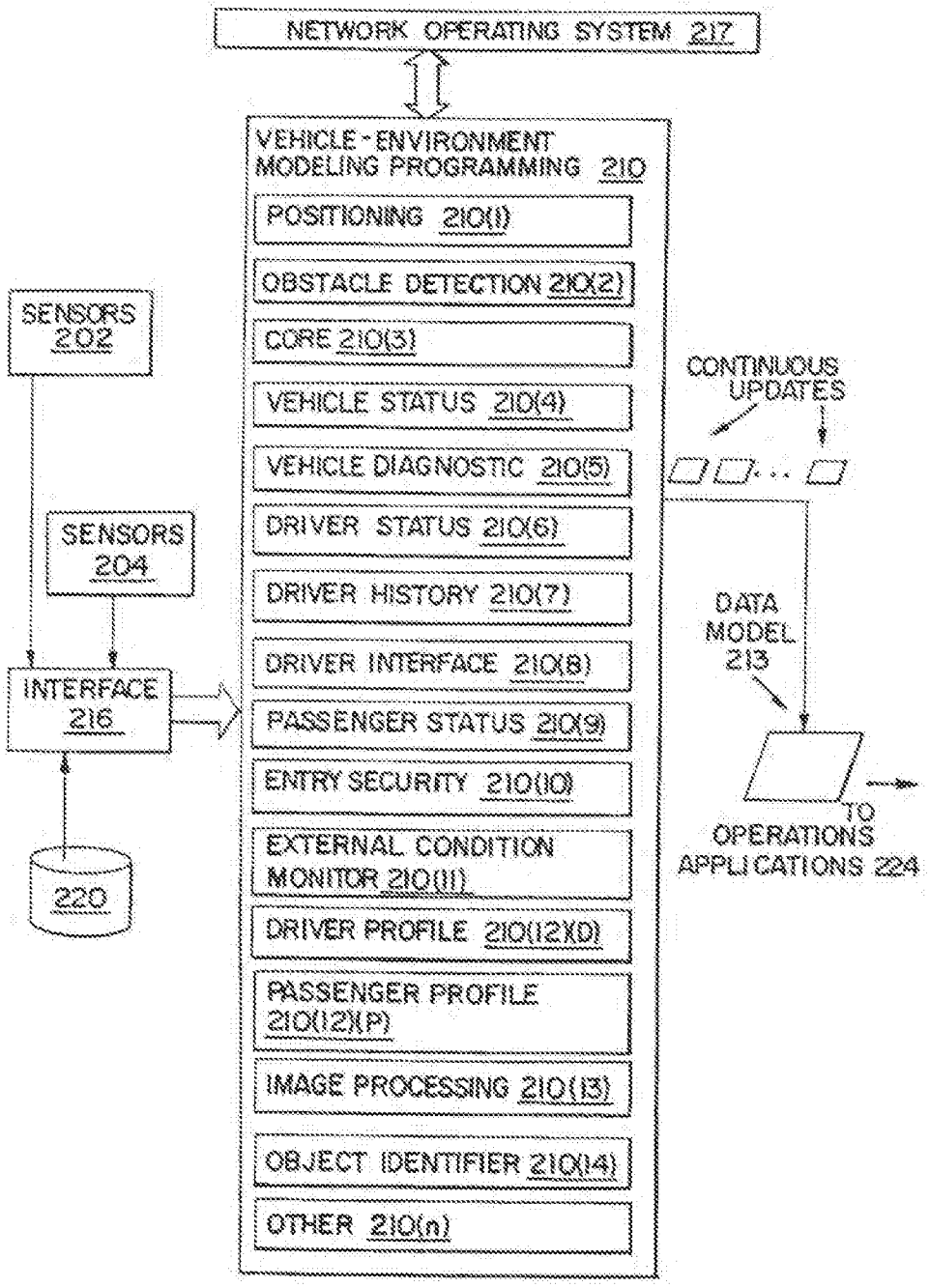
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FIG. 4



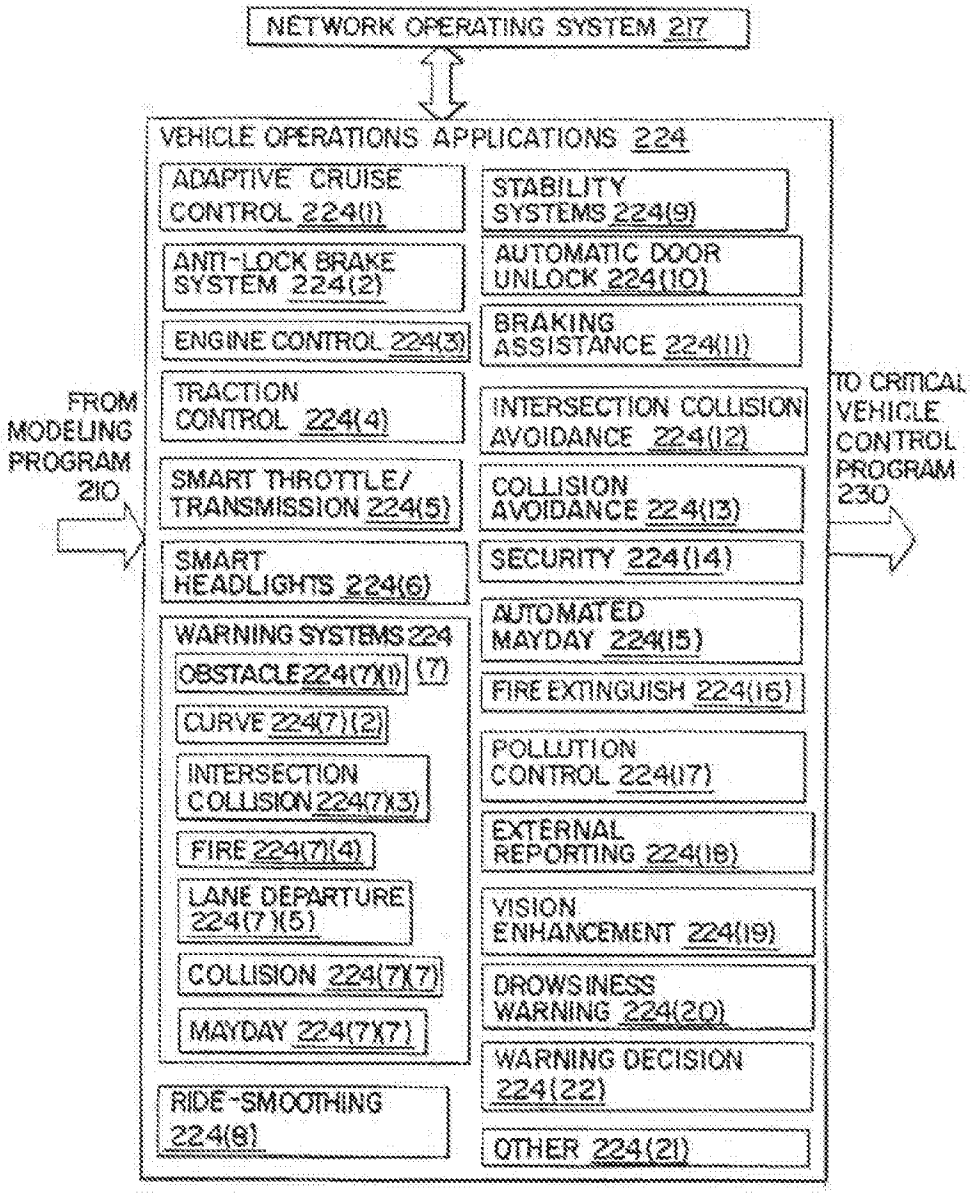
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FIG. 5



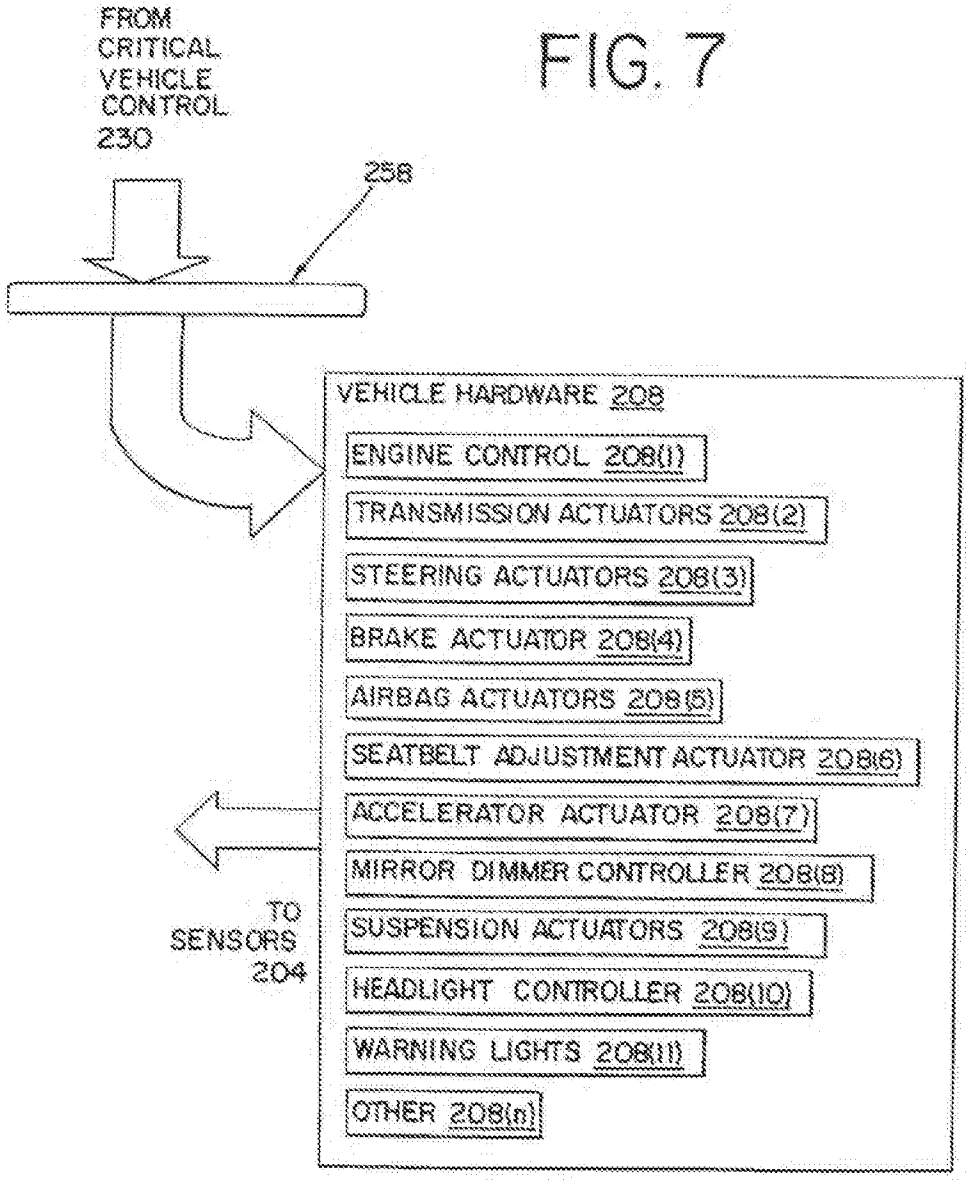
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FIG.6



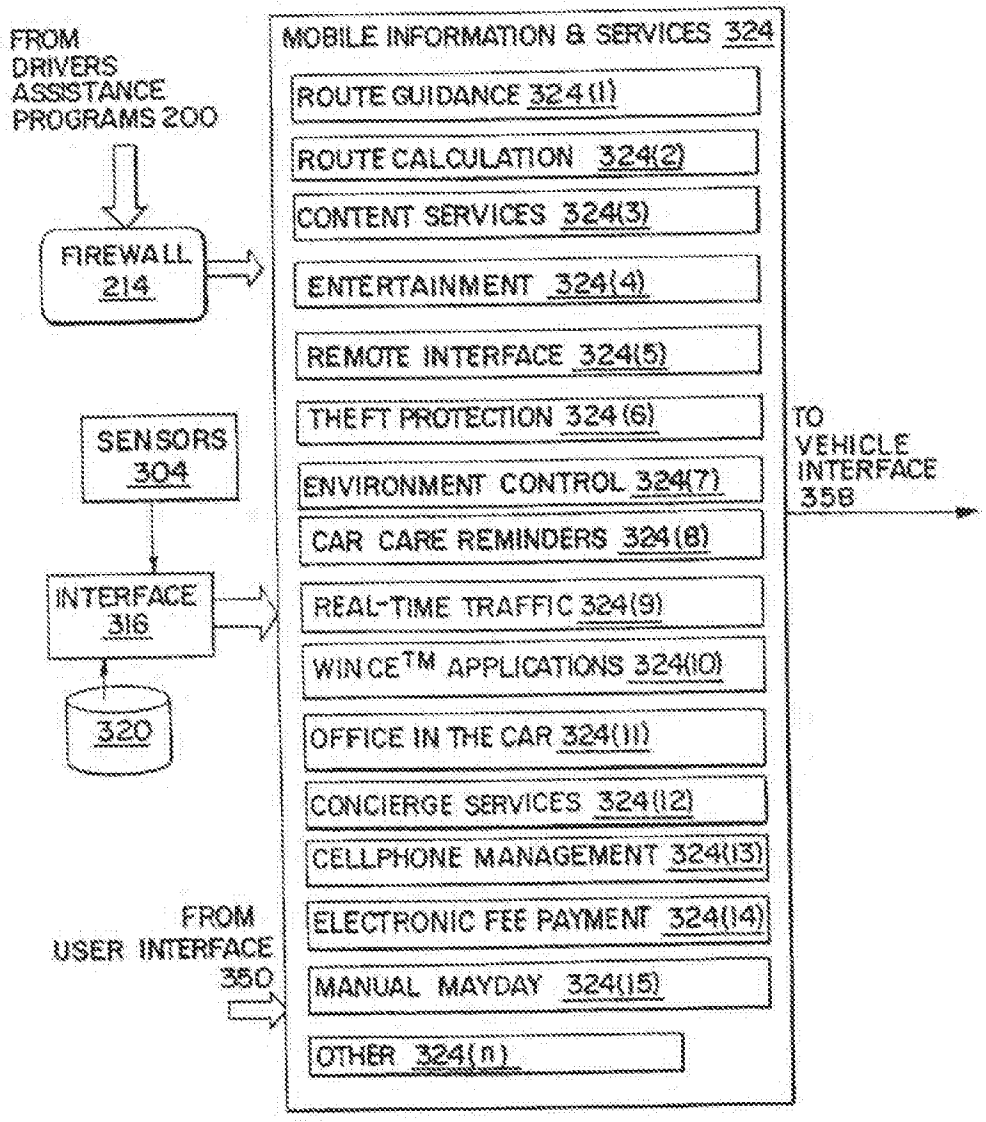
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FIG. 7



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FIG. 8



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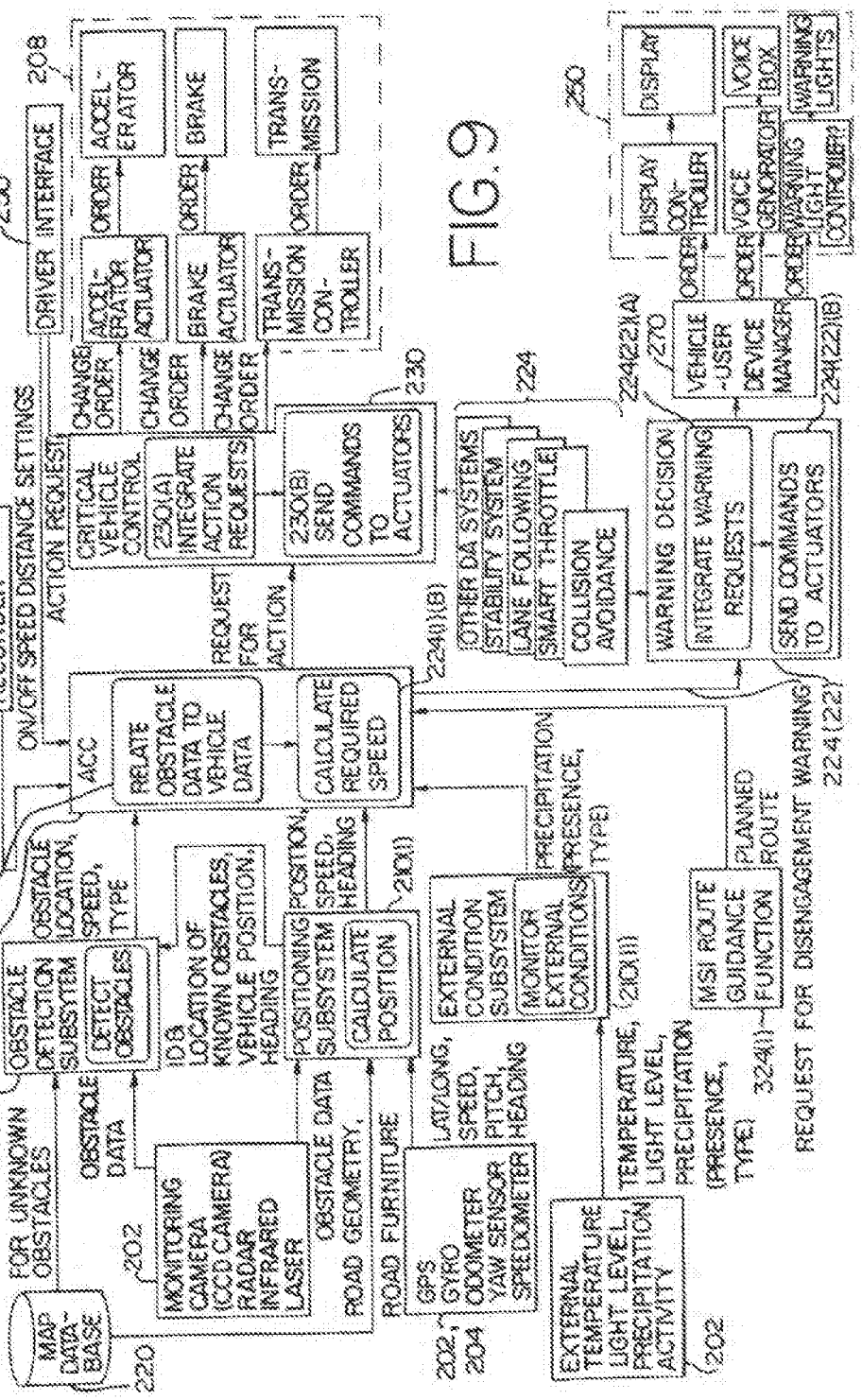


FIG. 9

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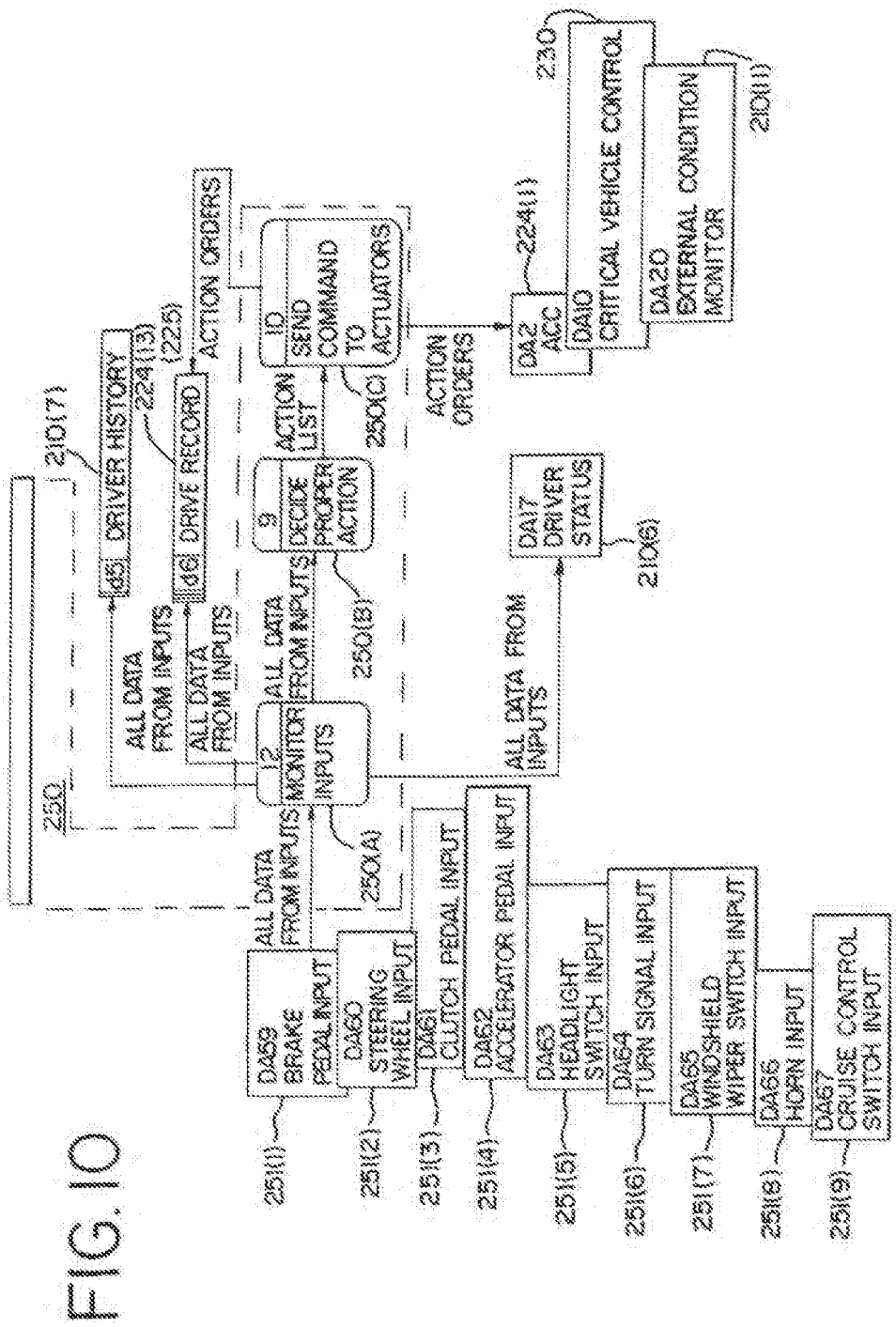


FIG. 10

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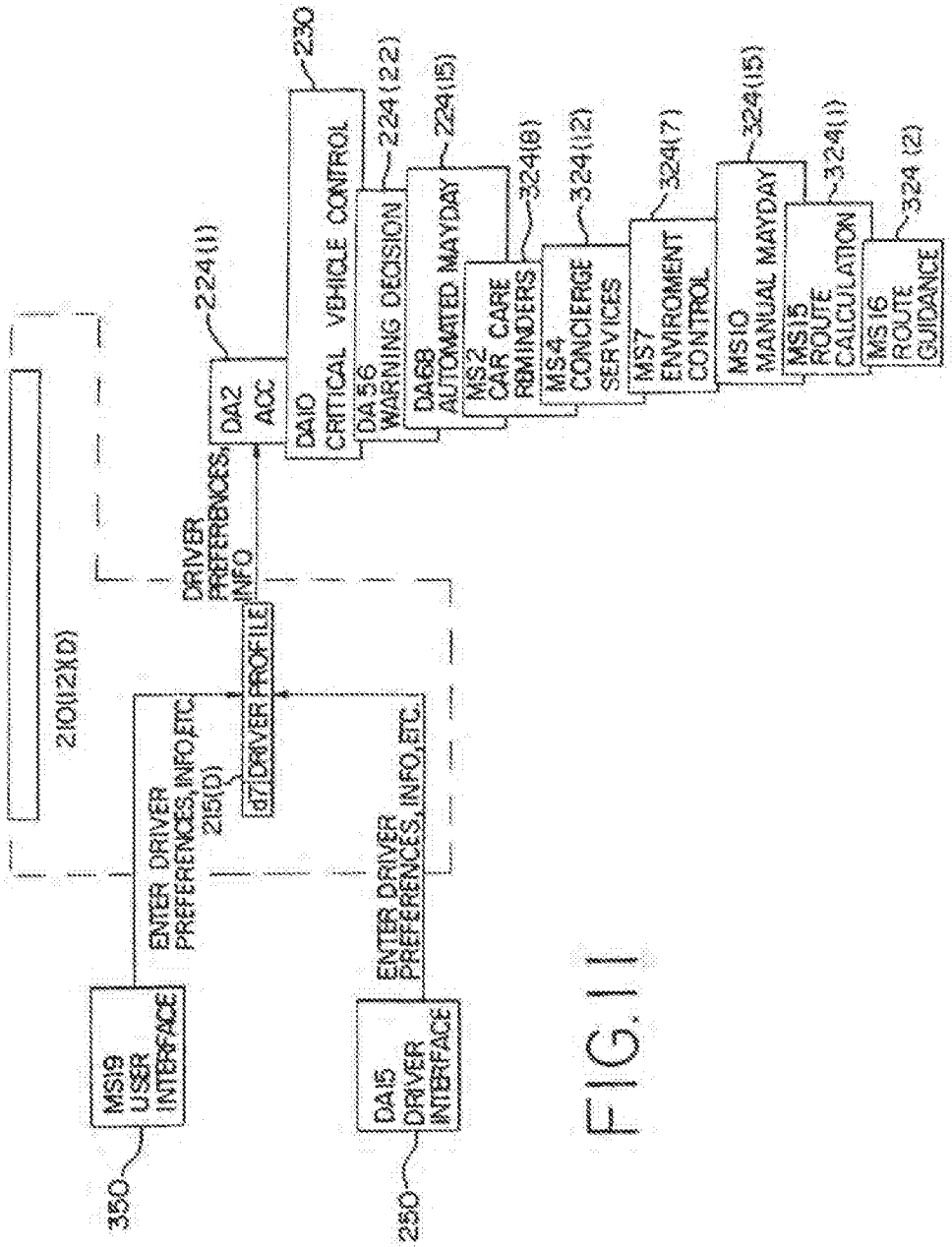


FIG. 11

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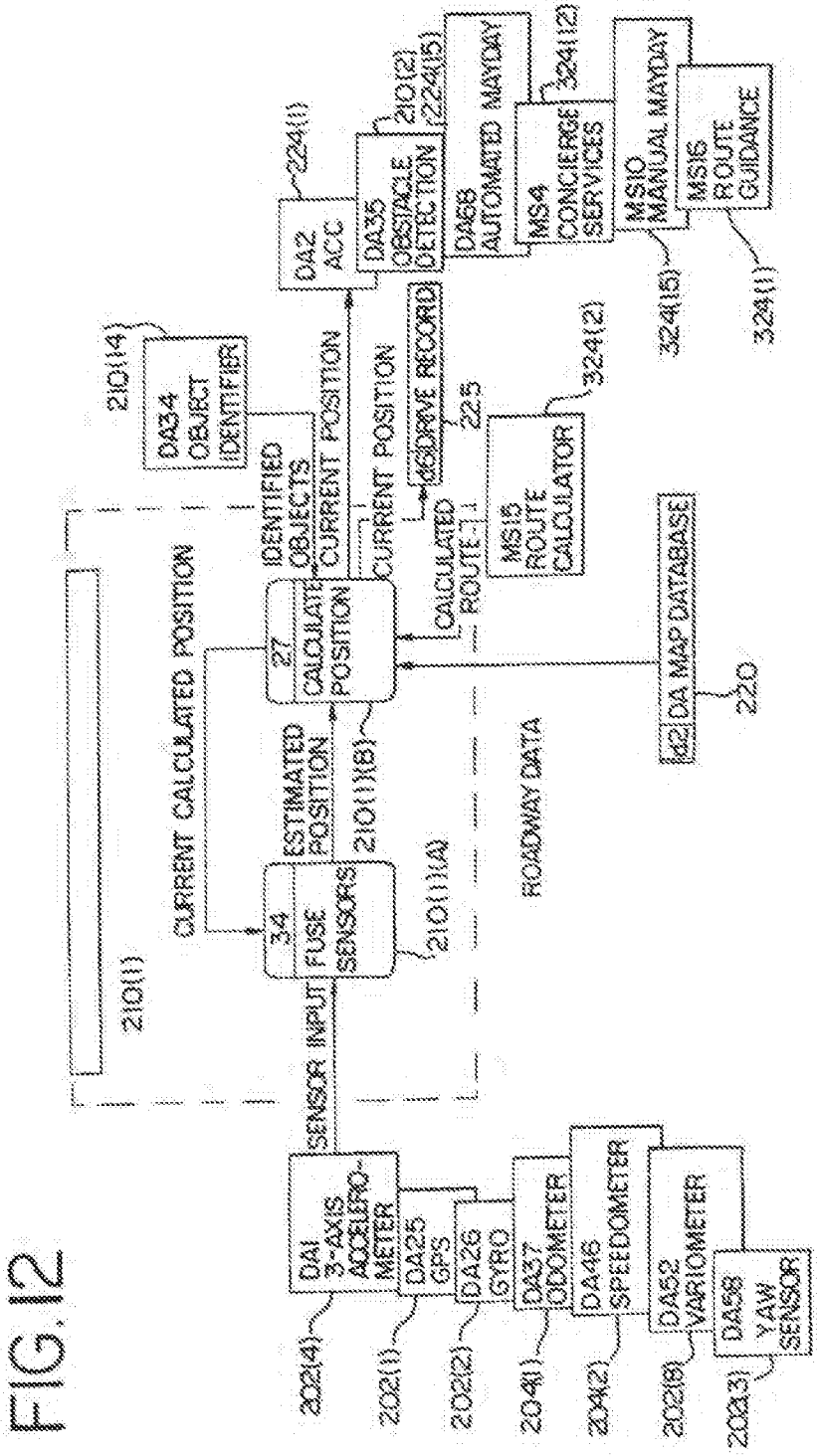
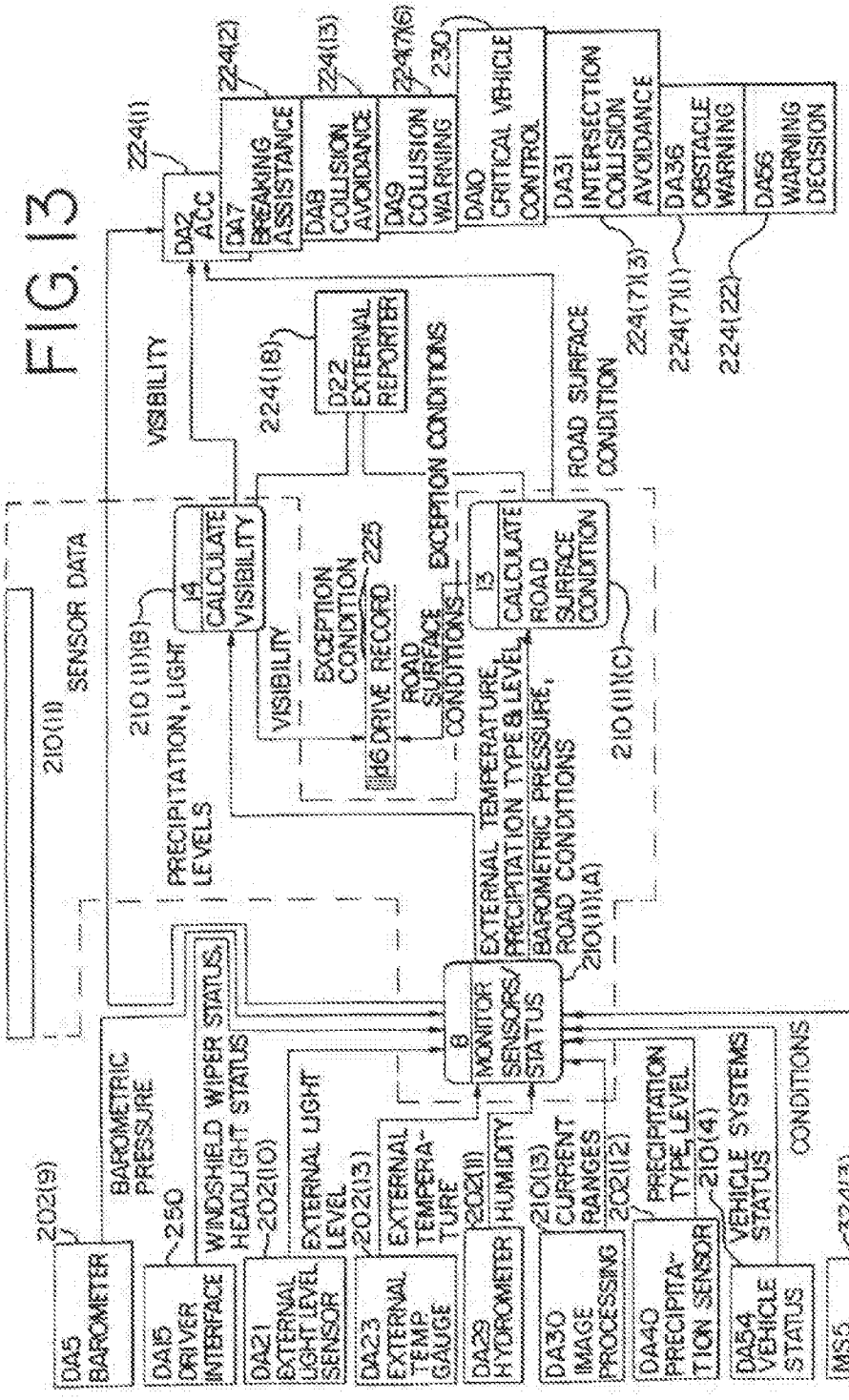


FIG. 12

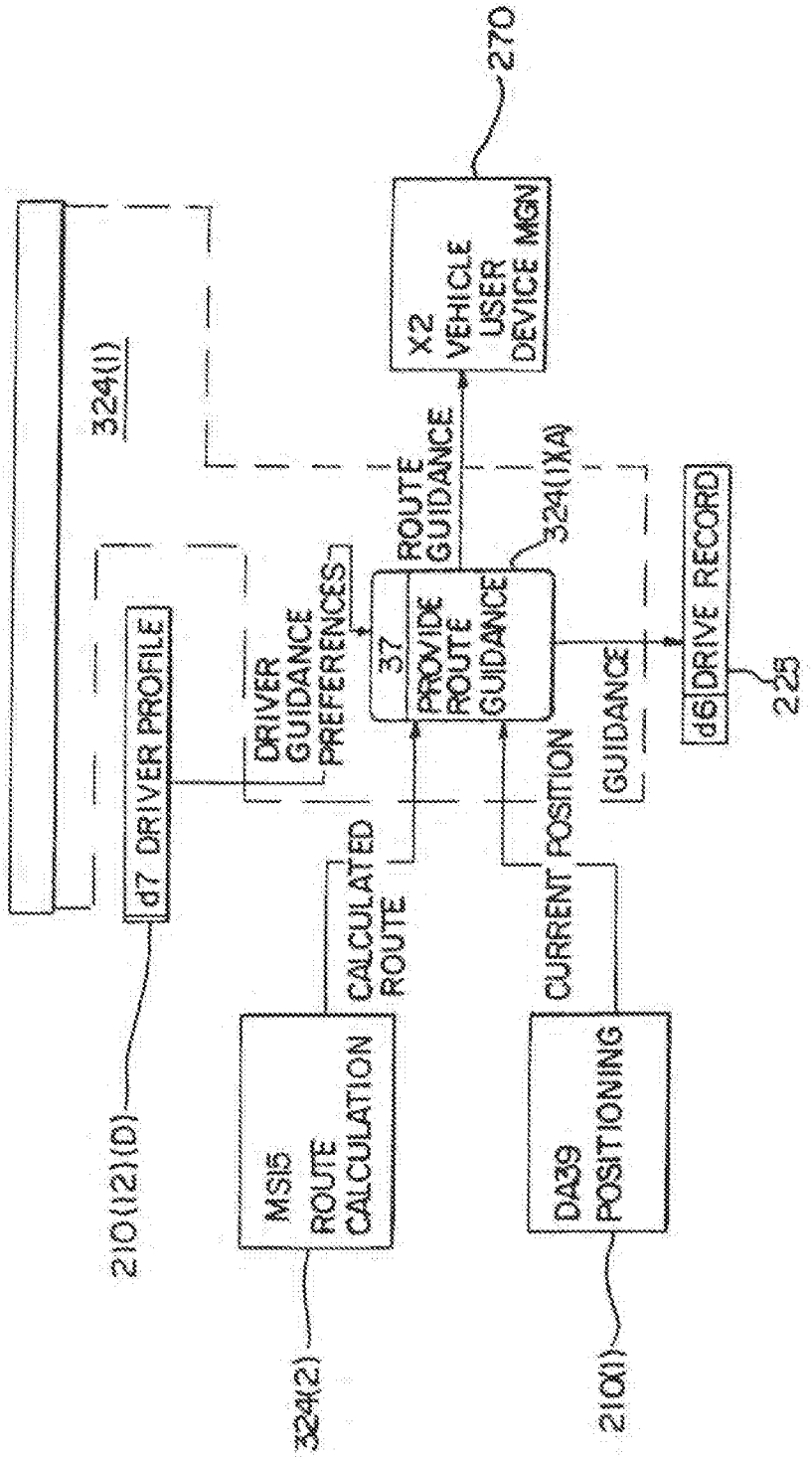
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FIG. 13



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FIG. 14



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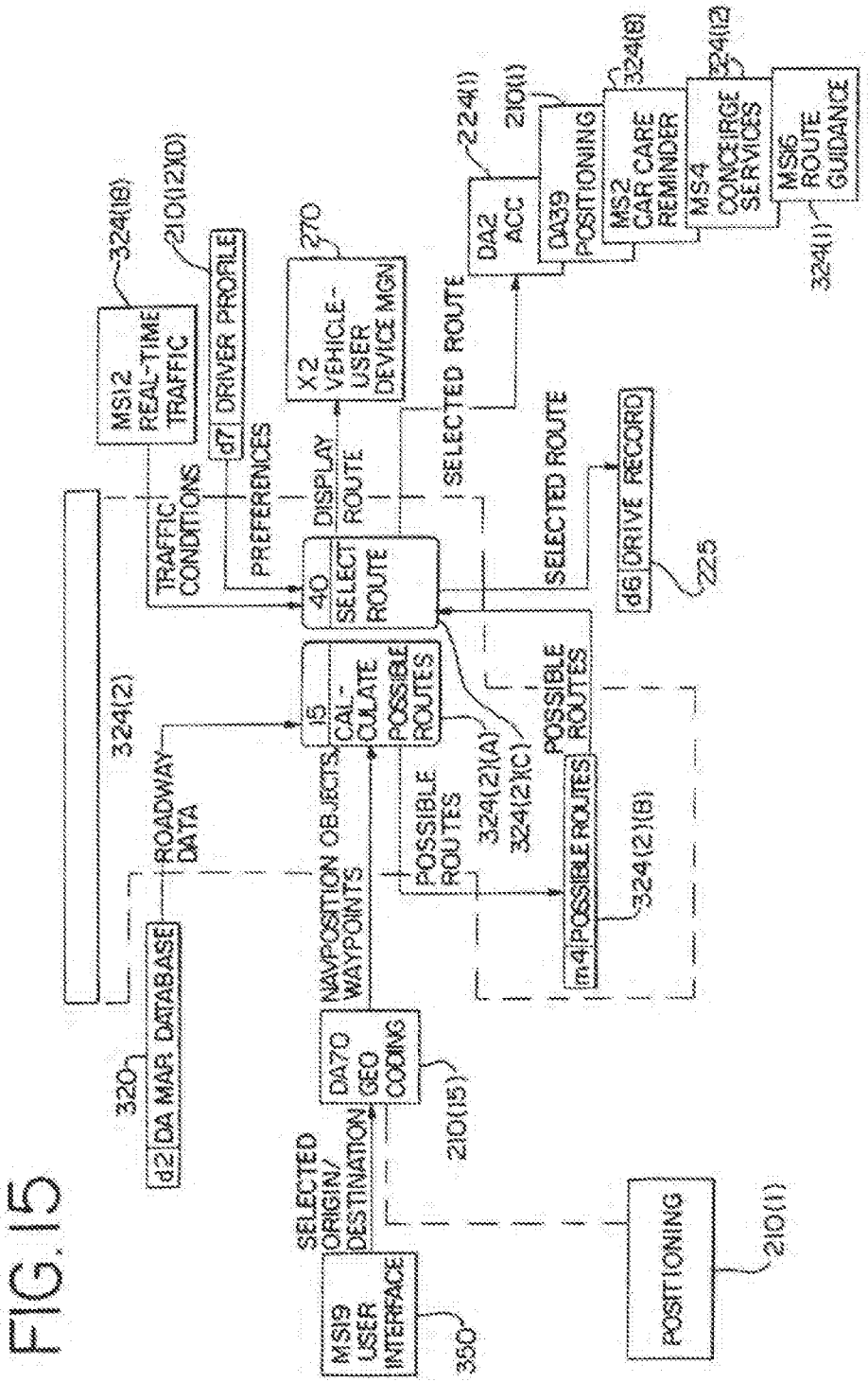
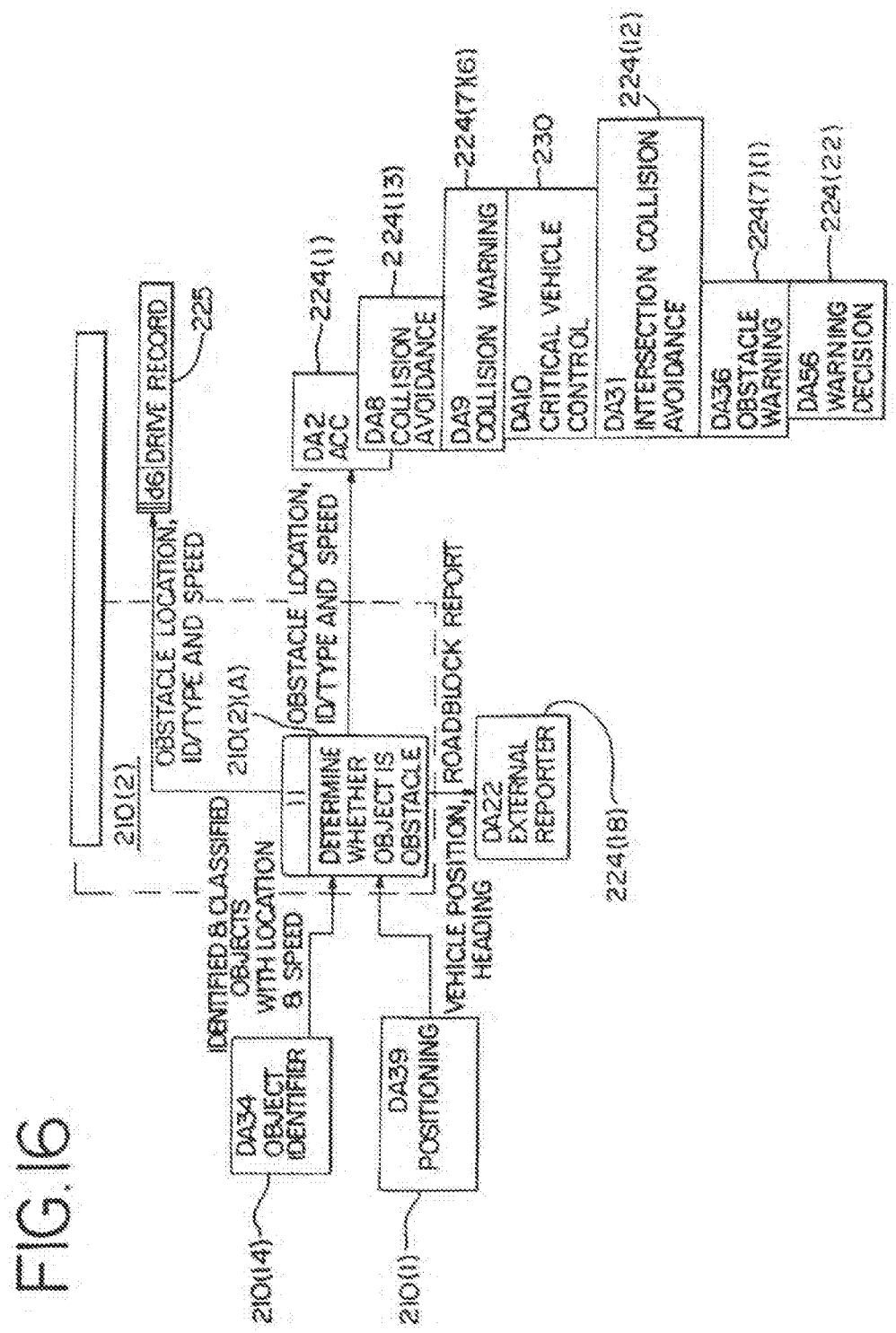


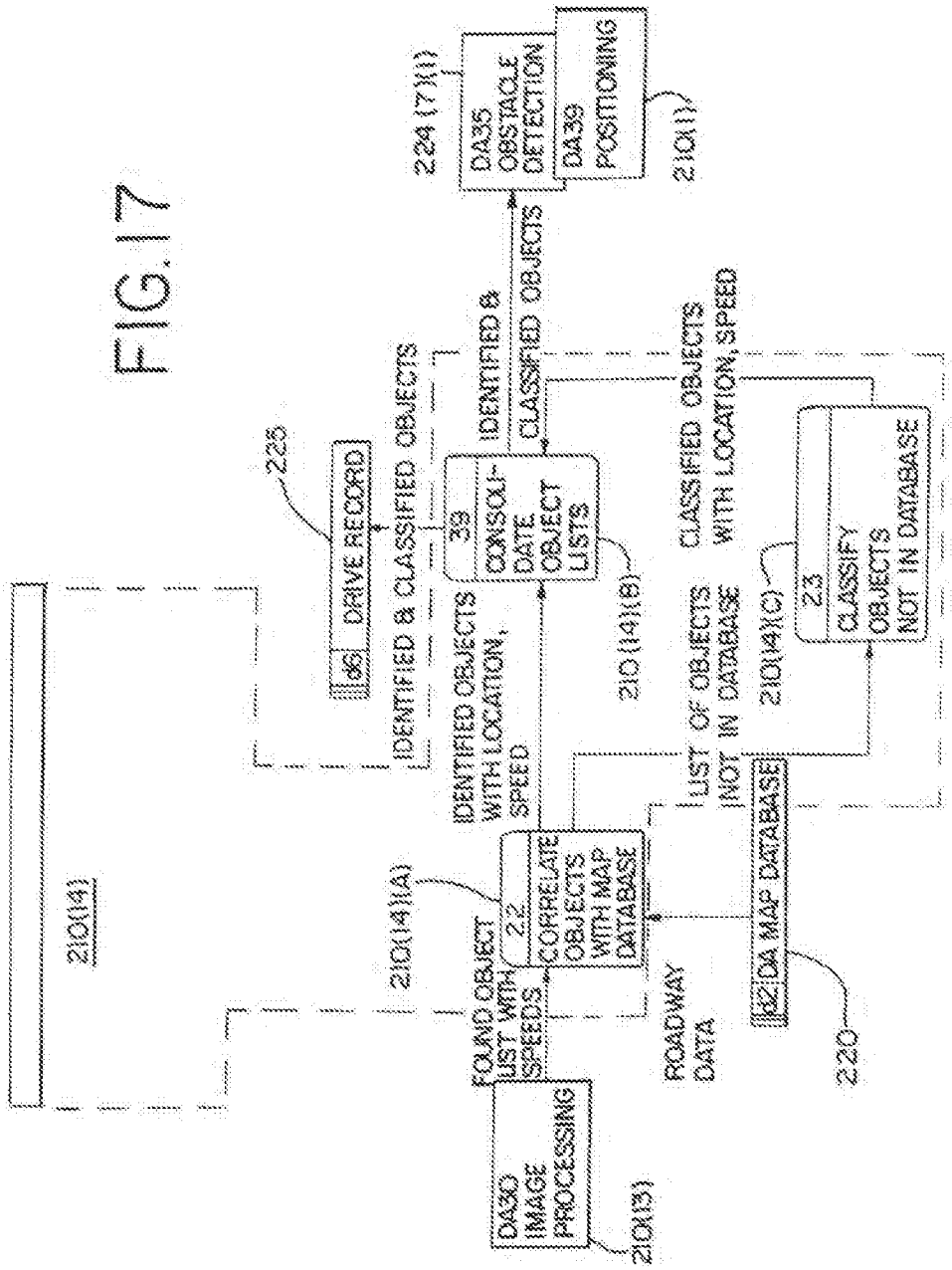
FIG. 15

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FIG. 17



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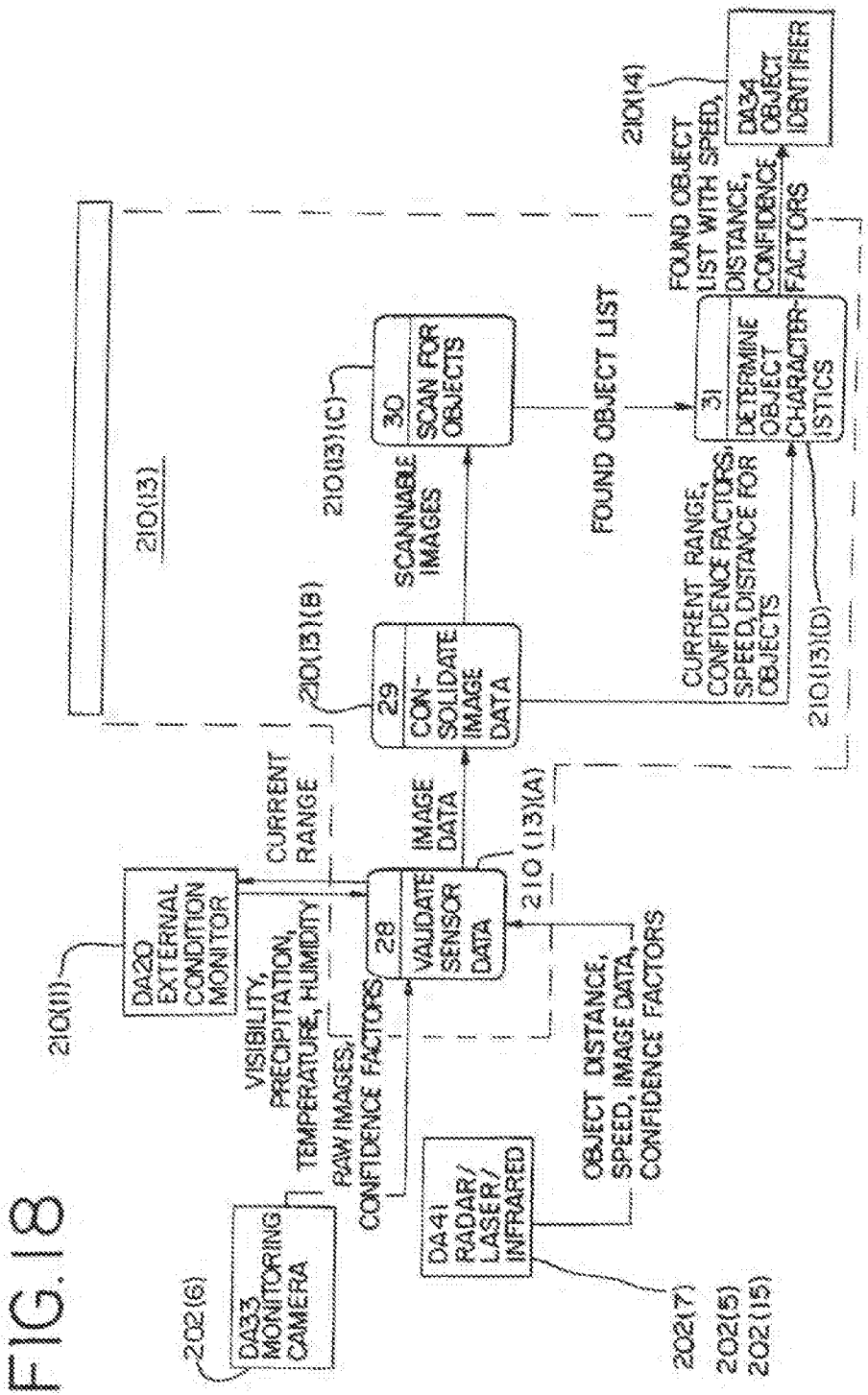
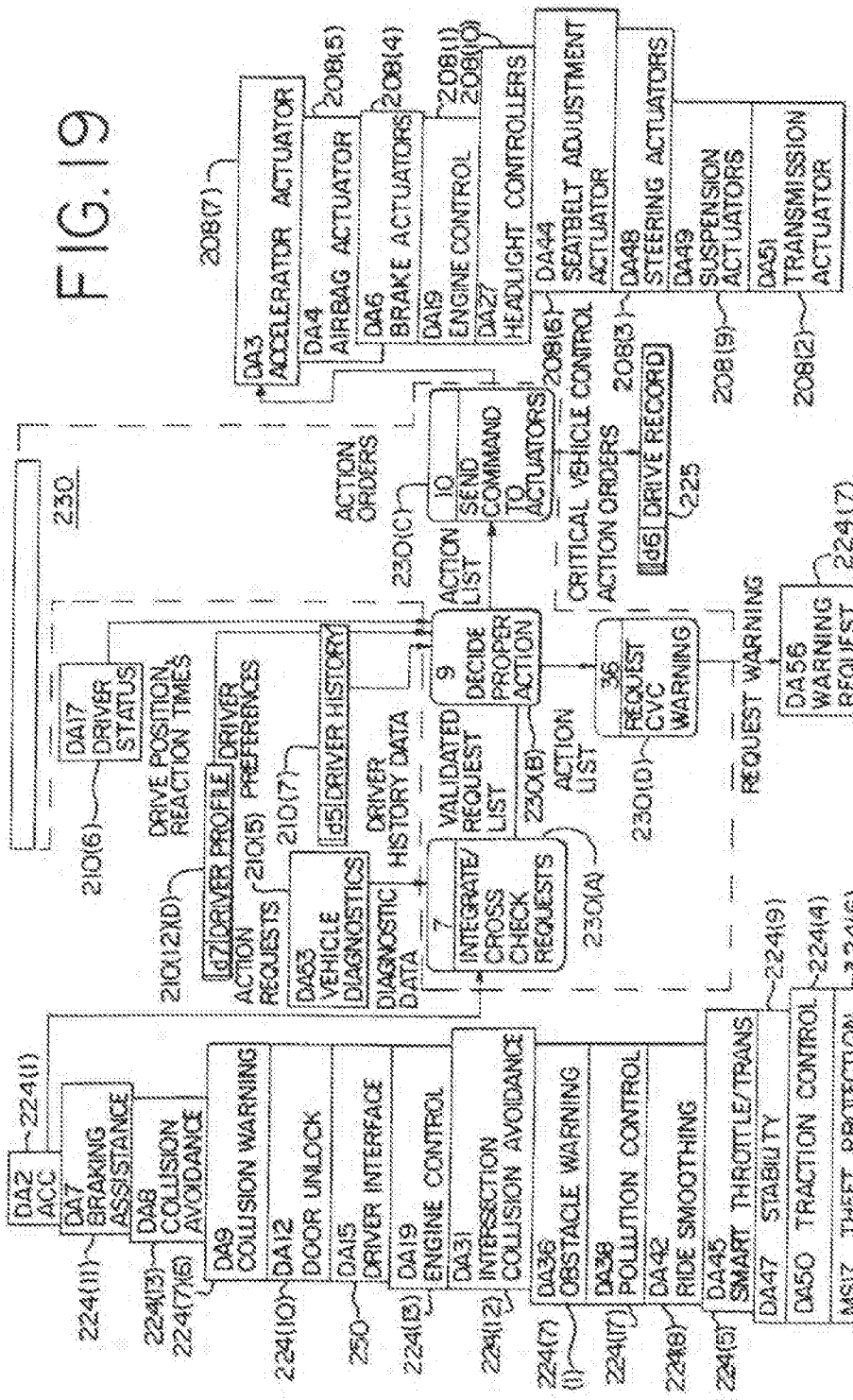


FIG. 18

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FIG. 19



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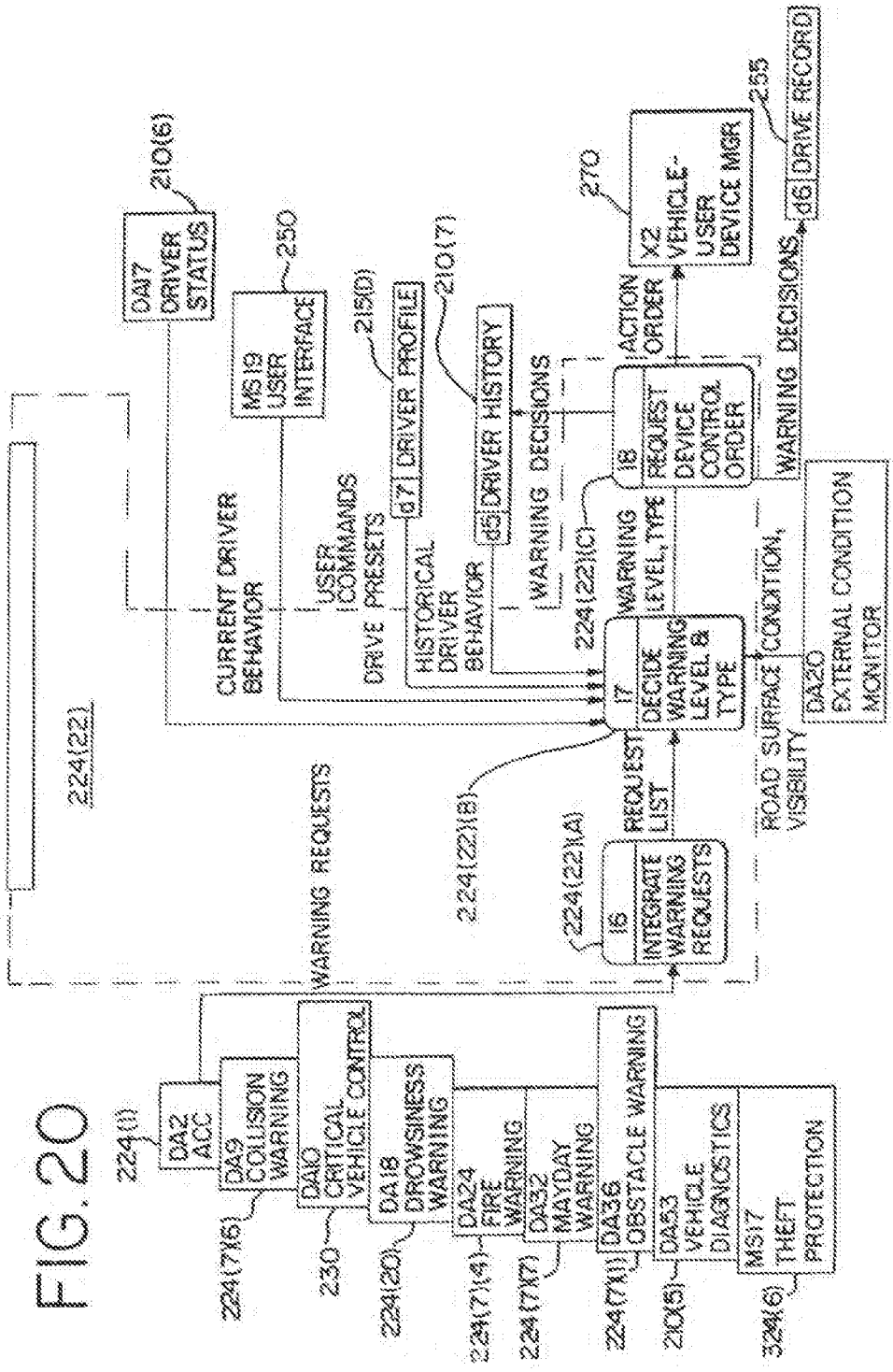


FIG. 20

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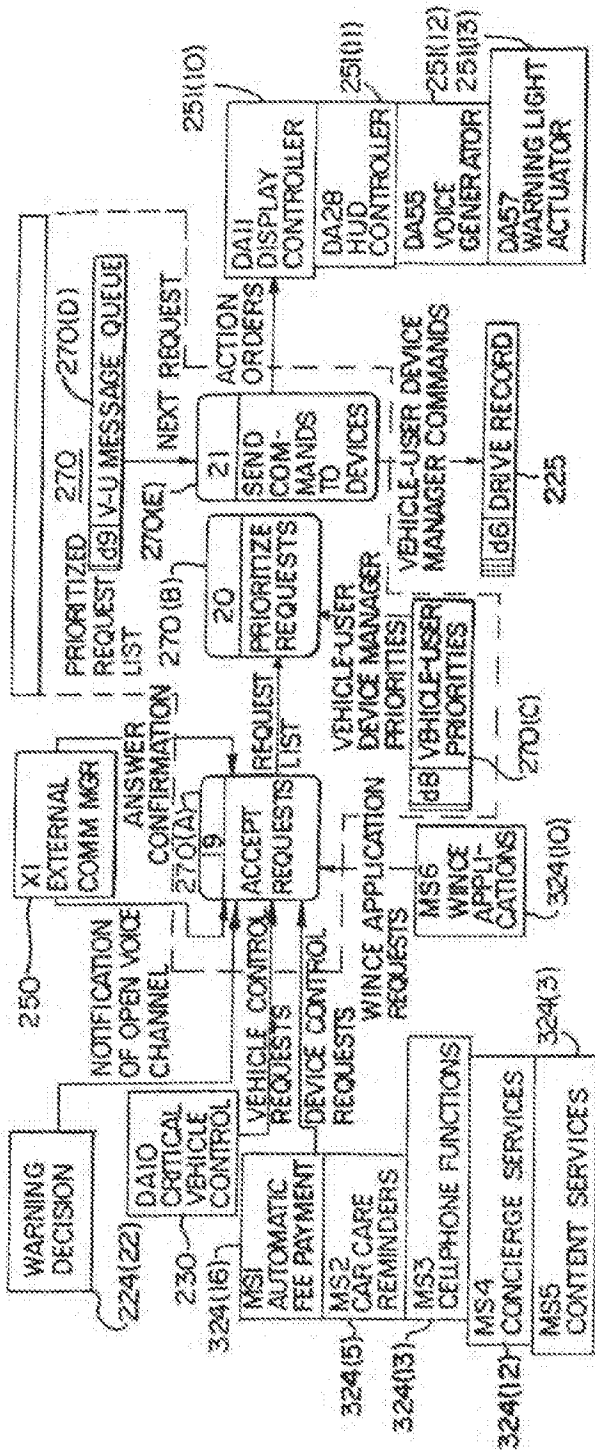
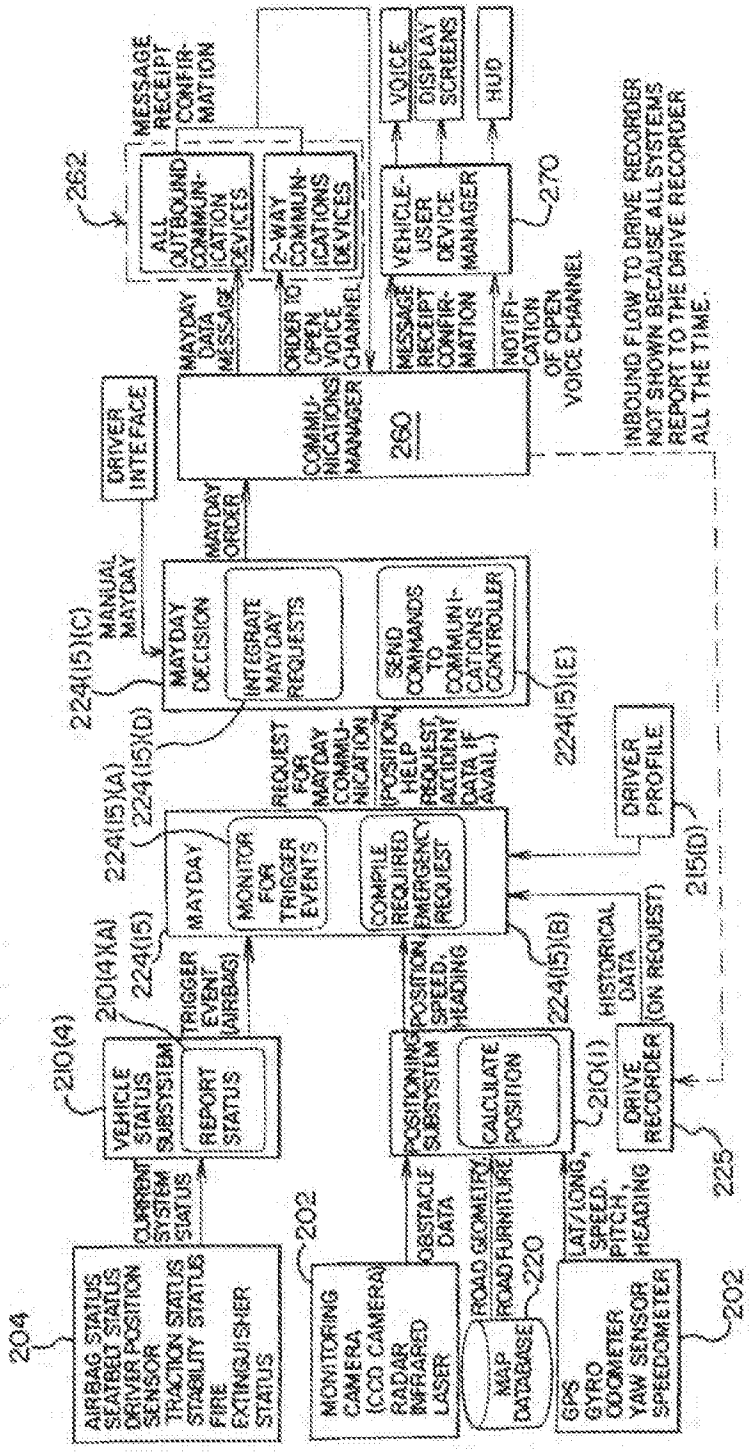


FIG. 21

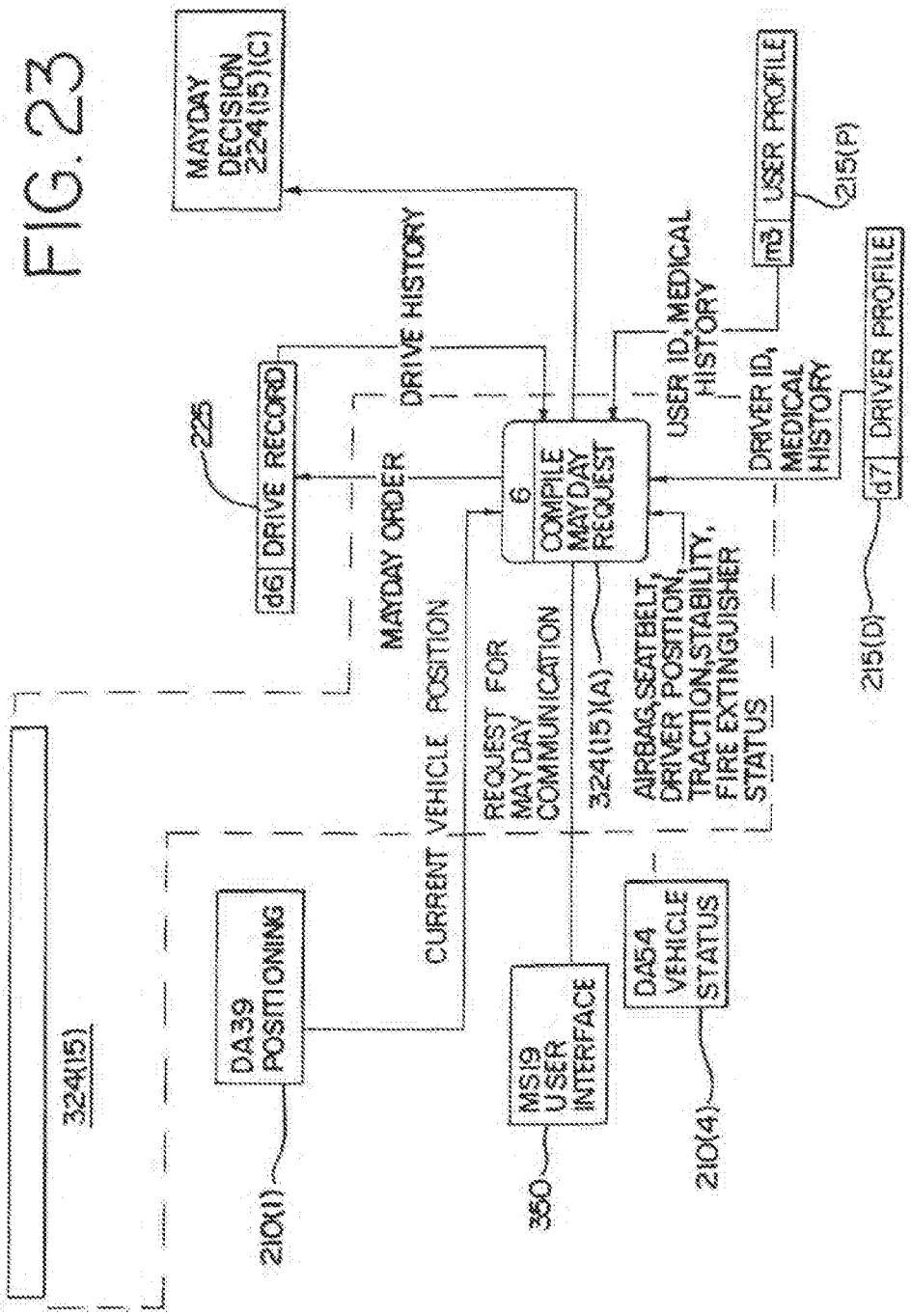
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FIG. 22

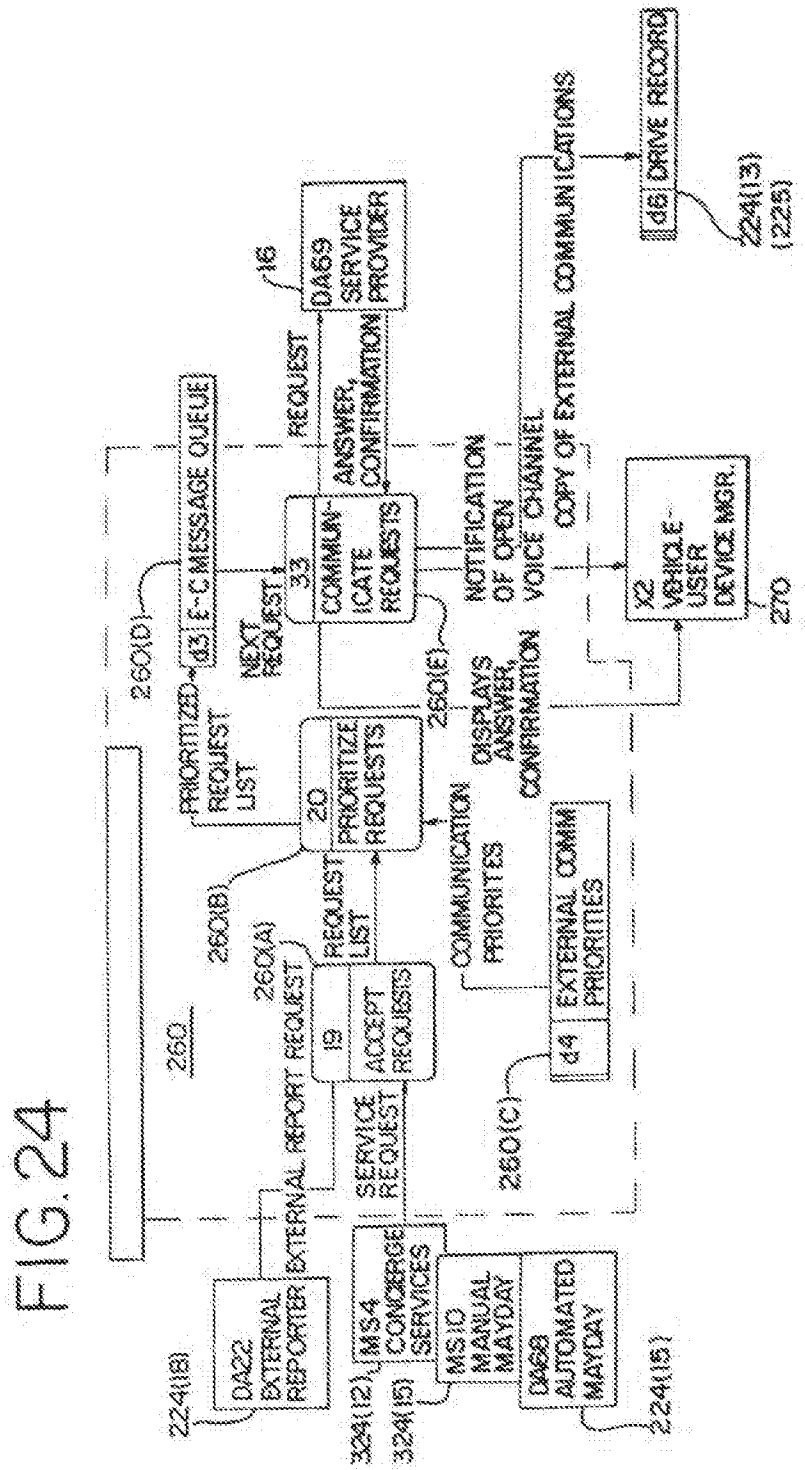


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FIG. 23



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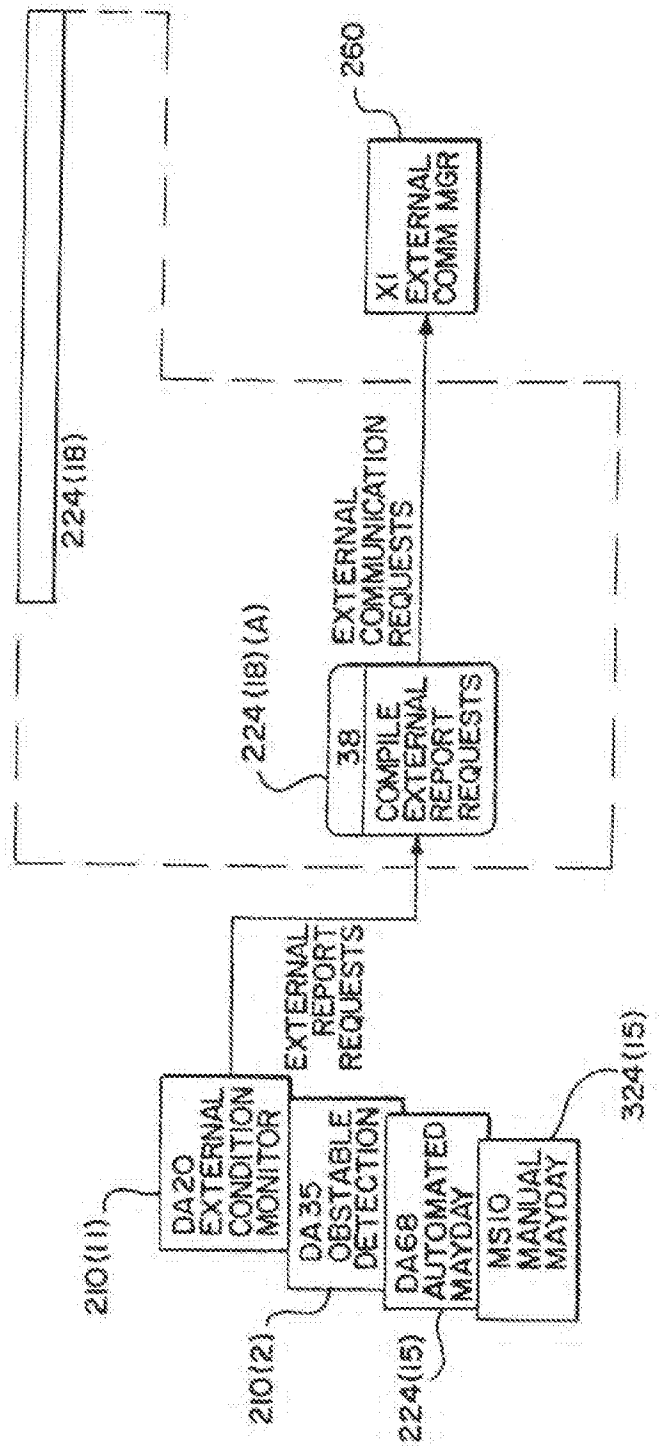


FIG. 25

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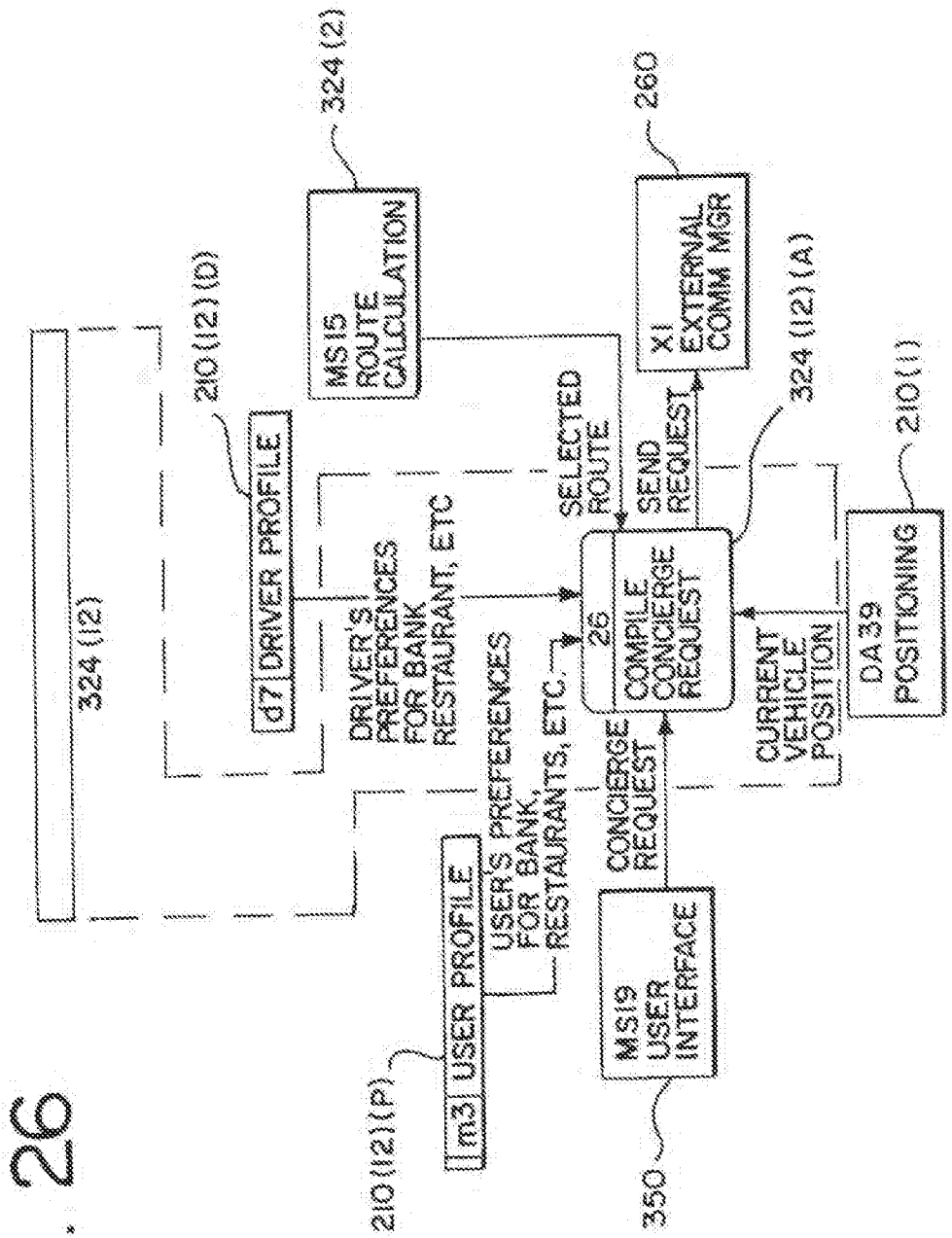


FIG. 26

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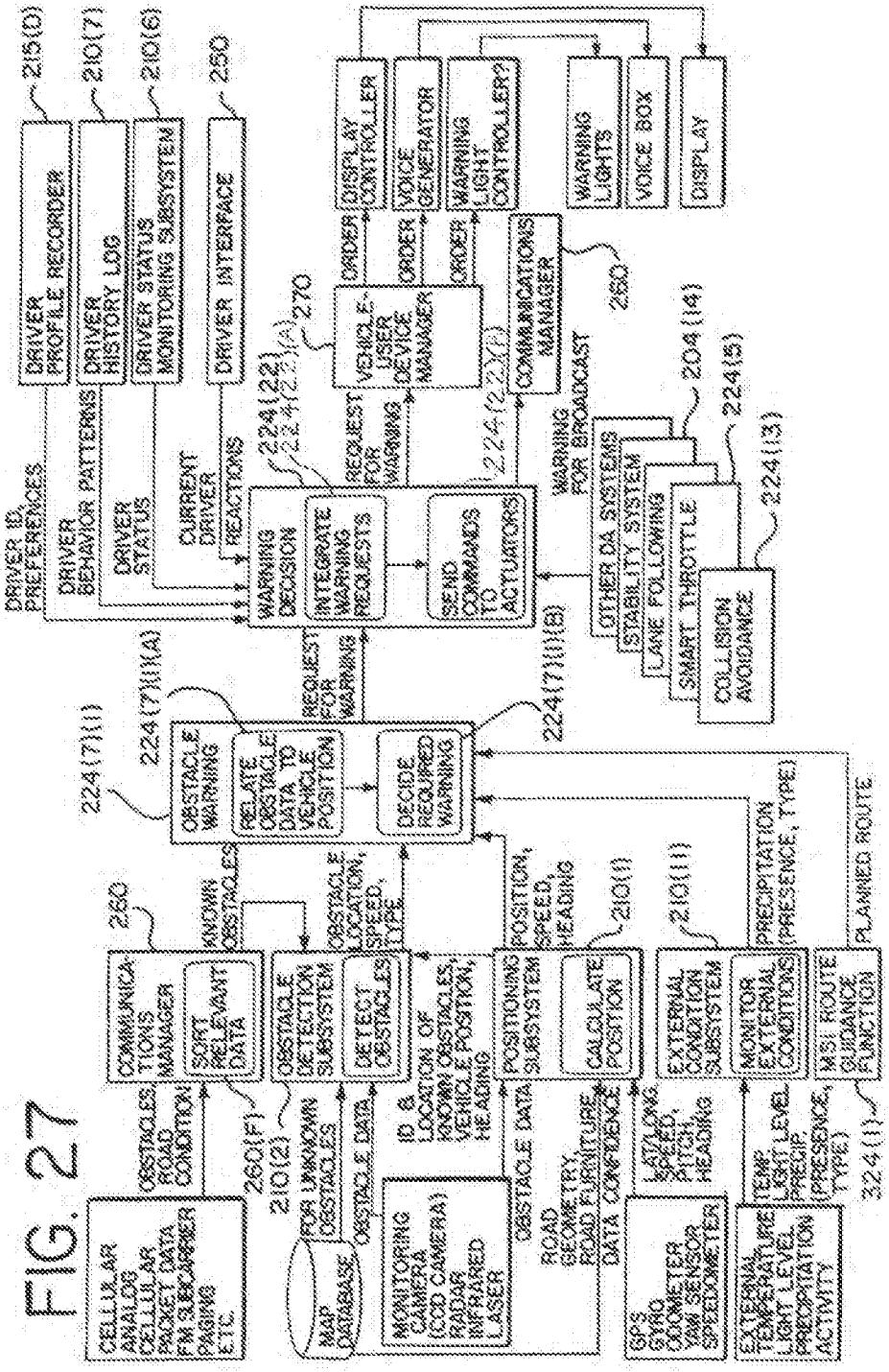


FIG. 27

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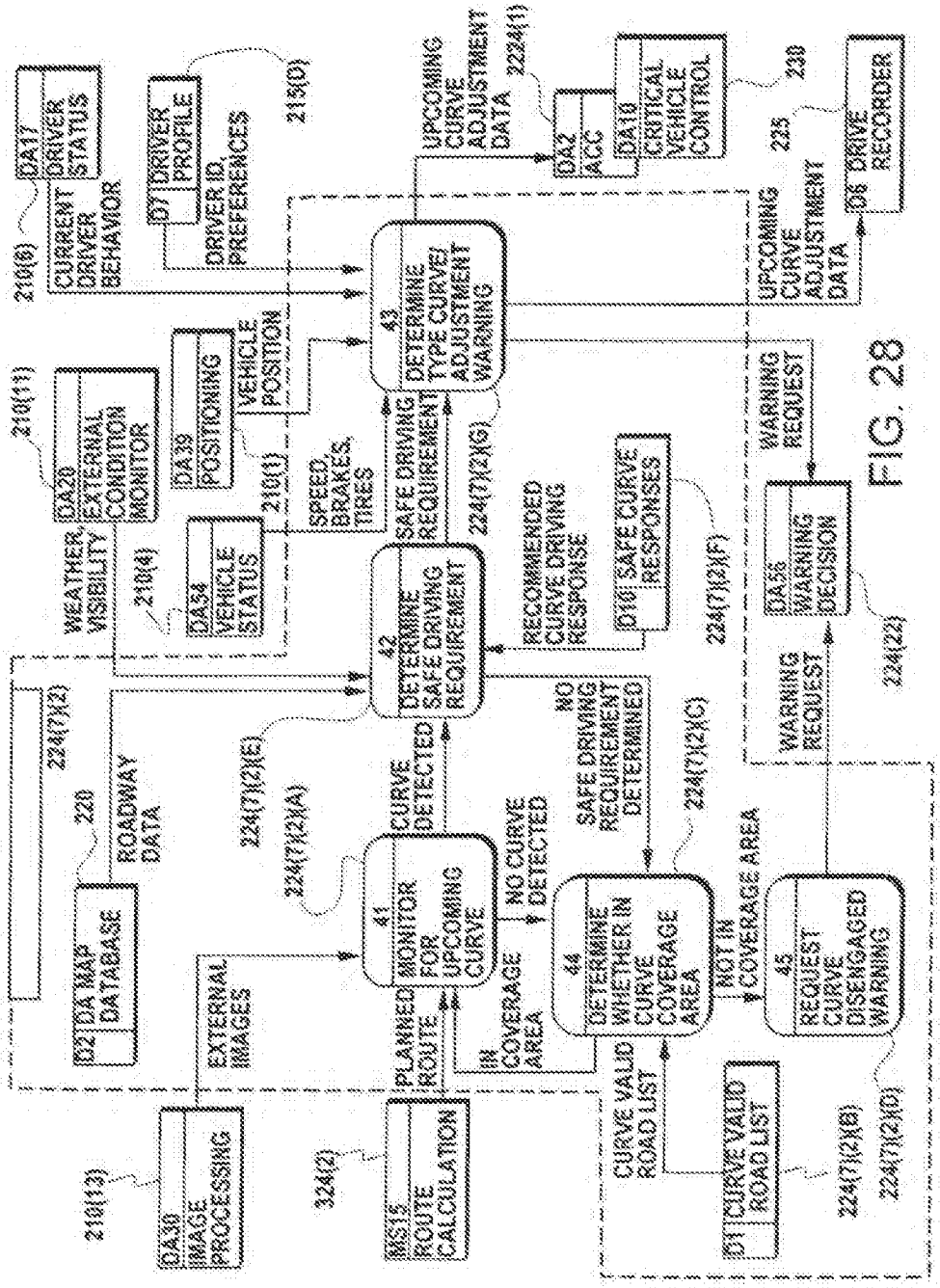
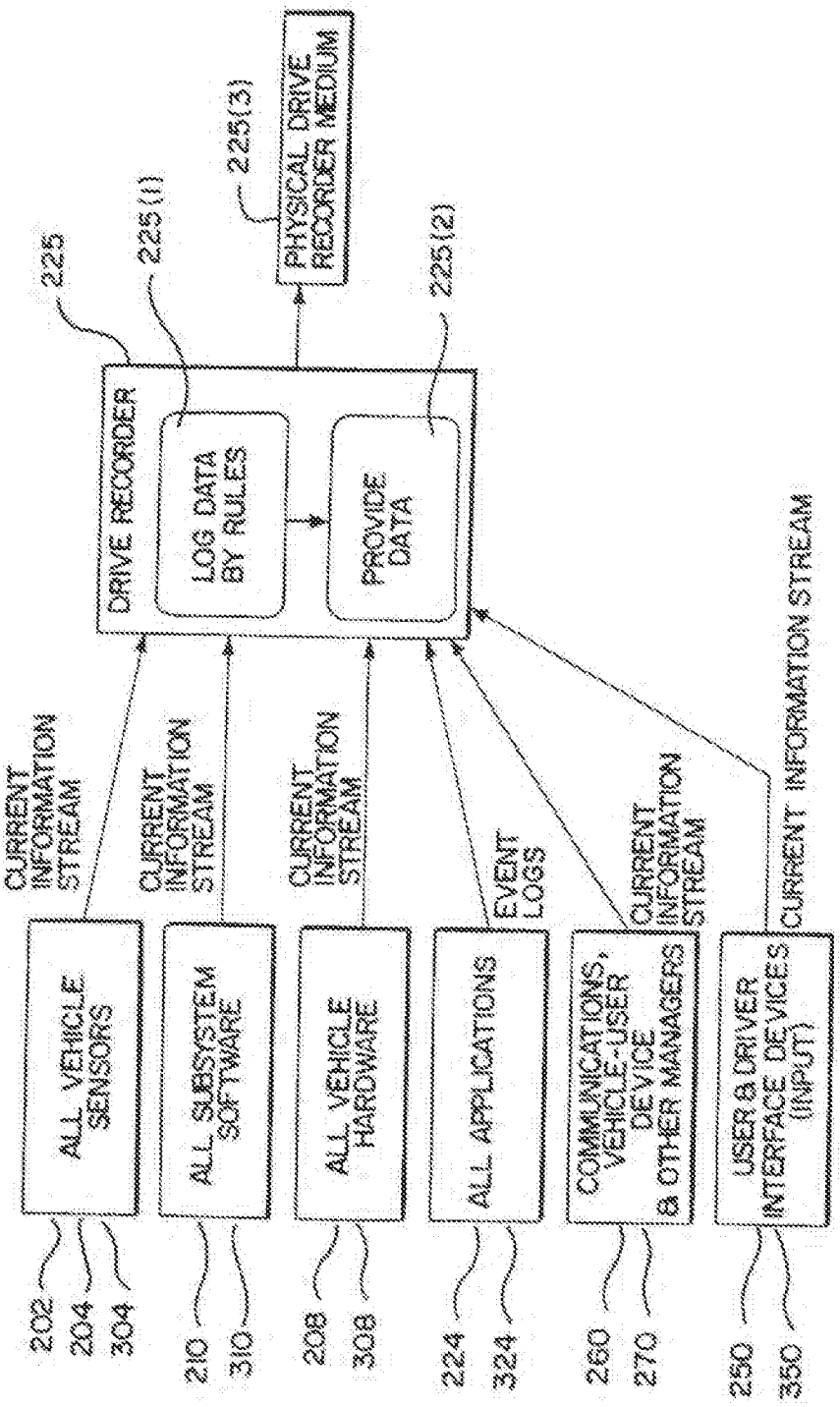

210(6)
DA17 DRIVER STATUS
CURRENT DRIVER BEHAVIOR
D7 DRIVER PROFILE
DRIVER ID, PREFERENCES
213(D)
UPCOMING CURVE ADJUSTMENT DATA
224(1)
DA2 ACC
DA10 CRITICAL VEHICLE CONTROL
230
225
D6 DRIVE RECORDER
210(11)
DA20 EXTERNAL CONDITION MONITOR
WEATHER, VISIBILITY
DA39 POSITIONING
VEHICLE POSITION
43 DETERMINE TYPE CURVE/ ADJUSTMENT WARNING
SAFE DRIVING REQUIREMENT
224(7)(2)(G)
210(4)
DA34 VEHICLE STATUS
210(J)
SPEED, BRAKES, TIRES
42 DETERMINE SAFE DRIVING REQUIREMENT
RECOMMENDED CURVE DRIVING RESPONSE
D16 SAFE CURVE RESPONSES
224(7)(2)(F)
WARNING REQUEST
DA56 WARNING DECISION
224(22)
224(7)(2)
220
ROADWAY DATA
224(7)(2)(E)
224(7)(2)(A)
CURVE DETECTED
NO CURVE DETECTED
SAFE DRIVING REQUIREMENT DETERMINED
NO
224(7)(2)(C)
WARNING REQUEST
D2 DA MAP DATABASE
EXTERNAL IMAGES
41 MONITOR FOR UPCOMING CURVE
44 DETERMINE WHETHER IN CURVE COVERAGE AREA
NOT IN COVERAGE AREA
45 REQUEST CURVE DISENGAGED WARNING
PLANNED ROUTE
IN COVERAGE AREA
CURVE VALID ROAD LIST
D1 CURVE VALID ROAD LIST
224(7)(2)(B)
224(7)(2)(D)
210(13)
DA30 IMAGE PROCESSING
324(2)
M615 ROUTE CALCULATION

FIG. 28

FIG. 29



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METHOD AND SYSTEM FOR AN IN-VEHICLE COMPUTING ARCHITECTURE

REFERENCE TO RELATED APPLICATIONS

The present application is a continuation of Ser. No. 10/090,330, filed Mar. 4, 2002, which was a continuation of Ser. No. 09/706,943, filed Nov. 6, 2000, now U.S. Pat. No. 6,353,785, which was a continuation of Ser. No. 09/268,162 filed Mar. 12, 1999, now U.S. Pat. No. 6,161,071, the entire disclosures of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

The present invention relates to a computing architecture for vehicles and more particularly, the present invention relates to a novel computing architecture that includes modeling programming from which a data model of the vehicle and the environment around the vehicle is built, which in turn is used by vehicle operations applications to provide various functions consistently and efficiently.

Over the years, manufacturers of on-road vehicles, such as automobiles, vans, trucks, buses, and so on, have utilized computer technology to enhance the operations of existing features and functions in the vehicles as well as to provide new features and functions. For example, programmed controllers, custom-designed processors, embedded systems, and/or computer modules have been developed that support or even control various kinds of mechanical equipment in vehicles. For example, programmed controllers or computer modules have been developed that control or support various engine functions, such as fuel injection, timing, and so on. Programmed controllers or computer modules have been developed to enhance or support operation of transmission systems, suspension systems, braking systems, and so on. The sophistication of these enhancements has advanced as the processing power available for these purposes has increased. It is expected that in the future more aspects of the mechanical equipment in vehicles will be controlled or supported by processors or controllers in order to enhance performance, reliability, and safety, to reduce emissions, and so on.

Aside from using computer technology to support various mechanical functions in vehicles, processors, controllers, or other programmed computer-based technologies are used in vehicles in other ways. Car phones, entertainment equipment (such as CD players), in-vehicle navigation systems, and emergency roadside assistance systems are examples. In addition, new kinds of equipment that provide entirely new features may become available in vehicles. For example, vehicles may include radar systems that detect obstacles on the road ahead and then automatically brake the vehicle to prevent accidents. Another example is an in-vehicle email system that automatically downloads and reads the driver's email. These new kinds of equipment are likely to include one or more processors and appropriate programming.

These new kinds of equipment hold the promise of making the operation of a vehicle safer, more reliable, less polluting, and more enjoyable. However, there are several considerations related to providing these kinds of features that constrain implementation. One consideration relates to enabling the various processor-controlled equipment to work together. Although many of these processor-controlled kinds of equipment can be (and have been) implemented piecemeal, there exists the possibility that operation of some equipment may conflict with operation of other equipment. This possibility may increase in the future as more kinds of processor-controlled equipment are provided in vehicles.

Another consideration relates to the need to provide fail-safe and back-up features as users increase their reliance on these features. Still another consideration is that as the number of processor-controlled kinds of equipment provided in a vehicle increases, there exists an opportunity for efficiencies resulting from shared resources that enable overall costs to be decreased. A still further consideration is that as more processor-controlled equipment is provided in a vehicle, synergistic benefits may arise from sharing resources.

SUMMARY OF THE INVENTION

To address the above concerns, the present invention comprises a computing architecture for a motorized land-based vehicle. The computing architecture includes a data network comprised of a plurality of interconnected processors, a first group of sensors responsive to environmental conditions around the vehicle, a second group of sensors responsive to the vehicle's hardware systems, and a map database containing data that represent geographic features in the geographic area around the vehicle. A vehicle-environment modeling program, executed on the data network, uses the outputs from the first and second groups of sensors and the map database to provide and continuously update a data model that represents the vehicle, past, present, and future environmental conditions around the vehicle, and geographic features, including structures, objects and obstacles around the vehicle. Vehicle operations programming applications, executed on the data network, use the data model to determine desired vehicle operation in the context of the vehicle's past, present, and future environment. A driver interface receives the vehicle driver's input. Vehicle control programming, executed on the data network, receives outputs from the vehicle operations programming applications and the driver interface, determines a resolved operation for the vehicle's hardware systems and provides output commands indicative thereof. The vehicle operations programming applications may include adaptive cruise control, automated mayday, and obstacle and collision warning systems, among others. Also supported is a drive recorder that maintains records of the statuses of all vehicle systems and of the driver.

According to another aspect, a new computing architecture for a vehicle is disclosed. The computing architecture organizes the applications and systems in the vehicle into two groups. The systems and applications in the first group are the driver assistance systems. The driver assistance systems include critical mobility-related and safety-related systems, such as the engine, brakes, airbags, and so on, as well as the software that supports these systems. The systems in the second group are the mobile services and information systems. The mobile services and information systems provide for driver and passenger convenience, entertainment, non-emergency communication, and navigation. The first and second groups communicate with each other through an internal firewall system. The internal firewall system assures that operations of the driver assistance systems are not compromised by operations of the mobile services and information systems. The driver assistance systems and the mobile services and information systems can exchange information with one or more external networks using a wireless communications system of the vehicle. A second firewall system prevents unauthorized and/or unwanted external data transmissions from interfering with the driver assistance systems and the mobile services and information systems.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram illustrating a geographic area including a plurality of vehicles, some of which include an in-vehicle computer network architecture according to a first embodiment.

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FIG. 2 is a logical block diagram illustrating the driver assistance portion of an in-vehicle computer system architecture for one of the vehicles shown in FIG. 1.

FIG. 3 is a logical block diagram illustrating the mobile services and information portion of the in-vehicle computer system architecture shown in FIG. 2.

FIG. 4 is a logical block diagram illustrating the sensor devices shown in FIG. 2.

FIG. 5 is a logical block diagram illustrating some of the specific programs and Systems included in the vehicle environment modeling program shown in FIG. 5.

FIG. 6 is a logical block diagram illustrating some of the specific applications included among the vehicle operations applications shown in FIG. 2.

FIG. 7 is a logical block diagram illustrating the vehicle mechanical systems controlled by the critical vehicle control programming shown in FIG. 2.

FIG. 8 is a logical block diagram illustrating some of the specific applications included among the mobile services and information applications shown in FIG. 3.

FIG. 9 is a logical data flow diagram illustrating the components that form the adaptive cruise control application shown in FIG. 8.

FIG. 10 is a logical data flow diagram illustrating components of the driver interface system shown in FIG. 9.

FIG. 11 is a logical data flow diagram illustrating the component processes that form the driver profile recorder shown in FIG. 9.

FIG. 12 is a logical data flow diagram illustrating the component processes that form the positioning program shown in FIG. 9.

FIG. 13 is a logical data flow diagram illustrating the component processes that form the external condition monitoring program shown in FIG. 9.

FIG. 14 is a logical data flow diagram illustrating the component processes that form the route guidance application shown in FIG. 8.

FIG. 15 is a logical data flow diagram illustrating the component processes that form the route calculation application shown in FIG. 14.

FIG. 16 is a logical data flow diagram illustrating the component processes that form the obstacle detection program shown in FIG. 9.

FIG. 17 show a logical data flow diagram illustrating the component processes that form the object identifier program shown in FIG. 16.

FIG. 18 is a logical data flow diagram illustrating the component processes that form the image processing program shown in FIG. 17.

FIG. 19 is a logical data flow diagram illustrating components of the critical vehicle control programming shown in FIG. 9.

FIG. 20 is a logical data flow diagram illustrating components of the warning decision application shown in FIG 9.

FIG. 21 is a logical data flow diagram illustrating the component processes that form the vehicle-user device manager shown in FIG. 9.

FIG. 22 is a logical data flow diagram illustrating the components that form the automated mayday system shown in FIG. 6.

FIG. 23 is a logical data flow diagram illustrating the component processes that form the manual mayday application shown in FIG. 22.

FIG. 24 is a logical data flow diagram illustrating the component processes of the external communication manager system shown in FIG. 22.

FIG. 25 is a logical data flow diagram illustrating the component processes that form the external reporter application shown in FIG. 24.

FIG. 26 is a logical data flow diagram illustrating the component processes that form the concierge application shown in FIG. 24.

FIG. 27 is a logical data flow diagram illustrating the component processes that form the obstacle/collision warning application shown in FIG. 6.

FIG. 28 is a logical data flow diagram illustrating the component processes that form the enhanced curve warning application shown in FIG. 6.

FIG. 29 is a logical data flow diagram illustrating the component processes that form the drive recorder shown in FIG. 2.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

1. Overview of Network Environment

In a first embodiment, an in-vehicle computing architecture is disclosed that enables the provision of safety-enhancing and convenience-enhancing features and services in a vehicle. The in-vehicle computing architecture is a high-integrity, non-stop system that meets stringent requirements for the reliability of hardware, operating software, and key applications. One of the features enabled by the in-vehicle computing architecture is a vehicle-environment modeling program. The vehicle-environment modeling program maintains a data model that precisely describes the vehicle, its past, present, and predicted future environment around the vehicle, and where the vehicle is located relative to the environment around the vehicle. The description of the vehicle in the data model includes a description of the conditions and status within the vehicle, including the driver and passengers. The data model description of the environment around the vehicle includes roadway geometry, road conditions, traffic conditions, obstacles, and other vehicles.

Referring to FIG. 1, there is a diagram illustrating a vehicle **10**. The vehicle **10** is located in a multiple vehicle environment **12**. Located in the multiple vehicle environment **12** are a plurality of other vehicles **11**A, **11**B, **11**C . . . **11***n*. The multiple vehicle environment **12** includes a road network **13**. The geographic region may correspond to a metropolitan or rural area, a state, a country, or combinations thereof The multiple vehicle environment **12** may include more than one such geographic region. The multiple vehicle environment **12** may also include off-road portions of a geographic region.

Located in the multiple vehicle environment **12** is at least one service provider **16**. The service provider **16** provides remote services for the vehicle **10** when the vehicle **10** is located in the multiple vehicle environment **12**. The service provider **16** may provide other functions as well, as described below. The service provider **16** may provide similar or identical remote services for some, but not necessarily all, of the other vehicles **11** located in the multiple vehicle environment **12**. In alternative embodiments, there may be two or more service providers in the multiple vehicle environment, each of which may provide services for the vehicles. The services provided by different service providers may be similar or may be different.

The service provider **16** and the vehicle **10** communicate with each other over a data network **18**. The other vehicles **11** in the multiple vehicle environment **12** that are serviced

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by the service provider **16** may also communicate with the service provider **16** over the data network **18**. In addition to the service provider **16**, the vehicle **10**, and the other vehicles **11**, there may be other stations or nodes **17** on the data network **18**. These other stations or nodes **17** may be fixed stations or mobile stations. The data network **18** is linked to and/or interfaces with other networks **19**. These other networks may include the Internet, telecommunications networks, private intranets, and so on.

The data network **18** may use any suitable protocols for information exchange between parties on the network. These suitable protocols include any that are currently available, such as TCP/IP, as well as protocols that become available in the future. More than one protocol may be used in the data network **18** provided that appropriate conversion is used.

At least part of the data network **18** is comprised of a wireless portion **20**. The wireless portion **20** enables two-way communication between the vehicle **10** and the service provider **16** while the vehicle **10** is located anywhere in the multiple vehicle environment **12**. The wireless portion **20** may be implemented by any suitable form of wireless communications, including cellular, PCS, satellite, FM, radio, or technologies that may be developed in the future.

The other vehicles **11** in the multiple vehicle environment that are serviced by the service provider **16** may also use the same means of wireless communication **20** to communicate over the data network **18** with the service provider **16**. Alternatively, other vehicles that are serviced by the service provider **16** may use other means of wireless communication to connect to the data network **18** and/or communicate with the service provider **16**.

The wireless portion **20** may include one or more transmitters **22**, such as a transponder tower, an antenna tower, an FM tower, satellites, or other suitable means. The transmitters **22** include an appropriate communication link **28** to the service provider **16**. This link **28** may be land-based or may be wireless. The transmitters **22** include suitable technology that enables two-way communication between the service provider **16** and the plurality of vehicles **11**.

The vehicle **10** is equipped with a computing architecture, as described in more detail below. The computing architecture in the vehicle provides for networking of the computer systems internal to the vehicle as well as networking of the systems in the vehicle with computer systems outside the vehicle, such as the data network **18**. Some or all of the other vehicles in the multiple vehicle environment **12** may be equipped similarly or identically to the vehicle **10**. Thus, the vehicle **10** is representative of a class of vehicles equipped with network-computer-architecture enhancements.

II. In-Vehicle Computing Architecture

A. OVERVIEW

FIGS. **2** and **3** show a logical block diagram of the new computing system architecture (labeled generally **100**), for a land-based vehicle **10**. The architecture shown in FIGS. **2** and **3** provides an organization for the various computing systems in the vehicle that support the vehicle hardware and other systems and equipment in the vehicle **10**. The computing systems in the vehicle **10** include both hardware and software components. The in-vehicle computing architecture **100** facilitates operation of the various hardware and software equipment and systems in the vehicle, thereby enabling them to work together in a coordinated manner. Further, the in-vehicle system **100** enables the provision of enhanced features and services in the vehicle.

As shown in FIGS. **2** and **3**, a plurality of software programs and applications provide various features and functions. The plurality of software programs and applications run on a plurality of processors **212** included in the vehicle **10**. The processors **212** are interconnected in a data network so that the plurality of programs and applications can be executed on one or more of the plurality of processors **212**.

In a present embodiment, the in-vehicle computing architecture **100** provides a framework that enables different programs and applications in the vehicle **10** to share information while avoiding conflicts. The computing architecture **100** accomplishes this, in part, by establishing priorities and providing a consistent architecture. FIGS. **2** and **3** show that the in-vehicle computing architecture **100** organizes the programs and applications running in the vehicle **10** into two groupings. A first grouping **200**, shown in FIG. **2**, relates to driver assistance applications and systems. A second grouping **300**, shown in FIG. **3**, relates to mobile information and services. The programs and applications in these two groupings can share data. However, the programs and applications in these two groupings are logically separated from each other by a first or internal firewall system **214**. The internal firewall system **214** preserves the driver assistance applications and systems **200** from interference from or resource contention with the mobile information and services applications and systems **300**. The in-vehicle computing architecture **100** also provides a second or external firewall system **219**. The external firewall system **219** provides protection for the entire in-vehicle computing system architecture **100**, including both the driver assistance systems **200** and the mobile services and information systems **300**, from external interference from the outside world.

The in-vehicle computing architecture **100** also provides for redundancies and backups of certain functions and equipment in the vehicle. The in-vehicle computing architecture **100** enables certain functions and equipment to be afforded priority in a networked system environment. The in-vehicle computing architecture **100** enables the provision of safety-enhancing and convenience-enhancing equipment and services in the vehicle **10**.

Referring first to the driver assistance applications and systems **200** in FIG. **2**, the vehicle **10** includes a first group of sensors **202** and a second group of sensors **204**. The first group of sensors **202** monitors the environment and conditions around the vehicle **10**. The second group of sensors **204** monitors the mechanical systems **208** of the vehicle. Vehicle-environment modeling programming **210** is implemented on one or more of the plurality of networked programmable processors **212**. The vehicle-environment modeling programming **210** receives the outputs of the first group of sensors **202** and the second group of sensors **204** via a sensor (or first) programming interface **216**. The vehicle-environment modeling programming **210** also uses data from a geographic database **220**. The geographic database **220** includes data that represent geographic features in the geographic area around the vehicle. The vehicle-environment modeling programming **210** uses the data from the geographic database **220** in combination with the outputs from the first and second groups of sensors **202** and **204** to generate and continuously update a data model (shown at **213** in FIG. **5**, below) of the vehicle **10** in its environment. The data model **213** represents a fusion of the sensor data and the data from the map database. The data model generated by the vehicle-environment modeling programming **210** is used by vehicle operations applications **224**. The vehicle operations applications **224** are implemented on one or more of the plurality of networked programmable processors **212**. The vehicle operations applications **224** use

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lyze the data model and determine desired vehicle operation. The vehicle operations applications **224** provide outputs to a critical vehicle control program **230**.

Meanwhile, the end-user-driver provides input to a driver interface **250** to indicate desired vehicle operation. The end-user-driver inputs received by the driver interface **250** are provided to the vehicle operations applications **224**, the data modeling program **210**, and the critical vehicle control program **230**.

The critical vehicle control program **230** uses the outputs from the vehicle operations programming **224** and the driver interface **250**, resolves any ambiguities or conflicts, determines a single desired vehicle operation, and translates the desired operation to commands for one or more of the vehicle mechanical systems **208** to effect the single desired vehicle operation. These commands are transmitted from the critical vehicle control program **230** to operate the vehicle mechanical systems **208** via a control (or second) programming interface **258**.

The critical vehicle control program **230** also includes an interface to a communications manager **260**. Based upon commands from the critical vehicle control program **230**, data may be transmitted to the service facility **16** (*in* FIG. 1) or other necessary destinations such as directly to other vehicles or to roadside equipment. The transmission of data to the service facility is subject to the priorities established between the driver assistance systems and the mobile services and information systems.

The critical vehicle control program **230** also includes an interface to a vehicle-to-user device manager **270**. Based upon commands from the critical vehicle control program **230**, data, such as warning or other advice, may be forwarded to the driver. This data may be forwarded to the driver from the vehicle-to-user device manager **270** via the driver interface **250**. The priorities of these warnings are based upon the relative priorities established between the driver assistance systems and the mobile services and information systems.

In addition to the vehicle operations applications **224** that directly relate to the vehicle operations and safety, the in-vehicle architecture also supports another group of applications **324** that relate to mobile services and information. The mobile services and information applications **324** provide convenience, entertainment, business, comfort, and other features. In general the mobile services and information applications **324** are not as critical as the driver assistance applications **224**. Thus, the mobile services and information applications **324** may be provided in general with lower priorities for the computing and communications resources of the vehicle than the driver assistance applications **224**. Nonetheless, during normal operation of the vehicle, there are usually sufficient computing resources to support some or all of the mobile services and information applications **324**.

The mobile services and information applications **324** receive user input from a user interface **350**. The user interface **350** may include some of the same equipment and hardware as the driver interface **250**. The user interface **350** may include additional interface equipment. The user interface **350** includes means by which passengers, as well as the driver, can provide input to the mobile services and information applications.

The mobile services and information applications **324** may use some of the data from the same sensors **202** and **204** used to support the driver assistance applications **224**. In addition, the mobile services and information applications **324** may be supported by additional sensors **304**.

In a preferred embodiment, the mobile services and information applications **324** receive input directly from the user interface **350** and the sensors **304**, or alternately, the mobile services and information applications receive some of their input via one or more processing subsystem programs **318** executed on one or more of the plurality of networked processors **212**. The mobile services and information applications **324** may also get information from the driver assistance systems **200**.

The mobile services and information applications **324** provide outputs to a vehicle interface **330**. The vehicle interface **330** resolves any conflicts among commands from the mobile services and information applications **324** and provides appropriate commands to the equipment **308** under the control of the mobile services and information applications **324**. The vehicle interface **330** also includes an interface to the communications manager **260** and the drive recorder **225** and vehicle-user device manager **270**.

8. THE SENSORS (DRIVER ASSISTANCE)

FIG. **4** shows some of the specific types of sensors included among the sensors **202** and **204** shown in FIG. **2**. The first type of sensor devices **202** includes one or more different kinds of hardware or apparatuses that sense the position of the vehicle in its environment and features and conditions in the environment around the vehicle **10**. Included among the sensor devices **202** are apparatuses that detect stationary or moving objects physically in the vicinity around the vehicle **10**. For example, the sensor devices **202** sense and detect other vehicles, pedestrians, buildings, lampposts, bridge abutments, lane barriers, fences, traffic signals, traffic signs, and so on. The sensor devices **202** not only detect the presence of objects around the vehicle **10**, but also, the sensor devices **202** detect the positions and sizes of these objects relative to the vehicle **10**. Various kinds of sensor devices may be used and the present embodiment is not restricted to any particular type of sensor or combination of sensors. Examples of sensor devices that may be used to perform the desired functions include a radar system **202(7)**, a video camera CCD **202(6)**, a laser device **202(5)**, an infrared sensor **202(15)**, as well as other devices.

Also included among the sensor devices **202** are apparatuses that determine the physical position of the vehicle. The physical position of the vehicle includes its geographic position (e.g., latitude and longitude). The physical position of the vehicle also includes its orientation, altitude, inclination, and so on. The devices that perform this detection may include a global positioning system **202(1)**, a gyroscope **202(2)**, a yaw sensor **202(3)**, a variometer **202(8)**, and a 3-axis accelerometer **202(4)**, as well as other devices.

The sensor devices **202** also include apparatuses that sense road conditions, such as moisture and traction. The sensor devices **202** also include apparatuses that sense and detect weather and meteorological conditions, such as temperature, precipitation, barometric pressure, humidity, wind speed, ambient light, visibility, and so on. Various kinds of devices may be used and the present embodiment is not restricted to any particular type of device. Examples of such devices include a barometer **202(9)**, an external light sensor **202(10)**, a hydrometer **202(11)**, a precipitation sensor **202(12)**, a temperature sensor **202(13)**, a friction sensor **202(14)**, as well as other devices **202(n)**.

The second type of sensor device **204** in FIG. **2** includes one or more different kinds of hardware or apparatuses that sense various vehicle conditions. Various kinds of sensor devices may be used and the present embodiment is not restricted to any particular type of sensor. Examples of suitable devices include a vehicle odometer **204(1)**, a vehicle

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speedometer **203(2)**, a vehicle fuel gauge **204(3)**, a tire pressure sensor **204(4)**, an oil pressure sensor **204(5)**, an airbag status sensor **204(6)**, a fire extinguisher sensor **204(8)**, a traction control sensor **204(9)**, an engine control sensor **204(12)**, a stability control sensor **204(13)**, a seatbelt tension sensor **204(15)**, a drowsiness monitor **204(10)**, and passenger seat sensors **204(11)** that determine the presence and position of each passenger. The sensor devices **204** also include a vehicle diagnostic sensor **204(7)**. Other sensors in addition to those may be included and used.

C. VEHICLE-ENVIRONMENT MODELING PROGRAMMING

FIG. **5** shows some of the component programs that form the vehicle-environment modeling programming **210** shown in FIG. **3**. These programs are implemented by software running on one or more of the plurality of processors **212** in FIG. **3**. These component applications use the outputs from the various sensor devices **202** and **204** as well as data from the geographic database **220**. In one embodiment, the outputs from various sensor devices **202** and **204** and the geographic database **220** are provided to the vehicle-environment modeling programming **210** via the common programming interface **216**.

As mentioned above, the vehicle-environment modeling programming **210** provides an output in the form of the data model **213**. The data model **213** is a representation (or picture) of the vehicle and the environment surrounding the vehicle. One of the properties of the data model **213** constructed by the vehicle-environment modeling programming **210** is that it is interpreted. For example, the objects in the environment surrounding the vehicle are not only detected, but an interpretation is made by the vehicle-environment modeling programming **210** as to what the detected objects are. To provide this feature, the vehicle-environment modeling programming **210** uses data from the geographic database **220** as well as data from the sensors **202** and **204** to construct the data model **213**.

Another of the properties of the data model **213** is that it is a three dimensional spatial representation. The data model **213** includes representations of the objects in the environment surrounding the vehicle, including the sizes of the objects, the distances of each of the objects relative to the vehicle, the speeds and accelerations of each of the objects relative to the vehicle, and so on.

Another of the properties of the data model **213** is that it is dynamic. The data model is continuously being updated over time as the sensors acquire new data. The data model **213** is also continuously being updated spatially as the vehicle moves in the geographic area. The data model **213** is also continuously being updated as the environment around the vehicle changes, for example as other vehicles and pedestrians move in the vicinity of the vehicle.

Referring to FIG. **5**, the vehicle-environment modeling programming **210** includes a vehicle positioning program **210(1)**. The vehicle positioning program **210(1)** uses data from the sensors **202** and **204** and the geographic database **320** to determine the position, speed, and heading of the vehicle **10**.

Another of the programs included in the vehicle-environment modeling programming **210** is an obstacle detection program **210(2)**. The obstacle detection program **210(2)** determines various properties of all the obstacles detected around by the vehicle by the sensors **202**. Some of the properties of the obstacles determined by the obstacle detection program **210(2)** include the position, size, speed, acceleration, etc., of each detected obstacle.

The vehicle-environment modeling programming **210** also includes core programming **210(3)**. The core programming **210(3)** uses the data from the map database **220**. The map database **220** provides a highly accurate, three-dimensional representation of the roadway geometry, including features along the roadway. (In one embodiment, the map database **220** has sub-meter accuracy, although in other environments, the map database has an accuracy level that is other than sub-meter.)

The vehicle-environment modeling programming **210** also includes programming **210(4)** that monitors the status of the vehicle. For example, the vehicle status programming **210(4)** monitors engine speed, which gear the transmission is in, whether the headlights are on, and various other vehicle conditions.

The vehicle-environment modeling programming **210** also includes a vehicle diagnostics application **210(5)**. The vehicle diagnostics application **210(5)** monitors the operating behavior of the vehicle hardware. Based upon this monitoring, the vehicle diagnostics application **210(5)** determines whether the vehicle's operation is within normal operating parameters. The vehicle diagnostics application **210(5)** may include rules and parameter data for these purposes.

The vehicle-environment modeling programming **210** also includes a driver status program **210(6)**. This program **210(6)** monitors the driver's reaction times and other characteristics of the driver to determine whether the driver's behavior indicates drowsiness, intoxication, medical problems, and so on.

The vehicle-environment modeling programming **210** also includes driver history programming **210(7)**. This programming **210(7)** logs the driver's behavior patterns over time. The driver history programming **210(7)** is used in conjunction with the driver status programming **210(6)** to determine when the driver's behavior while driving the vehicle deviates from normal patterns.

The vehicle-environment modeling programming **210** also includes driver interface programming **210(8)**. The driver interface programming **210(8)** monitors and interprets control requests by the driver that are input into the driver interface **250**.

The vehicle-environment modeling programming also includes programming **210(9)** that monitors and determines passenger status. This programming **210(9)** uses the input from the sensors **204** to determine which, if any, passenger seats are occupied, the number of passengers in the vehicle, the height and weight of each passenger, whether the passenger is occupying a baby or child seat, and other characteristics of the passengers.

The vehicle-environment modeling programming also includes entry security programming **210(10)**. The entry security programming **210(10)** acts as an entry management system. For example, the entry security programming **210(10)** may disable the engine if the wrong key is used or if the wrong electronic code key is entered.

The vehicle-environment modeling programming **210** also includes programming **210(11)** that monitors the conditions external to the vehicle. This programming **210(11)** monitors such conditions as temperature, humidity, wind speed, ambient light, altitude, and so on.

The vehicle-environment modeling programming **210** also includes programming **210(12)(1)** that maintains a profile of the driver. This programming **210(12)(1)** may maintain a listing of driver preferences, information, etc., which may be used for tailoring operation of certain of the applications, as described below. The programming **210(12)(1)** stores data about the driver preferences in a driver profile data file **215(1)**. This data file **215(1)** is stored so that

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it is accessible to other applications and programs in the vehicle. The driver profile data file **215(D)** also may include other information about the driver, such as age, physical handicaps, if any, medical history, and so on.

The vehicle-environment modeling programming **210** may also include programming **210(12)(P)** that maintains profiles of each of the passengers. This programming **210(12)(P)** may include age, physical handicaps if any, medical history, and passenger preference settings, such as seat, temperature, user interface, etc. The programming **210(12)(P)** stores data about the passengers in a passenger profile data file **215(P)**. This data file **215(P)** is stored so that it is accessible to other applications and programs in the vehicle.

The vehicle-environment modeling programming **210** also includes image processing programming **210(13)**. The image processing programming **210(13)** uses the data from the sensor devices that obtain visual images of the environment around the vehicle, such as the CCD (camera) **202(6)**, the radar system **202(7)**, the laser **202(8)**, and the infrared sensor **202(15)**. The image processing programming **210(13)** analyzes the visual images received from these devices in order to identify objects in the images. The image processing programming **210(13)** may use known techniques to identify objects in images. Based upon this analysis, the image processing programming **210(13)** provides a list of found objects as an output that can be used by other programs and applications in the vehicle.

The vehicle-environment modeling programming **210** also includes object identifier programming **210(14)**. The object identifier programming **210(14)** receives the list of found objects output from the image processing programming **210(13)** and attempts to identify objects by type, size and speed. The object identifier programming **210(14)** provides a data output to other programs and applications in the vehicle.

The vehicle-environment modeling programming **210** may also include other programs **210(q)**. D. DRIVER ASSISTANCE APPLICATIONS

FIG. **6** shows some of the driver assistance applications **224** shown in FIG. **3**. These applications use the data model output **213** from the vehicle-environment modeling programming **210** and the driver interface **250**. The driver assistance applications **224** also use information from the driver profile data file **215(D)**. As mentioned above, the profile data file **215(D)** stores driver preferences and desired operating characteristics. The driver assistance applications **224** provide outputs to the critical vehicle control program **230**.

The driver assistance applications **224** described below are not intended to be an exhaustive listing of all the kinds of applications that can be enabled by the disclosed in-vehicle architecture. Other applications can also be provided. Similarly, not all of the driver assistance applications described below are necessarily provided in each vehicle. Various combinations of applications and various combinations of features and functions may be provided.

One of the driver assistance applications **224** that may be provided is an adaptive cruise control system and application **224(1)**. The adaptive cruise control system and application automatically maintains a desired following distance by managing vehicle speed as well as braking. This application is described in more detail in connection with FIGS. **9–21**, below.

Another of the driver assistance applications **224** is an anti-lock brake system ("ABS") application **224(2)**. This application uses the information from the data model **213** relating to wheel speed, road conditions, precipitation, and desired braking to provide an output for the braking to be applied to each vehicle wheel.

The driver assistance applications **224** also include an engine control application **224(3)**. This application uses the information relating to vehicle status to provide an output for controlling overall engine operation, including engine speed.

The driver assistance applications **224** also include a smart throttle/transmission application **224(5)**. This application uses the information from the data model **213** relating to road grade, engine load, desired acceleration, and so on, to determine the appropriate transmission gear and shift points.

The driver assistance applications **224** also include a smart headlights application **224(6)**. This application uses information from the data model **213** relating to the vehicle environment, including other vehicles, vehicle orientation, the intended route, the road configuration along the intended route, and so on. This application provides an output that controls the headlights to better illuminate around and ahead of the vehicle. The output of the smart headlights application **224(6)** is used to automatically aim the headlights around curves ahead of the vehicle. The output of the smart headlights application **224(6)** may also be used to automatically aim the headlights upward as hills are approached. The smart headlights application **224(6)** may also be used to automatically adjust the high beams, automatically turn on and off the headlights, automatically turn on the driving lights and fog lights, automatically turn on directional signals, and so on.

The driver assistance applications **224** also include a traction control application **224(4)**. This application uses the information from the data model **213** relating to vehicle speed, engine speed, road conditions, and desired operation to provide outputs for the torque to be applied to each wheel.

The driver assistance applications **224** also includes warning system applications **224(7)**. The warning system applications **224(7)** may include an obstacle warning application **224(7)(1)**, a curve warning application **224(7)(2)**, an intersection collision warning application **224(7)(3)**, a fire warning application **224(3)(4)**, a lane departure warning application **224(7)(5)**, a collision warning application **224(7)(6)**, and a mayday warning application **224(7)(7)**. The obstacle warning application **224(7)(1)** uses the information from the data model **213** relating to the speed and direction of the vehicle and the speeds and directions of the obstacles around the vehicle. This application provides an output to warn the driver of these obstacles. The curve warning application **224(7)(2)** uses the information from the data model **213** about curves in the road ahead of the vehicle, the road conditions, the weather conditions, the ambient light, and the vehicle's position and speed relative to curves in the road ahead. The curve warning application **224(7)(2)** provides an output to give the driver with a warning, if appropriate. As the vehicle approaches an intersection, the intersection collision warning application **224(7)(3)** uses the information from the data model **213** about the speed and direction of the vehicle and the speeds and directions of the other vehicles around the intersection to provide a warning of possible collisions with other vehicles. The fire warning application **224(7)(4)** uses the information from the data model **213** relating to vehicle status and diagnostics to provide an output to warn about a detected fire in the vehicle. The lane departure warning application **224(7)(5)** uses the information from the data model relating to the vehicle's coordinates and the lane coordinates to provide an output warning of possible departure by the vehicle from the lane. The colli-

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sion warning application **224(7)(6)** uses the information from the data model relating to the vehicle's coordinates and coordinates of other objects around the vehicle to provide an output warning of possible collision with other objects. The mayday warning application **224(7)(7)** provides a warning informing the driver when the automatic mayday application **224(5)** has been activated to send a warning.

The driver assistance applications **224** also include a ride-smoothing application **224(8)**. This application uses the information from the data model **213** relating to road conditions and vehicle speed to provide outputs to adjust the vehicle suspension characteristics.

The driver assistance applications **224** also include a stability application **224(9)**. This application uses information from the data model **213** relating to vehicle status and vehicle environment. This application provides an output to adjust vehicle operation to prevent overturning.

The driver assistance applications **224** also include an automatic door unlock application **224(10)**. This application uses the information from the data model relating to vehicle status, driver status, and passenger status to automatically lock the vehicle doors when a collision is imminent and then automatically unlock the vehicle doors when the vehicle has safely come to a stop after a collision. This application may also lock all the vehicle doors when the driver and passengers are all inside the vehicle and the vehicle is ready to move.

The driver assistance applications **224** also include a braking assistance application **224(11)**. This application uses information from the data model **213** relating to vehicle status and vehicle environment. This application provides an output to assist the function of the vehicle brakes.

The driver assistance applications **224** also include an intersection collision avoidance application **224(12)**. As the vehicle approaches an intersection, this application **224(12)** uses information about the road configuration to automatically command the vehicle to avoid a collision at an intersection that the vehicle is approaching. This application uses information from the data model **213** relating to the vehicle's position and direction, as well as data relating to the road configuration. The road configuration information can be used to provide this function even at intersections that may not be visible to the driver. The road condition information is also used by this application to determine a safe collision avoidance maneuver (i.e., so that a maneuver that avoids one object does not hit another object). This application may also use information about the positions and planned routes of the other vehicles that are approaching an intersection ahead of the vehicle. Using this information, the application also determines maneuvers that avoid collisions with other vehicles that are also approaching the intersection. The information relating to the planned routes of the other vehicles may be obtained from the service provider **16** or directly from the other vehicles.

The driver assistance applications **224** also include a collision avoidance application **224(13)**. This application uses information about the road configuration, road furniture, and about obstacles detected around the vehicle and provides an output that can be used to automatically command the vehicle to avoid obstacles.

The driver assistance applications **224** also include a security application **224(14)**. This application uses the information from the data model **213** relating to the vehicle status, driver status, and passenger status. This application uses this information to prevent unauthorized use of the vehicle, to provide outputs to request assistance in the event of unauthorized use of the vehicle, and so on.

The driver assistance applications **224** also include an automated mayday application **224(15)**. This application uses the information from the data model **213** relating to vehicle and driver condition to provide an output to the communications manager **260** to request emergency assistance. This application is described in more detail in connection with FIGS. **22–25**, below.

The driver assistance applications **224** also include a fire extinguisher application **224(16)**. This application uses information from the data model **213** relating to vehicle status and environmental conditions. This application provides an output to operate a fire extinguisher system under appropriate conditions.

The driver assistance applications **224** also include a pollution control application **224(17)**. This application uses information from the data model **213** relating to vehicle status and vehicle environment. This application provides output commands to the vehicle hardware systems to minimize pollution under various driving conditions. For example, using information about the altitude, barometric pressure, wind speed, ambient light conditions, and temperature, the pollution control application **224(17)** modifies engine operation to minimize pollution.

The driver assistance applications **224** also include an external reporting application **224(18)**. This application uses information from the data model **213** relating to the vehicle status and vehicle environment. This application provides an output to report on certain vehicle and/or environment conditions. For example, if the sensors detect ice or snow on the road, the external reporting application **224(18)** reports information about the amounts and locations of the ice or snow to the service provider **16**, which in turn may send messages to other vehicles travelling along the road so that the other vehicles can adjust their operation to account for the ice or snow.

The driver assistance applications **224** also include a vision enhancement application **224(19)**. This application uses information from the data model **213** relating to vehicle status and vehicle environment. This application provides an output to provide additional information to the driver about conditions around the vehicle. For example, the vision enhancement application **224(19)** uses information from the sensors, such as the radar **202(7)**, to display objects around the vehicle to the driver when the visibility around the vehicle is poor.

The driver assistance applications **224** also include a drowsiness warning application **224(20)**. This application uses information from the data model **213** relating to driver status, vehicle status, and driver history. This application provides an output to warn the driver in the event driver behavior indicates that the driver is drowsy.

The driver assistance applications **224** also include a warning decision application **224(22)**. This application uses information from the warning applications **224(7)**, the vehicle status, and the driver status to determine whether to provide the driver with a warning message, to coordinate provision of multiple warning messages, and to forward information about warnings to the communication manager **260** for relay to the service provider **16**, when appropriate. This application is described in more detail in connection with FIG. **30**, below.

The driver assistance applications **224** may include additional programs **224(n)**. Also, additional programs may be added as upgrades, updates, or entirely new applications. Because the applications **224** operate from the data model **213** and not directly from the sensors **202** and **204**, new applications may be added by means of a software upgrade.

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E. VEHICLE HARDWARE SYSTEMS

FIG. 2 shows that the vehicle 10 includes various hardware systems 208. These hardware systems 208 include the various mechanical, hydraulic, and electrical systems that move and stop the vehicle and provide for driver and passenger safety. These mechanical, hydraulic, and electrical systems 208 operate under the control of actuators or other controller devices. The actuators and controller devices receive commands from the critical vehicle control program 230 through the command programming interface 238.

Some of the vehicle hardware systems 208 according to one embodiment are shown in FIG. 7. Vehicle embodiments may include hardware systems in addition to those shown in FIG. 7 and likewise there may be vehicle embodiments that do not include all the hardware systems shown in FIG. 7. As shown in FIG. 7, these hardware systems 208 are operated by commands from the critical vehicle control program 230. Included among these systems are an engine control system 208(1), a transmission actuator 208(2), steering actuators 208(3), brake actuators 208(4), airbag actuators 208(5), seatbelt adjustment actuators 208(6), an accelerator actuator 208(7), a mirror dimmer controller 208(8), suspension actuators 208(9), a headlight controller 208(10), and warning light actuators 208(11). Other mechanical, hydraulic, and electrical systems 208(n) may be operated via commands from the critical vehicle control program 230.

F. MOBILE SERVICES AND INFORMATION

FIG. 8 shows some of the specific mobile services and information applications 324 that are indicated in FIG. 3. These applications 324 may be provided entirely on-board the vehicle, entirely off-board the vehicle, or may be hybrid applications that are provided in part on-board and in part off-board the vehicle.

In FIG. 8, the mobile services and information applications 324 are shown to receive data from the vehicle sensors 304 and the mobile services and information geographic database 320. The geographic database 320 used by the mobile services and information programming may be the same as the geographic database (i.e., 220 in FIG. 2) used by the driver assistance programs 210 and 224. Alternatively, the mobile services and information programming and the driver assistance programming may use different databases. The geographic database 320 used by the mobile services and information programming includes information that can be used to calculate routes, provide route guidance, find desired destinations, find desired points of interest, and provide other services. The geographic database 220 used by the driver assistance programming is used to build a detailed three-dimensional model of the environment around the vehicle. Although separate databases may be used, information about the planned route of the vehicle is used when forming a three-dimensional model in order to determine what part of the environment around the vehicle is ahead. The mobile services and information applications 324 also receive input from the user interface 350. The mobile services and information applications 324 also receive data from the driver assistance systems 200 across the firewall 214.

FIG. 8 shows the mobile services and information applications and systems in one exemplary vehicle embodiment. Other embodiments may include applications and systems in addition to those shown in FIG. 8. Also, some embodiments may not include all the applications and systems shown in FIG. 8 or may include different combinations of applications and systems.

The mobile services and information applications 324 may include route guidance 324(1), route calculation 324(2), content services 324(3), entertainment 324(4), a remote interface 324(5), theft protection services 324(6), office-in-the-car services 324(11), car environment controls 324(7), car care reminders 324(8), Win CE™ applications 324(10) (or other visiting operating systems applications), real-time traffic services 324(9), concierge services 324(12), electronic fee payment 324(14), cellphone management 324(13), and a manual mayday application 324(15), as well as other services 324(n). These services and applications provide outputs to the vehicle interface 358 (shown in FIG. 3).

Examples of services or systems that provide some of the features of the mobile services applications or similar features include AutoPC™, MONET™, Tegaron Info™, SmarTraveler™, and OnStar™.

III. Component Applications

A. Adaptive Cruise Control

(1). Overview

One of the applications that can be implemented using the disclosed vehicle computing architecture is an adaptive cruise control system. The hardware and connectivity needs of the adaptive cruise control system are supported by the physical portion of the in-vehicle computing architecture platform.

The adaptive cruise control feature automatically adjusts the speed and direction of the vehicle to provide for proper intervals between the vehicle and other vehicles and obstacles. This feature is provided by a combination of components, including software and hardware components in the mobile information and services portion of the in-vehicle computing architecture as well as software and hardware components in the driver assistance portion. The adaptive cruise control feature is described in connection with FIGS. 9-21.

Referring first to FIG. 9, there is shown a logical block diagram showing the major components that implement the adaptive cruise control feature. In FIG. 9, the adaptive cruise control application 324(1) receives data from and outputs data to other systems, programs and applications included in the in-vehicle computing architecture. These other systems, programs and applications are described in the sections that follow.

(2). Driver Interface

Included among the components from which the adaptive cruise control application 324(1) receives data is the driver interface system 250. The driver interface system 250 is shown in more detail in FIG. 10. The driver interface system 250 includes a monitoring process 250(A). The monitoring process 250(A) monitors inputs from various driver interface hardware components. The inputs that the process 250(A) monitors may include input from the brake pedal 251(1), input from the steering wheel 251(2), input from the clutch pedal 251(3), input from the accelerator 251(4), input from the headlights switch 251(5), input from the turn signal handle 251(6), input from the windshield wiper switch 251(7), input from the horn 251(8), input from the cruise control switch 251(9), and well as from other driver interface hardware components. The monitoring process 250(A) collects the data from these various inputs and provides an output to the driver history program 210(7) and the drive recorder 225. The driver history program 210(7) and the drive recorder 255 use the data from the monitoring process 250(A) to store respective records in memories in the vehicle. The monitoring process 250(A) also provides an output to the driver status program 210(6). The monitoring process 250(A) also outputs the data collected from the various driver interface components to a decision process 250(B). These outputs provided to the decision process

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250(B) represent physical manipulations by the driver of the driver interface components. The decision process 250(B) receives each of these outputs from the monitoring process 250(A) and provides a translation into data indicating a desired vehicle operation. For example, a signal from a sensor associated with the brakes indicates the force applied by the driver to the brake pedal (or other brake component). This signal is collected by the monitoring process 250(A) and provided to the decision process 250(B) that provides an output indicative of a desired force to be applied by the brakes.

The decision process 250(B) provides an output to a send command process 250(C). In turn, the send command process 250(C) provides data outputs to the adaptive cruise control application 224(1). Specifically, the driver interface system 250 provides data to the adaptive cruise control application 224(1) indicating whether the driver has turned on or off the adaptive cruise control feature. Additionally, the driver interface 250 may also provide data to the adaptive cruise control application 224(1) indicating distance settings desired by the driver which will be used instead of default settings. The driver interface system 250 also provides data to other components and systems in the in-vehicle computing architecture, including the critical vehicle control program 230 and the external condition monitor program 210 (11), among others.

(The driver interface 250 may also include a display controller 251(10), a heads-up controller 251(11), a voice generator 251(12), and a warning light actuator 251(13). These components are described below in connection with the vehicle-user device manager 270.)

(3). Driver Profile Recorder

Referring again to FIG. 9, another of the programs from which the adaptive cruise control application 224(1) receives data is the driver profile recorder program 210(12) (D). FIG. 11 shows the component that forms the driver profile recorder program 210(12)(D). The driver profile data file 215(D) receives driver preferences, information, etc., from the driver interface 250. The information in the driver profile data file 215(D) is made available to the other applications, components, and systems. These other applications, components, and systems include the adaptive cruise control application 224(1), the critical vehicle control system 230, the warning decision application 224(22), the automatic mayday application 324(15), the car care reminders application 324(8), the concierge services application 324(12), the environment control application 324(7), the manual mayday application 324(15), the route calculation application 324(1), and the route guidance application 324 (3). Specifically, the adaptive cruise control application 224(1) obtains data from the driver profile data file 215(D) indicating the identity of the driver as well as the driver's preferences, such as speed, driving intervals, preferred types and timing of warnings, etc.

(4). Positioning System

Referring again to FIG. 9, another of the components from which the adaptive cruise control application 224(1) receives data is the positioning program 210(1). The positioning program 210(1) is part of a vehicle positioning system that includes software and hardware components. FIG. 12 shows the component processes included in the positioning program 210(1). In FIG. 12, the positioning program 210(1) includes a process 210(1)(A) that fuses data from sensors. The process 210(1)(A) receives data from sensors, such as the GPS 202(1), the gyroscope 202(2), the yaw sensor 202(3), the speedometer 204(2), the odometer 204(1), the variometer 202(8), and the 3-axis accelerometer 202(4). The process 210(1)(A) then fuses the data and provides a fused collection of the data to a position calculation process 210(1)(B). The position calculating process 210(1)(B) receives the fused collection of data from the fusing process 210(1)(A). The position calculating process 210(1)(B) also receives data from the map database 220. The position calculating process 210(1)(B) may also receive from the object identifier application 210(14) data indicating objects identified around the vehicle. The position calculating process 210(1)(B) may also receive from the route calculation application 324(2) data indicating the calculated route that the vehicle is following.

The position calculating process 210(1)(B) calculates the position, speed, and heading of the vehicle 10 using data from the fusing process 210(1)(A), the map database 220, the object identifier application 210(14), and the route calculation application 324(2). The position calculating process 210(1)(B) provides data to the adaptive cruise control application 224(1) indicating the position, speed, and heading of the vehicle 10. The position calculating process 210(1)(B) also feeds back the current calculated position to the fusing process 210(1)(A) which uses the current calculated position in connection with a subsequent iteration of the fusion process. The position calculating process 210(1)(B) also provides data indicating the position, speed, and/or heading of the vehicle 10 to other applications, such as the obstacle detection application 210(2), the automated mayday application 224(15), the concierge services application 324(12), the manual mayday application 324(15), the route guidance application 324(3), and the drive recorder 225.

(5). External Condition Monitor

Referring again to FIG. 9, another of the programs from which the adaptive cruise control application 224(1) receives data is the external condition monitor program 210(11). FIG. 13 shows the component processes that form the external condition monitor program 210(11). In FIG. 13, the external condition monitor program 210(11) includes a monitoring process 210(11)(A). The monitoring process 210(11)(A) receives barometric data from the barometer 202(9), data indicating the status of the windshield wipers and headlights from the driver interface 250, data indicating the external light level from the external light sensor 202 (10), data indicating the external temperature from the external temperature gauge 202(13), data indicating the humidity from the hydrometer 202(11), data indicating the current visibility ranges from the image processing program 210(13), data indicating the precipitation type and level from the precipitation monitor 202(12), data indicating the vehicle status from the vehicle status program 210(4), and data, such as road condition warnings, from the content services 324(3). It is noted that in one embodiment, the sensor data received by the monitoring process 210(11)(A) may also be used by other applications in the vehicle that need such data. It is also noted that uncorrelated sensor information can be made available to any and all applications as they need it. There may be cases when an application only needs a certain piece of sensor data and does not required the correlated version. Both the correlated and uncorrelated data are used when forming the data model.

The monitoring process 210(11)(A) may provide some or all of the data it receives to other in-vehicle applications, including the adaptive cruise control application 224(1), the braking assistance application 224(11), the collision avoidance application 224(13), the collision warning application 224(7)(6), the critical vehicle control program 230, the intersection collision avoidance application 224(7)(3), the obstacle warning application 224(7)(1), and the warning decision application 224(22).

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(This monitoring process **210(11)(A)** also monitors the operational status of each of the sensor components **202**, **204**, and **304** that provides data to it.) The monitoring process **210(11)(A)** provides the data relating to visibility, such as precipitation and light levels, to a visibility calculation process **210(11)(B)**. The process **210(11)(B)** calculates the visibility and provides output data indicating the visibility to the adaptive cruise control application **224(1)**, the braking assistance application **224(11)**, the collision avoidance application **224(13)**, the collision warning application **224(7)(6)**, the critical vehicle control program **230**, the intersection collision avoidance application **224(7)(3)**, the obstacle warning application **224(7)(1)**, and the warning decision application **224(22)**. The visibility calculating process **210(11)(B)** also provides the data indicating the visibility to the drive recorder **225**. If the visibility data represents an exception (i.e., from normal visibility conditions and/or from a previously reported abnormal visibility conditions), the visibility calculating process **210(11)(B)** also provides the data indicating the visibility to the external reporting application **224(18)** so that it can be transmitted to the service facility **16** and relayed to other vehicles.

The monitoring process **210(11)(A)** also provides the data relating to road surface conditions, such as external temperature, precipitation type and level, and barometric pressure to a process **210(11)(C)** that calculates a road surface conditions parameter. This road surface condition calculating process **210(11)(C)** provides output data indicating the road surface condition parameter to the adaptive cruise control application **224(1)**, the braking assistance application **224(11)**, the collision avoidance application **224(13)**, the collision warning application **224(7)(6)**, the critical vehicle control program **230**, the intersection collision avoidance application **224(7)(3)**, the obstacle warning application **224(7)(1)**, and the warning decision application **224(22)**. The process **210(11)(C)** also provides the data indicating the road surface conditions to the drive recorder **225**. If the road surface condition data represents an exception (i.e., from normal road surface conditions and/or from previously reported abnormal road surface conditions), the road surface condition calculating process **210(11)(C)** also provides the data indicating the road surface conditions to the external reporting application **224(18)** so that it can be transmitted to the service facility **16** and relayed to other vehicles.

(6). Route Calculation and Route Guidance Applications

Referring again to FIG. **9**, another of the applications from which the adaptive cruise control application **224(1)** receives data is the route guidance application **324(1)**. The route guidance application **324(1)** operates in conjunction with the route calculation application **324(2)**. FIG. **14** shows the component processes that form the route guidance application **324(1)** and FIG. **15** shows the component processes that form the route calculation application **324(2)**.

Referring first to FIG. **15**, the user (who may be the driver) selects a desired destination location using the user interface **350**. Optionally, the user may also select an origin location using the user interface **350**, or alternatively, the current position of the vehicle may be specified as the origin location by default. Data indicating the desired destination location and the origin location are provided to a geocoding process **210(15)**. (If the current position of the vehicle is taken to be the origin, data indicating the current position of the vehicle is provided to the geocoding program **210(15)** from the positioning program **210(1)**.) The geocoding program **210(15)** determines the positions of the origin location and destination location relative to the data in the geographic database **320**. The geocoding program **210(5)** provides a data output indicating the positions of the origin location and destination location relative to the geographic database **320** to a route calculation process **324(A)** which is part of the route calculation application **324(2)**. (The geocoding process **210(15)** may also be part of the route calculation application **324(2)** or may be a standalone process.) Using data from the geographic database **320**, the route calculation process **324(2)(A)** calculates one or more possible routes. The route calculation process **324(2)(A)** provides a data output that defines the one or more possible calculated routes. The data output from the route calculation process **324(2)(A)** is provided to a data storage **324(2)(B)**.

A route selection process **324(2)(B)** receives the data that defines the one or more calculated routes. The selection process **324(2)(B)** may also receive data that indicates current traffic conditions from the real-time traffic application **324(9)**. The selection process **324(2)(B)** also receives data that indicates the driver's preferences from the driver profile program **210(12)(D)**. Using all these inputs, the route selection process **324(2)(B)** selects one of the calculated routes. The route selection process **324(2)(B)** provides a data output that defines the selected calculated route to the drive recorder **225**. The data that defines the selected calculated route is also provided by the route selection process **324(2)(B)** to the adaptive cruise control application **224(1)**, the positioning system **210(1)**, the car care reminder application **324(8)**, the concierge services application **324(12)**, and the route guidance application **324(1)**. The route selection process **324(2)(B)** also provides data to the vehicle-user device manager **270** that enables the selected calculated route to be displayed to the driver via the user interface **350**. FIG. **14** shows the processes related to the route guidance application **324(1)**. The route guidance application **324(1)** includes a process **324(1)(A)** that receives the data defining the selected route from the route calculation application **324(2)** (in FIG. **15**). The route guidance process **324(1)(A)** also receives from the positioning program **210(1)** (in FIG. **12**) data that indicates the current position of the vehicle. The route guidance process **324(1)(A)** also receives from the driver profile program **210(12)(D)** (in FIG. **11**) data that indicates the driver's preferences related to route guidance. These preferences may include, for example, the language in which the guidance should be provided, the medium (i.e., audio, visual display, both) via which the guidance should be provided, etc. Using these inputs, the route guidance process **324(1)(A)** determines what kinds of route guidance should be provided to the driver and when such guidance should be provided. More specifically, as the vehicle approaches certain locations along the selected calculated route, route guidance about required maneuvers is provided to the driver. At appropriate locations, the route guidance process **324(1)(A)** provides a data output to the vehicle-user device manager **270** indicating the kind of guidance to be provided.

(The route guidance application **324(1)** also provides an output to the driver recorder **225** indicating the guidance provided.)

(7). Obstacle Detection System

Referring again to FIG. **9**, another of the programs from which the adaptive cruise control application **224(1)** receives data is the obstacle detection program **210(2)**. The obstacle detection program **210(2)** operates in conjunction with the image processing program **210(13)** and the object identifier program **210(14)**. FIG. **16** shows the component processes that form the obstacle detection program **210(2)**. FIG. **17** shows the component processes that form the object identifier program **210(14)**, and FIG. **18** shows the component processes that form the image processing program **210(13)**.

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Referring first to FIG. **18**, the component processes that form the image processing program **210(13)** are shown. In FIG. **18**, the image processing program **210(13)** includes a process **210(13)(A)** that validates sensor data. This validation process **210(13)(A)** receives data indicating visibility, precipitation, temperature, and humidity from the external conditions monitoring program **210(11)**. This process **210(13)(A)** also receives raw image data from the camera **202(6)**. This process **210(13)(A)** also receives data indicating object distance, speed, image, and coordinates from the radar **202(7)**, laser **202(5)**, and infrared sensors **202(15)**. After validating the data, the process **210(13)(A)** provides image data to a consolidation process **210(13)(B)**. The validation process **210(13)(A)** also provides data indicating the current range back to the external conditions monitoring program **210(11)**. The consolidation process **210(13)(B)** provides scannable images to a process **210(13)(C)** that scans for objects. The process **210(13)(C)** that scans for objects provides a list of found objects to a process **210(13)(D)** that determines the characteristics of the objects. This characteristics determining process **210(13)(D)** also receives from the consolidation process **210(13)(B)** data indicating the current range, confidence factors, speed, and distance for the found objects. The characteristics determining process **210(13)(D)** outputs a list of found objects including their speed, distance, and confidence factors to the object identifier program **210(14)**.

Referring to FIG. **17**, the component processes that form the object identifier program **210(14)** are shown. In FIG. **17**, the object identifier program **210(14)** includes a correlation process **210(14)(A)** that receives the list of found objects including their speed, distance, and confidence factors from the image processing identifier program **210(13)**. The correlation process **210(14)(A)** also uses data from the map database **220**. The map database **220** includes data about objects located in the environment in which the vehicle is traveling, including the positions and sizes of the objects. The correlation process **210(14)(A)** uses the positions of known objects from the map database **220** to attempt to identify the found objects in the list received from the image processing program **210(13)**. The correlation process **210(14)(A)** provides data indicating the identified objects, along with their location and speed, to a consolidation process **210(14)(B)**. The correlation process **210(14)(A)** provides a list of objects that are not in the database **220** to a classification process **210(14)(C)**. The classification process **210(14)(C)** classifies the objects that were not found in the database **220** by the correlation process **210(14)(A)**. The classification process **210(14)(C)** provides an output to the consolidation process **210(14)(B)** that includes an identification of the objects that are not in the database **220** along with a classification of these objects.

The consolidation process **210(14)(B)** provides data indicating the objects identified in the database **220** and the objects not identified in the database **220**, along with their corresponding classifications, to the drive recorder **225**. The consolidation process **210(14)(B)** also provides data indicating the objects identified in the database **220** and the objects not identified in the database **220**, along with their corresponding classifications, to the obstacle warning application **224(7)(1)** and the positioning program **210(1)**.

Referring to FIG. **16**, the component processes that form the obstacle detection program **210(2)** are shown. The obstacle detection program **210(2)** includes a process **210(2)(A)** that determines whether a detected object is an obstacle. This process **210(2)(A)** receives data from the object identifier program **210(14)** that identifies detected objects including their location and speed. The process **210(2)(A)** also receives data from the positioning program **210(1)** that indicates the position and heading of the vehicle. The process **210(2)(A)** provides an output that identifies the obstacle by type and speed. The process **210(2)(A)** provides this data to the adaptive cruise control application **224(1)**, the collision avoidance application **224(13)**, the collision warning application **224(7)(6)**, the critical vehicle control program **230**, the intersection collision avoidance application **224(12)**, the obstacle warning application **224(7)(1)**, and the warning decision application **224(22)**. The process **210(2)(A)** also provides the data identifying the obstacle by type and speed to the drive recorder **225**. If the obstacle detected by the process **210(2)(A)** could affect other vehicles, data about the obstacle is also forwarded by the process **210(2)(A)** to the external reporter application **224(18)** so that a report can be sent to the service facility **16** and relayed to other vehicles.

(8). Adaptive Cruise Control Application

Referring again to FIG. **9**, the adaptive cruise control application **224(1)** includes a process **224(1)(A)** that receives the previously identified data from the driver interface **250**, the driver profile recorder **210(12)(1)**, the positioning system **210(1)**, route guidance program **324(1)**, the external condition monitor program **210(11)**, and the obstacle detection program **210(2)**. This process **224(1)(A)** relates the data relating to obstacles around the vehicle to data relating to the vehicle. For example, the process **224(1)(A)** relates the relative speeds and directions of vehicles identified around the vehicle to the speed and direction of the vehicle, taking into account road surface conditions, light conditions, precipitation, tire wear, etc. The relating process **224(1)(A)** outputs this information to a speed calculation process **224(1)(B)**.

The speed calculation process **224(1)(B)** calculates a desired vehicle speed. The speed calculation process **224(1)(B)** outputs data indicating the calculated speed along with a request to adjust the vehicle speed to the critical vehicle control program **230**. The speed calculation process **224(1)(B)** continuously updates its calculation to take into account changes in the vehicle environment which might require speeding up, slowing down, or stopping the vehicle. The speed calculation process **224(1)(B)** also outputs data indicating the calculated speed and an indication of the request to adjust the vehicle speed to the drive recorder **225**. If the speed calculation process **224(1)(B)** determines that the adaptive cruise control feature should be disengaged, it also outputs data indicating a request for disengagement to the warning/decision program **224(22)**. The critical vehicle control program **230** is described below in connection with FIG. **19**, the warning/decision program **224(22)** is described below in connection with FIG. **20**, and the drive recorder **225** is described below in connection with FIG. **29**.

(9). Critical Vehicle Control Program

FIG. **19** shows the components of the critical vehicle control program **230**. The critical vehicle control program **230** includes an integrator process **230(A)**. The integrator process **230(A)** receives inputs from various programs, applications and systems in the vehicle. Specifically, the integrator process **230(A)** receives data from the adaptive cruise control application **224(1)** indicating a request to set the vehicle speed to a desired speed. Other programs, applications and systems that send requests to the integrator process **230(A)** include the braking assistance application **224(11)**, the collision avoidance application **224(13)**, the collision warning application **224(7)(6)**, the door unlock application **224(10)**, the driver interface **250**, the engine

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control application 224(3), the intersection collision avoidance application 224(12), the obstacle warning application 224(7)(1), the pollution control application 224(17), the ride smoothing application 224(18), the smart throttle and transmission application 224(5), the stability application 224(9), the traction control application 224(4), and the theft protection application 324(6). The integrator process 230(A) also receives diagnostic data from the vehicle diagnostics program 210(5).

The integrator process 230(A) integrates these requests and provides a validated request list to a decision process 230(B). The decision process 230(B) also receives driver history data from the driver history program 210(7), data indicating the driver's preferences from the driver profile program 210(12)(D), and data indicating the driver status from the driver status program 210(6). For example, the driver status data may indicate the driver's reaction times.

The decision process 230(B) uses these inputs to provide an output in the form of an action list. The action list developed by the decision process 230(B) is provided to a send command process 230(C).

The action list output by the decision process 230(B) may also be provided to a warning request process 230(D). Upon receiving an action list that requires that a warning be provided to the driver, the warning request process 230(D) provides an output to the warning decision system 224(22) to request that a warning be provided to the driver. The warning request process 230(D) may include appropriate rules for this purpose.

Upon receiving the action list from the decision process 230(B), the send command process 230(C) provides action orders (or commands) to the various actuators associated with the respective vehicle systems and hardware 208. Specifically, the send command process 230(C) provides action orders to the accelerator actuator 208(5), the airbag actuator 208(5), the brake actuator 208(4), the engine controllers 208(1), the headlight controllers 208(10), the seat-belt adjustment actuator 208(6), the steering actuator 208(3), the suspension actuator 208(9), and the transmission actuator 208(2). The send command process 230(C) also provides a copy of the action orders to the drive recorder 225.

(10). Warning Decision Application

FIG. 20 shows the components of the warning decision application 224(22) shown in FIG. 9. The warning decision application 224(22) includes an integrator process 224(22)(A). The integrator process 224(22)(A) receives requests from various programs, applications and systems in the vehicle. The programs, applications and systems that send requests to the warning decision process 224(22) include the adaptive cruise control application 224(1), the collision warning application 224(7)(6), the obstacle warning application 224(7)(1), the theft protection application 324(6), the critical vehicle control program 230, the drowsiness warning application 224(20), the mayday warning application 324(7)(7), the vehicle diagnostics program 210(5) and the fire warning program 324(7)(4). The integrator process 224(22)(A) integrates warning requests from these various systems and outputs a request list to a process 224(22)(B) that decides the warning level and type. This decision process 224(22)(B) also receives data indicating the current behavior of the driver from the driver status program 210(6), data indicating the commands requested by the driver from the driver interface 250, data indicating the historical behavior of the driver from the driver history log 210(7), driver preferences from the profile data file 215(D), and data indicating external conditions, such as hazardous driving conditions, sensed around the vehicle by the external condition monitor application 210(11). Based upon these inputs, the warning decision process 224(22)(B) outputs data indicating a warning level and type associated with the warning request received from the integrator process 224(22)(A). This data is provided to a process 224(22)(C) that requests a device control order.

The process 224(22)(C) provides an action order to the vehicle-user device manager 270. The action order commands the vehicle-user device manager 270 to provide a warning to the driver via the driver interface 250. The type of warning is determined by the warning level and type determined by the process 224(22)(B). For example, a relatively low level warning may result in a warning light being displayed whereas a relatively high level warning may result in audio and visual warnings. The process 224(22)(C) also provides data indicating the warning decision to the drive recorder 225. (The process 224(22)(C) may also provide data indicating the warning type and level to the external reporter application 224(18).)

As mentioned above, when the adaptive cruise control application 224(1) determines that the adaptive cruise control feature should be disengaged, it sends a request to the warning decision program 224(22). The integration process 224(22)(A) integrates this request along with requests, if any, received from other programs, applications, and systems. The integrator process 224(22)(A) includes the request from the adaptive cruise control application 224(1) in a request list to the decision process 224(22)(B). The decision process 224(22)(B) uses the data inputs from the driver status program 210(6), the driver interface 250, the driver history log 210(7), and the driver profile data file 215(D) to determine a warning level and type which is output to the process 224(22)(D) that sends an action order to the vehicle-user device manager 270.

(11). Vehicle-User Device Manager

FIG. 21 shows the component processes that form the vehicle-user device manager 270 shown in FIG. 9. In FIG. 21, the vehicle-user device manager 270 includes a first process 270(A) that accepts requests from various other components of the in-vehicle computing architecture system over the networked data processors 212 (in FIGS. 2 and 3). Included among the components from which the vehicle-user device manager process 270(A) receives requests are the automatic fee payment application 324(14), the car care reminder application 324(8), the cellphone function application 324(13), the concierge services application 324(12), the content services application 324(3), the entertainment control application 324(4), the environment control application 324(7), the office-in-the-car application 324(11), the real-time traffic application 324(9), and the route guidance application 324(1). Each of these components sends device control requests to the vehicle-user device manager 270. The request receiving process 270(1) also receives vehicle control requests from the critical vehicle control program 230 and the warning decision program 224(22). The request receiving process 270(A) also receives notifications of open voice channels and answer confirmations from the with external communications manager 260. If a Win CE™ application 324(10) is present, the request receiving process 270(A) also receives requests from the Win CE™ application 324(10).

The request receiving process 270(A) outputs a request list to a prioritization process 270(B). The prioritization process 270(B) uses a stored listing of vehicle-user priorities 270(C) to form a prioritized request list which is provided to a vehicle-user manager queue 270(D). The vehicle-user device manager 270 also includes a command sending

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process **270**(E). The command sending process **270**(E) obtains requests from the queue **270**(D) and sends action orders to the display controller **251**(10), the heads-up controller **251** (11), the voice generator **251**(12), and the warning light actuator **251**(13), all of which are part of the driver interface **350** shown in FIG. **10**. The command sending process **270**(E) also sends data to the drive recorder **225** indicating the action orders that had been sent to the display controller **251**(10), the heads-up controller **251**(11), the voice generator **251**(12), and the warning light actuator **251**(13).

B. Automated Mayday

(1). Overview

The in-vehicle computing architecture provides manual and automatic mayday features. The manual mayday feature allows a driver or passenger to transmit a request for emergency assistance. The automated mayday feature automatically transmits a request for appropriate assistance under certain conditions, such as a vehicle accident, medical emergencies, and so on. The manual mayday feature is described in connection with FIG. **23**. The automated mayday feature is described in connection with FIGS. **22**-**24**.

Referring first to FIG. **22**, there is shown a block diagram showing the major components that provide the automated mayday feature. This automated mayday feature is provided by a combination of components, including software and hardware components in the mobile information and services portion of the in-vehicle computing architecture as well as software and hardware components in the driver assistance portion. The automated mayday feature is organized around the automated mayday application **224**(15). The automated mayday application **224**(15) receives data from and outputs data to other systems, programs and applications included in the in-vehicle architecture. These other systems, programs and applications are described in the sections that follow.

(2). Vehicle Status Subsystem

Referring to FIG. **22**, one of the components from which the automated mayday application **224**(15) receives data is the vehicle status program **210**(4). The vehicle status program **210**(4) receives status data from various sensors associated with vehicle hardware components and systems, including the airbag status sensors **204**(6), the seatbelt status sensors **204**(13), the driver and passenger position sensors **204**(10), the traction sensor **204**(9), the stability status sensors **204**(14), and the fire extinguisher status sensor **204**(8), among others. The vehicle status program **210**(4) integrates the status data received from these sensors. The vehicle status program **210**(4) includes a reporting process **210**(4)(A) that provides a data output reporting the status data to the automated mayday application **224**(15).

(3). Positioning system

Another of the components from which the automated mayday application **224**(15) receives data is the positioning system **210**(1). The positioning system **210**(1) is described above in connection with FIG. **12**. The positioning system **210**(1) receives data output from the geographic database **220** and the sensors **202** and **204**. The positioning system **210**(1) provides data to the automated mayday application **224**(15) indicating the position, speed, and heading of the vehicle.

(4). Automated Mayday Application

In FIG. **22**, the automated mayday application **224**(15) includes a process **224**(15)(A) that monitors the data received from the vehicle status application **210**(4) and the positioning system **210**(1). The monitoring process **224**(15)(A) scans this data for triggering events. Upon detection of a triggering event, the monitoring process **224**(15)(A) provides a request to a process **224**(15)(B) that compiles an emergency request. This process **224**(15)(B) uses the appropriate data from the vehicle status program **210**(4) and the positioning system **210**(1) in formulating the data to include in the request. If appropriate, the mayday request compiling process **224**(15)(B) also obtains data from the driver profile **210**(12)(D). For example, the mayday request compiling process **224**(15)(B) may obtain the driver's medical history data from the driver profile **210**(12)(D). The mayday request compiling process **224**(15)(B) may also obtain the passenger medical history data from the passenger profile **210**(12)(P). If appropriate, the mayday request compiling process **224**(15)(B) also obtains data from the drive recorder **225** indicating pertinent historical data relating to the vehicle.

The mayday compiling process **224**(15)(B) provides a data output that includes the vehicle position, the type of help requested, accident data, if available, and so on. The mayday compiling process **224**(15)(B) provides this data output in a request for a mayday communication to a mayday decision application **224**(15)(C).

(5). Manual Mayday Application

The mayday decision application **224**(15)(C) also receives input from the manual mayday application **324**(15). The manual mayday application **324**(15) provides a means by which the driver or passengers can voluntarily request emergency assistance. The operation of the manual mayday application **324**(15) is coordinated with the automatic mayday application **224**(15) to reduce the possibility of conflicts between manual and automated mayday requests.

FIG. **23** shows the components that form the manual mayday application **324**(15). In FIG. **23**, the manual mayday application **324**(15) includes a manual mayday request compiling process **324**(15)(A). The manual mayday request compiling process **324**(15)(A) receives data requests for mayday assistance from the user interface **350**. The manual mayday request compiling process **324**(15)(A) also receives data from the vehicle status application **210**(4). The data received from the vehicle status application **2210**(4) indicates the status of various hardware sensors, including the airbag sensor **204**(6), the seatbelt sensor **204**(13), the driver and passenger position sensors **204**(10), the traction sensor **204**(9), the stability status sensors **204**(14), the fire extinguisher status sensor **204**(8), among others. The manual mayday request compiling process **324**(15)(A) also receives data from the positioning system **210**(1) indicating the position, speed, and heading of the vehicle.

If appropriate, the manual mayday request compiling process **324**(15)(A) also obtains data from the drive recorder **225** indicating pertinent historical data relating to the vehicle. Also if appropriate, the manual mayday request compiling process **324**(15)(A) receives data from the driver profile data file **215**(D) indicating the medical history of the driver and data from the passenger profile data file **215**(P) indicating the medical histories of the passengers.

The manual mayday request compiling process **324**(15)(A) compiles the input data and provides an output to the mayday decision application **224**(15)(C). The manual mayday request compiling process **324**(15)(B) may also output data to the driver recorder **225** indicating that a manual mayday request was made.

(6). Mayday Decision Application

Referring again to FIG. **22**, the mayday decision application **224**(15)(C) receives the mayday requests from the automated mayday application **224**(15) and the manual mayday application **324**(15). The mayday decision application **224**(15)(C) includes a process **224**(15)(D) that inte-

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grates the mayday requests. For example, if the automated mayday application **224(15)** requests a mayday communication related to a vehicle accident and meanwhile the driver operates the manual mayday application **324(15)** to request a mayday communication for the same vehicle accident, the integration process **224(15)(D)** merges these requests into a single mayday request. The integration process **224(15)(D)** outputs this merged request to a process **224(15)(E)** that outputs a command to the communication manager **260** to send a mayday request to the service provider **16** or other appropriate entity.

(7). Communication Manager

FIG. **24** shows the component processes that form the external communications manager **260**. In FIG. **24**, the external communications manager **260** includes a process **260(A)** that accepts requests. This request accepting process **260(A)** accepts requests from the process **224(15)(E)** in the mayday decision application **224(15)(C)**. This request accepting process **260(A)** also accepts requests from the external reporter application **224(18)** and the concierge services application **324(12)**. The request accepting process **260(1)** outputs a request list to a process **260(B)** that prioritizes the requests. This prioritization process **260(B)** uses a listing of communications priorities stored in a non-volatile memory **260(C)** of the vehicle. The prioritization process **260(B)** provides a prioritized output list to an external message queue **260(D)**. From the queue **260(D)**, a communication process **260(E)** commands the appropriate communication hardware **262** (in FIG. **2**) to send requests to the service provider **16** or other appropriate entity.

The communication process **260(E)** also receives data from the service provider **16** or other entities. The data received from the service provider **16** may be either an answer to the request or a confirmation of receipt of the request. The communication process **260(E)** sends the answer or the confirmation received from the service provider **16** to the vehicle-user device manager **270** for display to the driver or passenger. (The vehicle-user device manager is described in more detail in FIG. **21**, above.)

The communication process **260(E)** also sends data to the drive recorder **225** indicating the action of sending the request to the service provider **16**, including the time, the type of message, and so on. The communication process **260(E)** also sends data to the drive recorder **225** indicating whether an answer or confirmation was received from the service provider **16** in response to the request, including the time of receipt, and so on.

If the driver or end user are using the external communication manager to initiate a voice telephone call, the communication process **260(E)** provides data to the vehicle user device manager **270** notifying the end user of an open line.

C. External Reporter System

In connection with the description of FIG. **24**, it was stated that the communications manager **260** includes a process **260(A)** that accepts requests from the external reporter application **224(18)**. FIG. **25** shows the component processes that form the external reporter application **224(18)**. The external reporter application **224(18)** includes a process **224(18)(A)** that compiles external report requests from the external condition monitor **210(11)** and the obstacle detection program **210(2)**. The process **224(18)(A)** may also compile requests from the automated mayday application **224(15)** and the manual mayday application **324(15)**. The external condition monitor **210(11)** may request that detected information about external conditions, such as precipitation or hazardous road conditions, be transmitted to the service provider **16** in order to be relayed to other vehicles. Similarly, the obstacle detection program **210(2)** may request that information about newly detected obstacles, such as stalled vehicles, be transmitted to the service provider **16** in order to be relayed to other vehicles. The compiling process **224(18)(A)** in the external condition reporter application **224(18)** provides a data output to the request accepting process **260(A)** in the communications manager **260**, as mentioned above.

D. Concierge Services

In connection with the description of FIG. **24**, it was stated that the communications manager **260** includes a process **260(A)** that accepts requests from the concierge services application **324(12)**. FIG. **26** shows the component processes that form the concierge services application **324(12)**. The concierge services application **324(12)** includes a process **324(12)(A)** that compiles concierge requests. Concierge requests may be received from the driver and/or passenger(s) through the user interface **350**. The concierge request compiling process **324(12)(A)** also receives data related to the selected route along which the vehicle is traveling from the route calculation application **324(3)**. The concierge request compiling process **324(12)(A)** receives data related to the driver from the driver profile **210(12)(D)** and data related to the passenger(s) from the passenger profile **210(12)(P)**. The concierge request compiling process **324(12)(A)** also receives data indicating the current vehicle position from the positioning system **210(1)**. Using all these data inputs, as appropriate, the concierge request compiling process **324(12)(A)** automatically constructs an appropriate request for concierge services. The request is provided to the external communications manager **260** (in FIG. **24**).

E. Obstacle/collision warning system

The in-vehicle computing architecture provides for an obstacle/collision warning system. This feature automatically provides a warning to the driver in the event that a collision with an obstacle or another vehicle is possible. The obstacle/collision warning feature is described in connection with FIG. **27**.

Referring to FIG. **27**, the obstacle/collision warning system is organized around the obstacle warning application **224(7)(1)**. The obstacle warning application **224(7)(1)** receives data relating to the planned route from the route guidance application **324(1)**. (The route guidance application **324(1)** is described above in connection with FIG. **14**.) The obstacle warning application **224(7)(1)** also receives data identifying the current vehicle position, speed and heading from the positioning system **210(1)**. (The positioning system **210(1)** is described above in connection with FIG. **12**.) The obstacle warning application **224(7)(1)** receives data relating to the external conditions, such as precipitation, road conditions, etc., from the external condition monitor **210(11)**. (The external condition monitor program is described above in connection with FIG. **13**.) The obstacle warning application **224(7)(1)** also receives data about detected obstacles from the obstacle detection system **210(2)**. (Portions of the obstacle detection system **210(2)** are described above in connection with FIGS. **16**, **17** and **18**.) As mentioned above in connection with FIGS. **16**, **17** and **18**, the obstacle detection system **210(2)** includes processes that identify objects around the vehicle, determine what type of obstacle a detected object is, and determine the speed and location of detected, identified obstacles. As shown in FIG. **27**, the obstacle detection system **210(2)** receives data from the communications manager **260**. (Portions of the communications manager **260** are described above in connection with FIG. **24**.) In FIG. **27**, the communications manager **260**

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includes a process 260(1') that receives data sent from sources outside the vehicle. These sources outside the vehicle may include the service provider 16, traffic broadcast services, other vehicles, and so on. The data provided by these source outside the vehicle may relate to obstacles and/or road conditions that are detected by others. The process 260(1') in the communications manager 260 sorts the relevant data received from sources outside the vehicle and provides an output identifying these known obstacles and road conditions to the obstacle detection system 210(2). The obstacle detection system 210(2) accepts the data provided from the communications manager 260 related to obstacles detected by others. The obstacle detection system 210(2) provides data about both obstacles detected by the vehicle as well as obstacles detected by others to the obstacle warning application 224(7)(1). The data provided to the obstacle warning application 224(7)(1) identifies the detected obstacles by type, location and speed;

The obstacle warning application 210(7)(1) includes a process 210(7)(1)(A) that accepts the data about detected obstacles from the obstacle detection system 210(2). This process 210(7)(1)(A) relates this information to the information that identifies the current position (including heading and speed) of the vehicle received from the positioning system 210(1) and the route guidance application 324(1). The obstacle warning application 210(7)(1) includes a process 210(7)(1)(B) that makes a determination based upon the data related by the process 210(7)(1)(A) whether a warning is required. If the process 210(7)(1)(B) determines that a warning is required, a request to provide a warning is provided to the warning decision application 224(22).

The warning decision application 224(22) accepts data relating to the driver's preferences from the drive profile recorder 210(12)(D). The warning decision application 224(22) accepts data relating to the driver's behavior patterns from the driver history log 210(7). Also, the warning decision application 224(22) accepts data relating to the driver's status from the driver status monitor 210(6). In addition, the warning decision application 224(22) accepts data relating to the driver's current reactions from the driver interface 250. In addition to these inputs, the warning decision application 224(22) accepts data from other driver assistance systems, including the stability system 204(14), the smart throttle 224(5), and the collision avoidance system 224(13). The warning decision application 224(22) includes a process 224(22)(A) that integrates all these inputs. This process 224(22)(A) provides an output to a sending process 224(22)(B). The sending process 224(22)(B) sends a request to the vehicle-user device manager 270 to provide warnings to the driver. (Components of the vehicle-user device manager 268 are described above in connection with FIG. 21.) The vehicle-user device manager 260 provides command orders to the various appropriate components of the driver interface 250 to provide appropriate warnings to the driver. The sending process 224(22)(B) in the warning decision application 224(22) also sends a request to the communications manager 260 to inform the service provider 16 or other drivers about the warning.

F. Enhanced curve warning system

The in-vehicle computing architecture provides for an enhanced curve warning system. The enhanced curve warning system is implemented using the curve warning application 224(7)(2). Referring to FIG. 28, the enhanced curve warning system includes a process 224(7)(2)(A) that receives data from the image processing application 210(13) and the route calculation application 324(2). Specifically, the process 224(7)(2)(A) receives data indicating the planned route from the route calculation application 324(2) and data indicating the external images from the image processing application 210(13). The process 224(7)(2)(A) monitors these data for upcoming curves along the route the vehicle is travelling. On a continuing basis while no curve is detected, the monitoring process 224(7)(2)(A) checks to confirm that the vehicle is within a coverage area of a curve valid road list 224(7)(2)(B). A process 224(7)(2)(C) uses the valid curve list 224(7)(2)(B) and data from the process 224(7)(2)(A) to determine whether the vehicle position is within the coverage area of the curve valid road list 224((7)(2)(B). If the vehicle is outside the coverage area of the curve valid road list 224((7)(2)(B), the process 224(7)(2)(C) provides an output to a process 224(7)(2)(D) that requests that a warning be provided to the driver to inform him/her that the curve warning feature is disengaged. The process 224(7)(2)(D) provides this output to the warning decision application 224(22) which in turn provides an appropriate warning to the driver consistent with the priorities and preferences associated with the warning decision application 224(22), described above. If the process 224(7)(2)(C) determines that the vehicle is within the coverage area of the curve valid road list 224(7)(2)(B), the process 224(7)(2)(C) provides an output back to the process 224(7)(2)(A) so indicating.

If the process 224(7)(2)(A) detects a curve ahead, an output is provided to a process 224(7)(2)(E) that determines a safe driving requirement. The process 224(7)(2)(E) receives inputs from the map database 220 and the external condition monitor 210(11). Specifically, the process 224(7)(2)(E) receives roadway data from the map database 220 and data indicating the weather and visibility conditions from the external condition monitor 210(11). The process 224(7)(2)(E) also receives roadway data from a data storage file 224(7)(2)(F) that indicates recommended curve driving responses. The data in this file 224(7)(2)(F) is based scientifically designed and developed responses for various curve and highway conditions. The process 224(7)(2)(E) provides an output to a process 224(7)(2)(G) that determines a type of curve/adjustment warning to provide. The process 224(7)(2)(G) also receives data indicating the vehicle position from the positioning system 210(1), data indicating the vehicle speed and the status of the vehicle brakes, tires, etc., from the vehicle status application 210(4), data indicating the driver's current behavior from the driver status application 210(6), and data indicating the driver's preferences from the driver profile data file 215(D). Based upon these inputs, the process 224(7)(2)(G) provides an output to the adaptive cruise control application 224(1) and/or the critical vehicle control system 230. The output to the adaptive cruise control application 224(1) may indicate a change in speed in order to safely maneuver through the upcoming curve in the road. The output to the critical vehicle control application 230 may indicate other modifications and/or adjustments for the vehicle operation. The process 224(7)(2)(G) also provides an output to the driver recorder 225 indicating that the upcoming curve was detected and the adjustment determined in response thereto, if any.

G. Drive Recorder

FIG. 29 shows the component processes that form the drive recorder 225 shown in FIG. 2. The drive recorder 225 obtains and logs information relating to all aspects of the vehicle and vehicle environment, including the driver and passengers. In FIG. 29, the drive recorder 225 includes a logging process 225(A) that receives current information streams from all the vehicle sensors 202, 204, and 304, all subsystem software 210 and 310, all the vehicle hardware

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208 and 308, the communications manager 262, the vehicle-user device manager 270, as well as other managers, and the driver and user interface devices 250 and 350. The logging process 225(A) also receives event logs from all the applications 224 and 324.

The driver recorder 225 continuously stores a history of the vehicle and vehicle environment in a non-volatile secure data storage device. The drive recorder 225 includes a process 225(B) that provides all the logged data into a format and stores the formatted data onto a physical drive recorder medium 225(C). This data storage device may be in the vehicle or may be located remotely.

IV. Firewalls

Referring again to FIGS. 2 and 3, the in-vehicle architecture 100 includes two firewall systems. The first firewall system 214 is an internal firewall. The first firewall system 214 prevents interference with driver assistance systems 200 from other systems that are a part of the in-vehicle computing architecture 100. In particular, the first system firewall 214 provides selective isolation of the driver assistance systems 200 from the mobile services and information systems 300 and the user interface 350.

The first firewall 214 provides this function by preventing inappropriate information from crossing from the mobile services and information systems 300 (or other in-vehicle systems) to the driver assistance systems 200. This is intended to isolate the driver assistance processing, electronics, and associated programming, so that they are not affected by anomalous mobile services and information systems behavior, whether physical, electronic, or software-based. The first firewall system 214 includes both physical and logical barriers. These physical and logical barriers are provided by a combination of hardware and software components that isolate the driver assistance systems 200 from the rest of the systems that are part of the in-vehicle computing architecture 100.

Although the first firewall system 214 provides for selective isolation of the driver assistance systems 200 from the rest of the in-vehicle systems, limited interactions between the driver assistance systems 200 and the other in-vehicle systems are desirable in order to provide many of the advantages afforded by the in-vehicle architecture 100. For example, data captured by the sensors 202 and 204 that are part of the driver assistance systems 200 are made available to the mobile services and information systems 300. Similarly, route selections calculated on the mobile services and information systems 300 are used by some of the driver assistance system functions that use data about the intended path of the vehicle. However, it is important to assure that computational demands, system crashes, device anomalies, and software faults in the application-oriented mobile services and information systems 300 are not allowed to interfere with processing on the control/warning/safety-oriented driver assistance systems 200. Accordingly, the first firewall 214 provides for limited data flow to the driver assistance systems 200 from the other in-vehicle systems. The first firewall 214 performs this function by carefully controlling the types and volumes of information flows that are delivered to the driver assistance systems 200. For example, the data permitted to flow across the first firewall 214 from the mobile services and information systems to the driver assistance systems may be limited to specified formats known to be safe. Also, these data may be provided with identifiers that allow the driver assistance systems 200 to assign priorities to the data being received across the first firewall 214.

With reference to FIGS. 2 and 3, the second firewall system 219 is an external firewall. The external firewall system 219 provides protection of the entire in-vehicle computing system architecture 100 from interference from the outside world. The second firewall 219 is analogous to the kinds of firewalls that exist in Internet-connected office computer networks. Included among the functions provided by the external firewall system 219 are the blocking of viruses, the blocking of spurious messages, and the blocking of both deliberate and inadvertent external interference from reaching and/or affecting the in-vehicle computing system 100. Like the first firewall 214, the second firewall 219 provides selective isolation. The second firewall 219 allows certain kinds of data to pass from outside to the in-vehicle computing system 100, but limits and/or filters other kinds of data.

Like the internal firewall 214, the second or external firewall system 219 includes both physical and logical barriers provided by a combination of hardware and software components. In the case of the external firewall 219, the hardware and software components protect the entire in-vehicle system 100 from the outside environment.

The second firewall 219 has a connection to the communications system 262. The second firewall 219 also has connections to the driver assistance systems 200 and the mobile services and information systems 300. These connections enable data from the service provider 16 to be sent directly to these systems via the second firewall system 219. These kinds of data may include updates on conditions for the traffic and weather advisories system, for example.

V. Advantages of Disclosed Embodiments

The embodiments disclosed above demonstrate the advantages associated with building a data model once and then using the data model for applications that provide various features to the driver and passengers. By building the data model once, benefits are derived with respect to software efficiency, reliability, and consistency. The supporting sub-processes create a basic suite of constantly updated information for use by the different applications that access the information. The architecture also provides for hardware efficiency, reliability, and consistency. The architecture also uses the computational resources effectively.

In one embodiment, the components are implemented using simple, sharable chips that provide for mutual backup. The architecture also provides for essential priority management. The sensor data is provided consistently to multiple functions.

The architecture coordinates device management. Requests for resources are accepted from various functions and applications, such as the driver interface 250, the adaptive cruise control 224(1), the stability control 224(9), the obstacle avoidance application 224(12) and the collision avoidance application 224(13), etc. The architecture provides for the appropriate response based on all inputs and issues device control commands from a single point.

The architecture has the advantage of managing complexity, assuring reliability, promoting compatibility, achieving speed, and containing cost. Furthermore, the architecture provides the opportunity to enable complex, software-intensive applications while simplifying system development and integration. Another advantage is the simplification of system testing and validation without compromising reliability or integrity. Still another advantage is the facilitation of software upgrades and telematics services.

The disclosed computing architecture provides these advantages through the use of multiple cooperating processors, priority management, a fail-safe environment with hot backups, integrated sensor processing, integrated decision and control, and communications management.

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Also assisting in providing these functions is the user device interface, vehicle device interface, the data buses, and the internal and external firewalls.

It is intended that the foregoing detailed description be regarded as illustrative rather than limiting and that it is understood that the following claims including all equivalents are intended to define the scope of the invention.

We claim:

1. A curve warning system implemented in a vehicle, the curve warning system comprising:

a first group of sensor devices installed in the vehicle that sense features around the vehicle;

a second group of sensor devices installed in the vehicle that sense vehicle hardware systems;

a map database installed in the vehicle, wherein said map database includes data representing features in a geographic area around the vehicle, wherein said map database includes a curve valid road list;

a positioning system that determines a location of the vehicle relative to features represented in the map database;

data modeling programming that uses outputs from the first group of sensors, the second group of sensors, and the map database to construct a data model of the vehicle and the area around the vehicle;

a driver interface from which a driver of the vehicle receives information; and

a curve warning application that uses the data model to determine an appropriate vehicle operation through a curved portion of road ahead of the vehicle,

wherein the curve warning application provides an indication to the driver via the driver interface if the vehicle is determined to be located outside a coverage area of the curve valid road list.

2. The system of claim 1 further comprising:

an adaptive cruise control application that controls vehicle speed, wherein said curve warning application provides an output to said adaptive cruise control application and further wherein the adaptive cruise control application adjusts the vehicle speed based on the output from the curve warning application.

3. The system of claim 1 further comprising:

a drive recorder that stores information from the first group of sensor devices and the second group of sensor devices in a non-volatile secure data storage device located in the vehicle,

wherein said curve warning application provides an output to said drive recorder and further wherein the drive recorder stores data indicating curve detection by said curve warning application and the appropriate vehicle operation determined.

4. The system of claim 1 further comprising:

a roadway data file stored in said vehicle, wherein said roadway data file contains recommended curve driving responses for various curve and highway conditions;

wherein said curve warning application uses the data model and the roadway data file to determine the appropriate vehicle operation through the curved portion of road ahead of the vehicle.

5. The system of claim 1 further comprising:

a driver profile stored in said vehicle, wherein said driver profile contains a listing of driver preferences;

wherein said curve warning application uses the data model and the driver profile to determine the appropriate vehicle operation through the curved portion of road ahead of the vehicle.

6. The system of claim 1 further comprising:

a route calculation application that receives indications of an origin and desired destination and determines at least one route from the origin to the destination; and

a route guidance application that provides the driver with instructions for following the route determined by the route calculation application.

wherein said curve warning application uses the data model and the route determined by the route calculation application to determine the appropriate vehicle operation through the curved portion of road ahead of the vehicle.

7. A curve warning system implemented in a vehicle, the curve warning system comprising:

a first group of sensor devices installed in the vehicle that sense features around the vehicle;

a second group of sensor devices installed in the vehicle that sense vehicle hardware systems;

a map database installed in the vehicle, wherein said map database includes data representing features in a geographic area around the vehicle;

a positioning system that determines a location of the vehicle relative to features represented in the map database;

data modeling programming that uses outputs from the first group of sensors, the second group of sensors, and the map database to construct a data model of the vehicle and the area around the vehicle;

a roadway data file stored in said vehicle, wherein said roadway data file contains recommended curve driving responses for various curve and highway conditions; and

a curve warning application that uses the data model and the roadway data file to determine an appropriate vehicle operation through a curved portion of road ahead of the vehicle.

8. The system of claim 7 further comprising:

an adaptive cruise control application that controls vehicle speed, wherein said curve warning application provides an output to said adaptive cruise control application and further wherein the adaptive cruise control application adjusts the vehicle speed based on the output from the curve warning application.

9. The system of claim 7 further comprising:

a drive recorder that stores information from the first group of sensor devices and the second group of sensor devices in a non-volatile secure data storage device located in the vehicle,

wherein said curve warning application provides an output to said drive recorder and further wherein the drive recorder stores data indicating curve detection by said curve warning application and the appropriate vehicle operation determined.

10. The system of claim 7 further comprising:

a curve valid road list; and

a driver interface from which a driver of the vehicle receives information;

wherein the curve warning application provides an indication to the driver via the driver interface if the vehicle is determined to be located outside a coverage area of the curve valid road list.

11. The system of claim 7 further comprising:

a driver profile stored in said vehicle, wherein said driver profile contains a listing of driver preferences;

wherein said curve warning application uses the data model and the driver profile to determine the appropriate vehicle operation through the curved portion of road ahead of the vehicle.

12. The system of claim 7 further comprising:

a route calculation application that receives an indication of a desired destination and determines at least one route from an origin to the destination; and

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a route guidance application that provides the driver with instructions for following the route determined by the route calculation application,

wherein said curve warning application uses the data model and the route determined by the route calculation application to determine the appropriate vehicle operation through the curved portion of road ahead of the vehicle.

13. A method for providing a curve warning in a vehicle comprising:

sensing features around the vehicle with a first group of sensor devices installed in the vehicle,

sensing vehicle hardware systems with a second group of sensor devices installed in the vehicle,

determining a location of the vehicle relative to features represented in a map database, wherein said map database includes data representing features in a geographic area around the vehicle and wherein said map database includes a curve valid road list,

constructing a data model of the vehicle and the area around the vehicle using outputs from the first group of sensors, the second group of sensors, and the map database;

using the data model with a curve warning application run on a processor in the vehicle to determine an appropriate vehicle operation through a curved portion of road ahead of the vehicle; and

providing an indication to the driver via an interface if the vehicle is determined to be located outside a coverage area of the curve valid road list.

14. The method of claim 13 further comprising:

providing an output from the curve warning application to an adaptive cruise control application that controls vehicle speed; and

adjusting the vehicle speed based with the adaptive cruise control application based on the output from the curve warning application.

15. The method of claim 13 further comprising:

providing an output from the curve warning application to a driver recorder that stores a history of the vehicle and vehicle environment in a non-volatile secure data storage device located in the vehicle; and

storing data with said driver recorder that indicates curve detection by said curve warning application and the appropriate vehicle operation determined.

16. The method of claim 13 further comprising:

with the curve warning application, using a roadway data file that contains recommended curve driving responses for various curve and highway conditions to determine the appropriate vehicle operation through the curved portion of road ahead of the vehicle.

17. The method of claim 13 further comprising: with the curve warning application, using a driver profile that contains a listing of driver preferences to determine the appropriate vehicle operation through the curved portion of road ahead of the vehicle.

18. The method of claim 13 further comprising:

receiving an indication of a desired destination;

calculating at least one route to the destination using the map database;

providing the driver with instructions for following the calculated route; and

with the curve warning application, using the data model and the calculated route to determine the appropriate vehicle operation through the curved portion of road ahead of the vehicle.

19. A method for providing a curve warning in a vehicle comprising:

sensing features around the vehicle with a first group of sensor devices installed in the vehicle;

sensing vehicle hardware systems with a second group of sensor devices installed in the vehicle;

determining a location of the vehicle relative to features represented in a map database, wherein said map database includes data representing features in a geographic area around the vehicle;

constructing a data model of the vehicle and the area around the vehicle using outputs from the first group of sensors, the second group of sensors, and the map database; and

with a curve warning application run on a processor in the vehicle, using the data model and a roadway data file stored in said vehicle, to determine an appropriate vehicle operation through a curved portion of road ahead of the vehicle, wherein said roadway data file contains recommended curve driving responses for various curve and highway conditions.

20. The method of claim 19 further comprising:

providing an output from the curve warning application to an adaptive cruise control application that controls vehicle speed; and

adjusting the vehicle speed based with the adaptive cruise control application based on the output from the curve warning application.

21. The method of claim 19 further comprising:

providing an output from the curve warning application to a driver recorder that stores a history of the vehicle and vehicle environment in a non-volatile secure data storage device located in the vehicle; and

storing data with said driver recorder that indicates curve detection by said curve warning application and the appropriate vehicle operation determined.

22. The method of claim 19 further comprising:

providing an indication to the driver via an interface if the vehicle is determined to be located outside a coverage area of a curve valid road list.

23. The method of claim 19 further comprising:

with the curve warning application, using a driver profile that contains a listing of driver preferences to determine the appropriate vehicle operation through the curved portion of road ahead of the vehicle.

24. The method of claim 19 further comprising:

receiving an indication of a desired destination;

calculating at least one route to the destination using the map database;

providing the driver with instructions for following the calculated route; and

with the curve warning application, using the data model and the calculated route to determine the appropriate vehicle operation through the curved portion of road ahead of the vehicle.

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Petrik (43) **Pub. Date: Jul. 19, 2007**

(54) **GPS MONITORING BIOMETRIC SMARTCARD, INTELLIGENT SPEED MANAGMENT**

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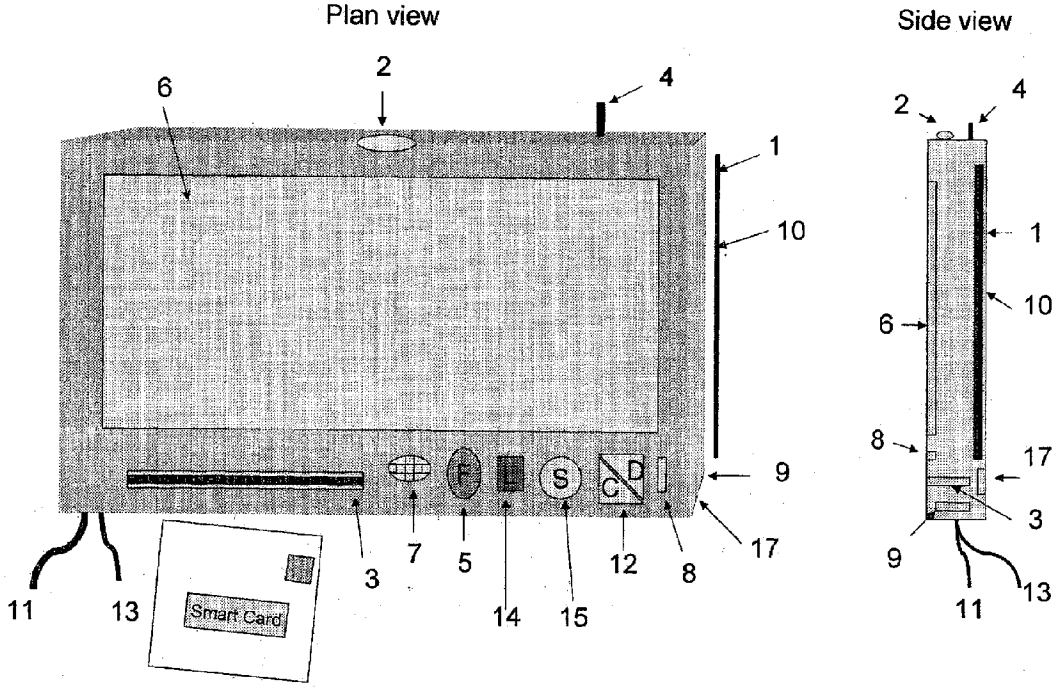
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(57) **ABSTRACT**

A method and system which, provides real time GPS based vehicle monitoring, management and cruise control by a small, single, sealed, the in-vehicle monitoring unit, incorporating intelligent speed adaptation, recording driver and vehicle operating parameters in memory and on a smart card a SATELITE/GPRS/GSM/BLUETOOTH mobile communication facility under the control of a national Transport Management Command Centre.



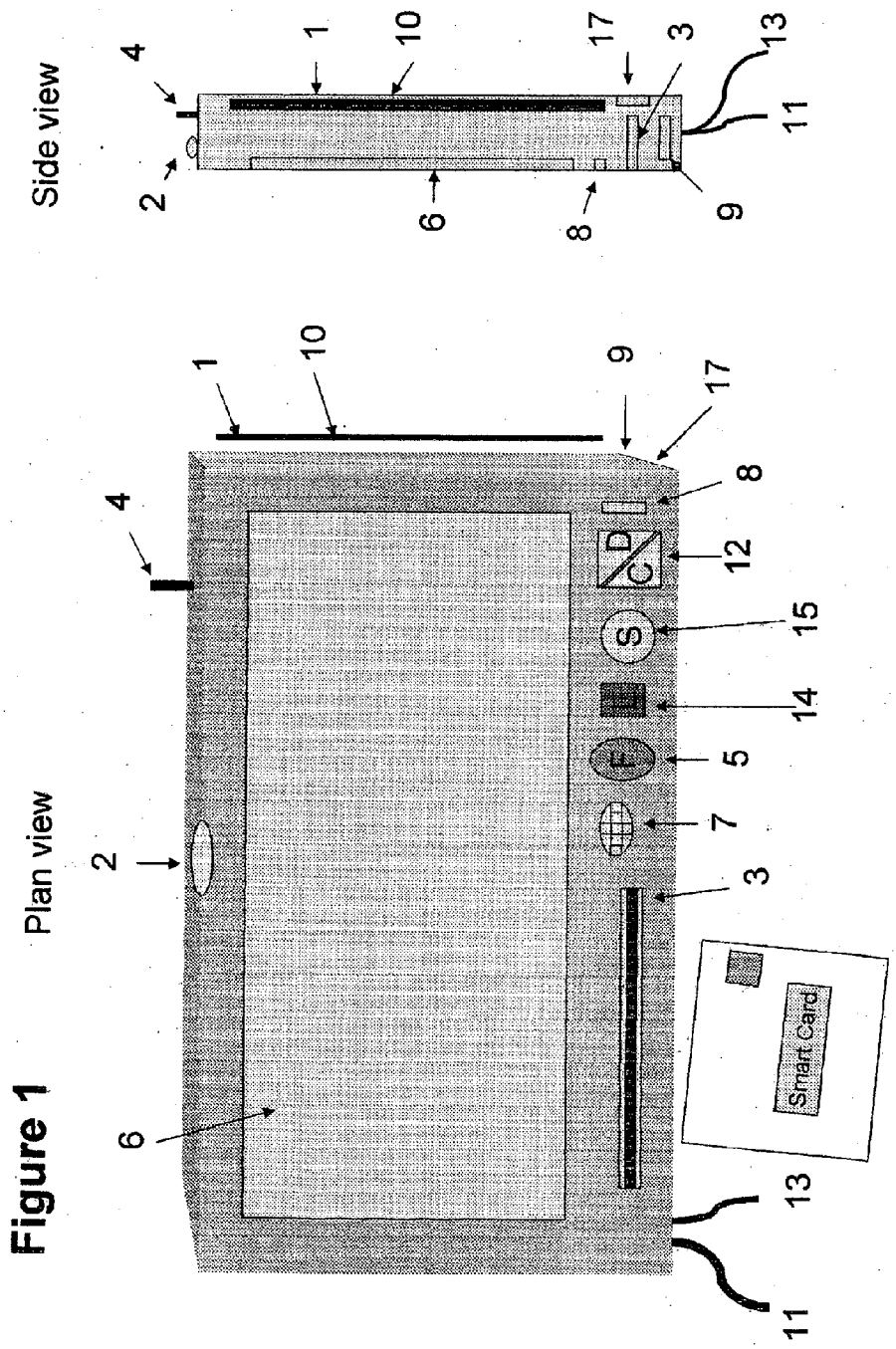


Figure 1

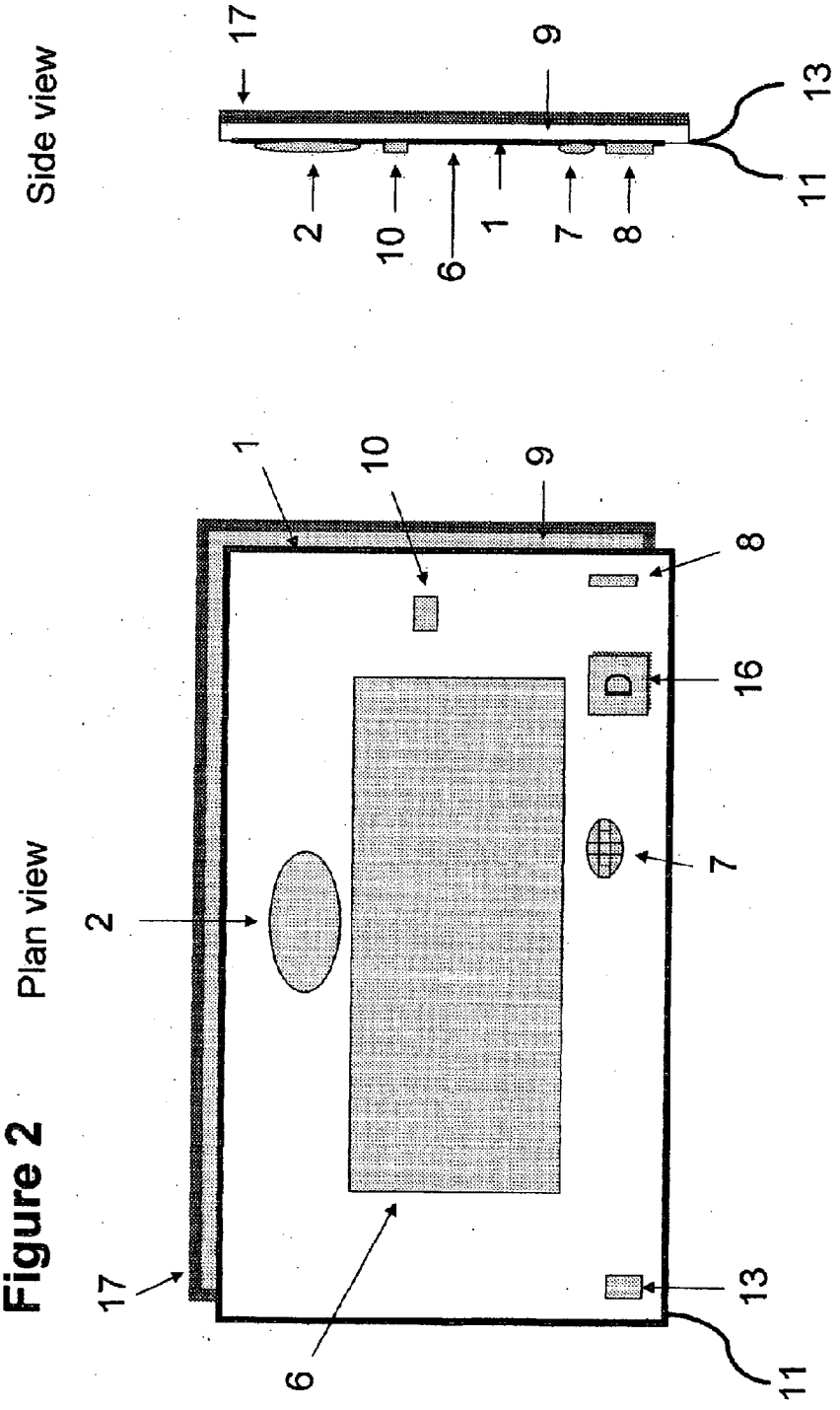
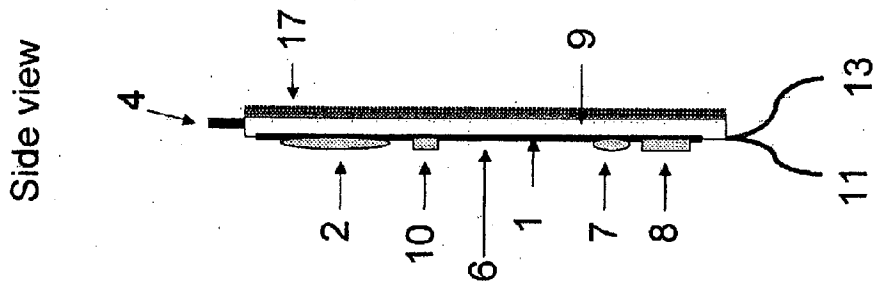


Figure 2



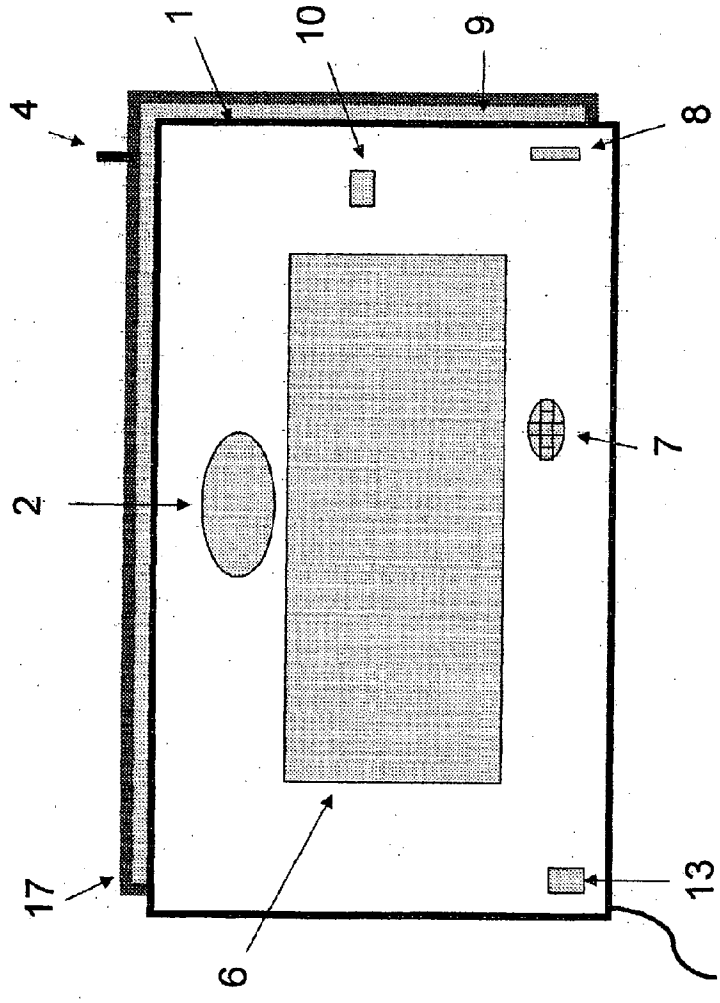


Figure 3

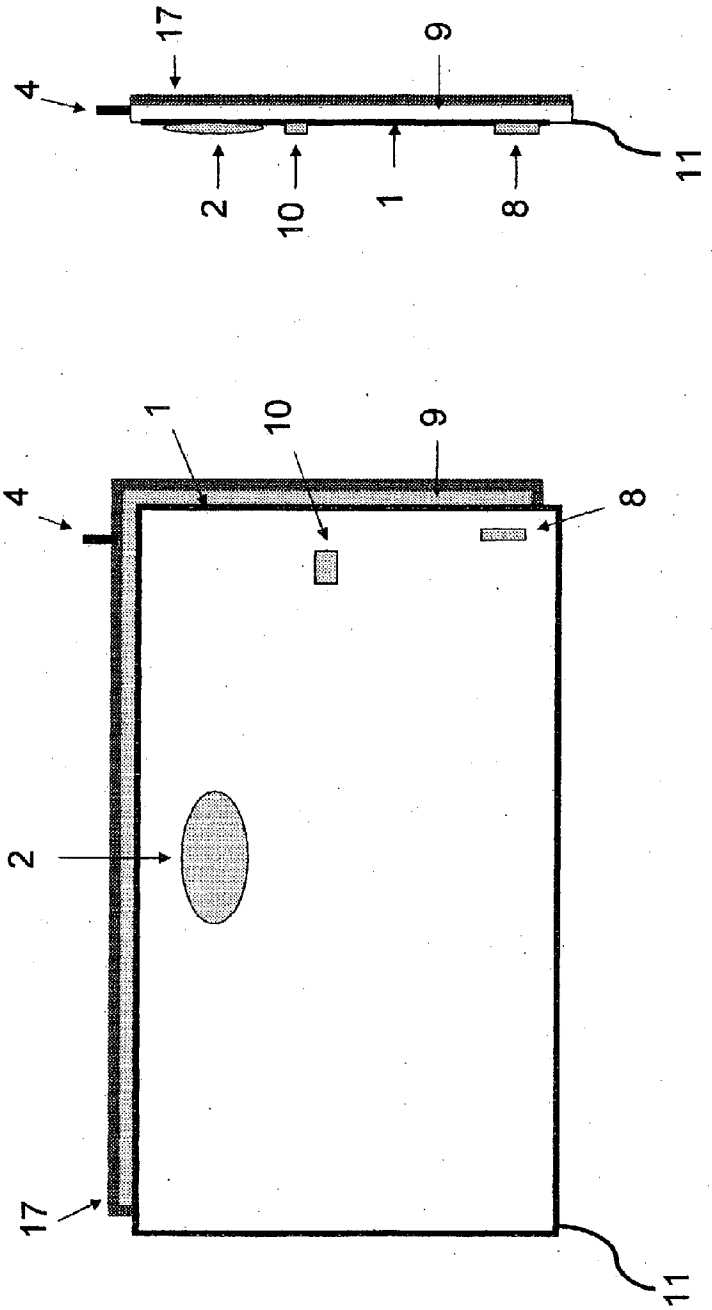


Figure 4

GPS MONITORING BIOMETRIC SMARTCARD, INTELLIGENT SPEED MANAGMENT

[0001] This invention relates to a method and system, which, provides GPS based vehicle monitoring, management and cruise control, incorporating intelligent speed adaptation, recording driver and vehicle operating parameters on a smart card and a SATELITE/GPRS/GS/MBLUETOOTH mobile communication facility by an in vehicle small, single sealed monitoring unit.

[0002] The method and system is coordinated through and by a national Transport Management Command Centre operating 24 hours per day 365 days per year.

[0003] Transport Authorities in every state/country are responsible for regulating the transport industry with regards to operational parameters such as licensing, vehicle registration, vehicle safety, fuel subsidies, freight rates and drivers' working and rest hours. The burden of ever the increasing competition between trucks and private vehicles for space on overcrowded roads is also a universal issue.

[0004] Simultaneously police in every jurisdiction are charged with enforcing traffic laws, road safety and speed regulations for all types of vehicles whilst trying to promote responsible driving habits such as regular rest periods for commercial and private vehicle drivers to combat fatigue related accidents.

[0005] Additionally, since the Sep. 11, 2001 attack on the New York World Trade Centre and subsequent world wide uses of vehicles as mobile bombs, security issues related to transport cargo are also of paramount interest.

[0006] Whereas different methods and systems to control the transport industry exist, they are all inefficient and subject to manipulation. Specifically the recording and control of legislated drivers' work and rest hours via log books are open to fraud. The present reliance on paper records is futile and the use of tachographs is regularly compromised by illegal manipulation of sensors and disconnection of installed speed governors. A centrally available advanced knowledge data base of road use, truck movements or dangerous cargos carried does not exist in any state or country.

[0007] The police have the difficulty of trying to cover huge road networks with ever increasing traffic loads and lack of sufficient manpower in their attempts to enforce road safety and speeding regulations.

[0008] While recently passed laws in Australia hold every person in the transport industry chain including owner, operator, driver and customer responsible for any offences, competitive pressures induce many to break the law and endanger the public. This is a world wide phenomenon. A system that cannot be compromised is required.

[0009] These problems are overcome by the present invention, which provides a method and system of automatically and irrefutably logging via GPS, operational parameters such as drivers' work and rest time, vehicle location, vehicle speeds, speeding offences, distance covered etc. and recording these on a secure smart card as well as in the vehicle units' memory.

[0010] A national Transport Management Command Centre with an up to date data base of road conditions is established. The SATELITE/GPRS/GSM/BLUETOOTH provides a real time communication link with the Command Centre and the vehicles. It also automatically informs the Command Centre in case of accidents when the GPS reports an impact or sudden stop.

[0011] Intended vehicle route plans and cargo details are automatically "filed" in the unit and with the national Transport Management Command Centre via the SATELITE/GPRS/GSM/BLUETOOTH prior to the start of each journey. Police workload is reduced since speed regulations are enforced in real time by the system and violators are automatically reported.

[0012] GPS is inherently and irrefutably the most accurate technology providing date, time, location and speed. Operating independent of vehicle sensor inputs it cannot be affected by fraudulent manipulation of vehicle functions. Unlike tachographs, it never needs calibration.

[0013] Smart cards supported by indisputable biometric fingerprints are the most secure forms of information storage available.

[0014] SATELITE/GPRS/GSM/BLUETOOTH is the cheapest and most convenient communication platform for mobile communications in logistic applications.

[0015] Transport vehicles and trailers come in many configurations, shapes, and sizes. To ensure easy installation on commercial as well as private vehicles, and trailers, this invention is provided in four forms all being a small, single, sealed monitoring/communication unit.

FORM ONE OF THE INVENTION

[0016] In form one of the invention, the in vehicle monitoring unit consists of **16** components namely, a custom designed micro computer, a GPS receiver module, a smart card reader/writer, a SATELITE/GPRS/GSM/BLUETOOTH module, a fingerprint verification module, a display, a beeper, a USB connector, a backup battery pack, an accelerometer, a power connector, a communications button, a sleep button, a load/unload button, an engine management system connector and a battery charger integrated into a small, single, sealed unit.

[0017] Secure smart cards supported by biometric fingerprints are used as the drivers' log books.

[0018] The monitoring unit is supplied with an upgradeable software program which, enables and disables engine ignition on the insertion and the removal of a valid driver card; provides a SATELITE/GPRS/GSM remote central and a BLUETOOTH local engine disable function; provides GPS based cruise control and an automatic speed limiter function; stores previous 2 minutes of data logged by engine management system; controls every function of the unit; correlates each vehicle and driver related operational parameter and records the results in its' memory as well as on the smart card.

[0019] The program also contains a table of state borders and a table of the geographical location of every speed zone change as per the 40Km/ph, 45Km/h, 50Km/h, 55Km/h, 60Km/h, etc. road speed signs throughout the country, and provides intelligent speed adaptation. Further, the program warns the driver each time he is due to take his mandatory break.

[0020] At the time of installation on the vehicle the unit is connected to the engine management system which is programmed to take instructions from it. The unit is turned on and from that moment it is never turned off again (though it may go into sleep mode) regardless of wether the vehicle is operating or not. Turning off or disconnecting the unit from the engine management system disables engine ignition. This ensures 24 hour a day 365 day per year monitoring of vehicle activity. If the monitoring unit is ever turned off or disconnected for any reason the date time and place is automatically logged in its memory allowing actionable discovery by relevant authorities.

[0021] Every unit has securely encoded in its' memory the registration number of the vehicle to which it is issued and on which it is installed. This prevents fraudulent or unauthorised swapping of units between vehicles.

[0022] Drivers are issued with their logbook smart cards with their fingerprint template recorded in the card.

[0023] Method of Operation

[0024] Prior to each departure, dispatch automatically "files" the intended vehicle rout plan and cargo details with the national Transport Management Command Centre and in the in-vehicle unit via the SATELITE/GPRS/GSM. The Transport Management Command Centre checks its up to date national data base to see if any obstacles such as accidents, road closures, detours, adverse weather etc. exist along the intended route and notifies the dispatcher and the vehicle via the SATELITE/GPRS/GSM of same.

[0025] At the start of the journey the driver inserts his smart card into the units' smart card reader/writer and places his finger on the fingerprint reader to confirm his identity. This automatically logs him in as the current driver and enables engine ignition. Simultaneously the monitoring unit displays the "filed" truck rout plan and a time chart showing the required driver rest times calculated from the drivers' current work/rest status recorded on the smart card. The engine will not start if the monitoring unit is disconnected or an invalid driver card and fingerprint combination is presented. During the trip the GPS keeps a constant log of the date, time, location, distance travelled and speed of the vehicle both in the units' memory and in the smart card. The system provides convenient and fool proof automated intelligent speed adaptation for any and all vehicles. The GPS based cruise control is always active and can be programmed never to allow the vehicle to exceed a set absolute maximum speed. As the vehicle approaches each new speed zone, the unit using its' intelligent speed adaptation and geographically based speed zone location tables, beeps to warn the driver of the zone change and if allowed, interacts with the engine management system to slow down or speed up the vehicle to automatically stay within appropriate speed limits in each zone.

[0026] The driver can always override the system by using the break, or the accelerator to the set absolute maximum speed only, but regardless of the drivers' actions, wether speeding up or slowing down, the unit automatically records the date, time, location and current actual speed of the vehicle, only in case of speeding violations within each speed zone. This record proves beyond doubt what actual speed the vehicle was doing at a specific date, time and place and disproves any false charges of speeding.

[0027] This is important protection for any driver since universal experience has proven the consistent inaccuracy of radar and speed cameras used to incorrectly book motorists who claim the radar and cameras are just a revenue rasing exercise which does not help traffic issues.

[0028] The unit warns the driver every time he is due to take a rest break. When the driver stops for his break, he pushes the sleep button. The unit confirms his rest start by automatically logging the date, time and location when the vehicle stops moving. At the end of the rest period as the vehicle begins moving again the date, time and location is again logged automatically. The units' accelerometer eliminates any possibility of faking starts and stops. Throughout the journey the unit records the date, time, place and duration of each and every stop and start hence legally mandated rest times cannot be fudged.

[0029] At the start and end of each loading/unloading the driver pushes the load/unload button. The unit records the time and stationary position of the vehicle at the shipper/receiver location. This provides loading dock times for which shipper/receiver are charged and eliminates disputes.

[0030] The SATELITE/GPRS/GSM facility allows two way communications with the base station and the national Transport Management Command Centre both of which can give real time instructions to the driver. Using the "filed" proposed rout plan the national Transport Management Command Centre can help to manage safety and traffic flow by directing the driver to alter course in case traffic jams, accidents, road closures or adverse weather have developed after departure. If a driver diverts inappropriately from the "filed" route plan the unit notifies the Centre. A hostile driver or out of control vehicle can be stopped by sending a "disable" command to the unit via the SATELITE/GPRS/GSM to lock up the engine management unit.

[0031] In police chase situations a BLUETOOTH enabled hand held unit can be used locally within a limited radius to "disable" the engine management unit and stop the vehicle regardless of drivers' actions. BLUETOOTH has a maximum affective range of 100 meters and so will not affect other vehicles in the area. In chase situations the police on the scene are better able to judge at what point and in which situation the vehicle should be "disabled" to minimise potential runaway damage.

[0032] In case of accidents the accelerometer and the GPS notes the sudden change in speed and the unit automatically reports to the national Transport Management Command Centre with the date, time and place coordinates of the accident even if the driver is unconscious. The "filed" route plan and cargo details allow immediate dispatch of police and rescue crews pre-warned and appropriately prepared to handle any hazardous cargo. The Centre can guide other vehicles around the new problem area to reduce congestion. The last 2 minutes of data logged by the engine management system is also automatically sent to Central.

[0033] Roadside "Hours of Service" inspections are simplified and times are literally reduced to seconds. There is no need for complicated often conflicting paper based calculations since police and DOT can simply read at a glance the drivers' current work/rest status on the units' display. Current infringements are displayed and can be acted on immediately. If a driver is "placed out of service" at roadside,

police and DOT know at a glance at what future time he will accumulate enough off duty time to be back in compliance and be allowed to resume his duties.

[0034] State border crossings are automatically logged and/or reported via the SATELITE/GPRS/GSM.

[0035] At the end of the shift or trip the driver places his finger on the fingerprint reader. This logs him out and records his finishing time, date and place.

[0036] These records irrefutably prove his working and rest times and can also be used in accounting to automate his wage payments.

[0037] At the start of the next shift the new driver logs in as above and the monitoring process is repeated.

[0038] The vehicle units' records and the drivers' card serves as an audit trail.

[0039] Rental fleets such as Avis or Hertz and private vehicles can derive the same benefits from installation of the invention as commercial installations do but may only utilise some of the available functions. In private vehicles an owner/driver smart card license can be used to operate the system. On all installations the built in engine ignition disable feature replaces the need for expensive anti theft systems and should lower both vehicle and cargo insurance costs.

[0040] As the GPS records distance travelled, the possibility of vehicle odometer tampering is eliminated and used vehicle purchasers are fully protected.

FORM TWO OF THE INVENTION

[0041] In form two of the invention the in-vehicle monitoring unit consists of **11** components namely a custom designed micro computer, a GPS receiver module, a display, a USB connector for software updates and record downloads, a backup battery pack, an accelerometer, a beeper, a display button, an engine management system connector a power/cigarette lighter connector and a battery charger integrated into a small, single, sealed unit. This form of the invention is more appropriate for voluntary use by conscientious drivers or mandatory use as part of vehicle registration to reduce reliance on police radar and speed cameras to enforce speed rules.

[0042] The monitoring unit is supplied with the upgradeable software program of form one of this invention which controls every function of the unit, correlates each vehicle and driver related operational parameter and records the results in its memory. The program also contains a table of the geographical location of every speed zone change as per the 40Km/ph, 45Km/h, 50Km/h, 55Km/h, 60Km/h, etc. road speed signs throughout the country and provides intelligent speed adaptation. Further the program warns the driver to take a suggested 10 minute safety break after every two hours of driving.

[0043] The unit may be portable or be connected to the engine management system. At the point of purchase/issue each unit has securely encoded in its' memory the registration number of the vehicle for which it was purchased and on which it will be used. This ties the portable units' records to a specific vehicle thus validating only that vehicles performance. A driver cannot claim that the records are of vehicle X when the unit was actually used in vehicle Y. Nor can he/she use a unit which is not encoded with a vehicle registration number to claim that he/she was at a different place at the time an infraction was recorded against his/her own vehicle.

[0044] Method of Operation

[0045] At the start of a journey the unit is automatically turned on by the accelerometer and it logs the date, time and place of departure.

[0046] The system program provides convenient and fool proof automated intelligent speed adaptation for any and all vehicles. In portable mode as the vehicle approaches each new speed zone the unit only beeps to warn the driver to take appropriate action.

[0047] If the unit is connected to the engine management system, the automatic GPS based cruise control of form one is activated, and the unit uses its' intelligent speed adaptation and geographically based speed zone location tables to interact with the engine management system to slow down or speed up the vehicle to stay within appropriate speed limits in each zone.

[0048] In both cases regardless of the drivers actions, wether speeding up or slowing down, the unit automatically records the date, time, location and current actual speed of the vehicle only in case of speeding violations within each speed zone. Pushing the display button displays all recorded violations and a blank display proves no violations occurred.

[0049] This record proves beyond doubt what speed the vehicle was doing at a specific date, time and place and disproves any false charges of speeding.

[0050] This is important protection for any driver since universal experience has proven the consistent inaccuracy of radar and speed cameras used to incorrectly book motorists who claim the radar and cameras are just a revenue rasing exercise which does not help traffic issues.

[0051] Further the program warns the driver to take a suggested 10 minute safety break after every two hours of driving.

[0052] System benefits are clear to users, law enforcement and public alike.

FORM THREE OF THE INVENTION

[0053] In form three of the invention the in vehicle monitoring unit consists of **11** components namely a custom designed micro computer, a GPS receiver module, a SATELITE/GPRS/GSM/BLUETOOTH module, a display, a USB connector or smart card reader for data download, an accelerometer, a beeper, an engine management system connector, a power connector, a battery/power source and a solar/thermoelectric battery charger integrated into a thin film and incorporated into the vehicle registration label to be stuck on the inside of the windscreen. This form of the invention is intended for jurisdictions which wish to introduce intelligent speed adaptation and mandate automatic speed monitoring and enforcement to reduce the need for manual policing and speed camera devices. The SATELITE/GPRS/GSM/BLUETOOTH module included in form three allow for automatic speed violation notification to be sent to authorities for fine issuing.

[0054] The monitoring unit is supplied with the upgradeable software program of form one of this invention which controls every function of the unit, correlates each vehicle and driver related operational parameter and records the results in its memory. The program also contains a table of the geographical location of every speed zone change as per the 40Km/ph, 45Km/h, 50Km/h, 55Km/h, 60Km/h, etc. road speed signs throughout the country and provides intelligent speed adaptation. Further the program warns the driver to take a suggested 10 minute safety break after every two hours of driving.

[0055] Since each unit is an integral part of the vehicle registration label it has securely encoded in its' memory the registration number of the vehicle for which it was purchased and on which it will be used. This ties the units' records to a specific vehicle thus validating only that vehicles' performance. A driver cannot claim that the records are of vehicle X when the unit was actually registered to vehicle Y.

[0056] As the GPS records distance travelled, the possibility of vehicle odometer tampering is eliminated and used vehicle purchasers are fully protected.

[0057] Method of Operation

[0058] The unit is fully automated and requires no driver input to operate. At the start of a journey the unit is automatically turned on by the accelerometer and it logs the date, time and place of departure. The system program provides convenient and fool proof automated intelligent speed adaptation for any and all vehicles. In unconnected mode, as the vehicle approaches each new speed zone, the unit only beeps to warn the driver.

[0059] If the unit is connected to the engine management system, the automatic GPS based cruise control of form one is activated, and the unit uses its intelligent speed adaptation and geographically based speed zone location tables to interact with the engine management system to slow down or speed up the vehicle to stay within appropriate speed limits in each zone.

[0060] The driver can always override the system by using the break, or the accelerator to the set absolute maximum speed only, but in both cases regardless of the drivers actions, wether speeding up or slowing down, the unit automatically records the date, time, location and current actual speed of the vehicle only in case of speeding violations within each speed zone.

[0061] This record proves beyond doubt what speed the vehicle was doing at a specific date, time and place and disproves any false charges of speeding.

[0062] This is important protection for any driver since universal experience has proven the consistent inaccuracy of radar and speed cameras used to incorrectly book motorists who claim the radar and cameras are just a revenue rasing exercise which does not help traffic issues.

[0063] Checking and enforcement is carried out automatically by the unit reporting each violation via the SATELITE/GPRS/GSM directly to a central facility or via the BLUETOOTH at petrol stations or other convenient locations equipped with BLUETOOTH receivers relaying the data to a central facility, depending on which method is adopted.

[0064] In either case fine notifications can be mailed.

FORM FOUR OF THE INVENTION

[0065] Form four of the invention is used as a trailer/yard monitoring unit, and consists of 8 components namely, a custom designed micro computer, a GPS receiver module, a SATELITE/GPRS/GSM/BLUETOOTH module, a USB connector, a battery, .an accelerometer, a power connector and a solar/thermoelectric battery charger integrated into a small, single, sealed unit.

[0066] This form of the invention is used to monitor the trailer while coupled to a prime mover in transit and also to monitor and locate the trailer in the dispatch yard to facilitate logistics, equipment use and scheduling.

[0067] The trailer/yard monitoring unit is supplied with the upgradeable software program of form one: of this invention which, controls every function of the unit, correlates each trailer/yard related operational parameter and records the results in its' memory.

[0068] In the drawings:

[0069] FIG. **1** shows form one of the invention where **1** is the microcomputer **2** is the GPS module **3** is the smart card reader writer **4** is the SATELITE/GPRS/GSM/BLUETOOTH module **5** is the fingerprint module **6** is the display **7** is the beeper **8** is the USB connector **9** is the backup battery pack **10** is the accelerometer **11** is the power connector **12** is the communications button **13**.is the engine management system connector **14** is the load/unload record button **15**. is the drivers' rest record button and **17** is the battery charger.

[0070] FIG. **2** shows form two of the invention where **1** is the microcomputer **2** is the GPS module **6** is the display **7** is the beeper **8** is the USB connector **9** is the backup battery pack **10** is the accelerometer and **11** is the power connector **13** is the engine management connector **16** is the display button and **17** is the battery charger.

[0071] FIG. **3** shows form three of the invention where **1** is the microcomputer **2** is the GPS **4** is the SATELITE/GPRS/GSM/BLUETOOTH module **6** is the display **7** is the beeper **8** is the USB connector **9** is the back up battery pack **10** is the accelerometer **11** is the power connector **13** is the engine management connector and **17** is. the battery charger.

[0072] FIG. **4** shows form four of the invention where **1** is the microcomputer **2** is the GPS module **4** is the SATELITE/GPRSIGSM/BLUETOOTH module **8** is the USB connector **9** is the battery **10** is the accelerometer **11** is the power connector and **17** is the. battery charger.

1-47. (canceled)

48: A method and system for carrier, driver, vehicle and cargo monitoring and management by an in-vehicle monitoring unit comprising:

a GPS system;

a GPS cruise control;

a biometrically enabled smart card; and

an intelligent speed adaptation;

wherein said in-vehicle monitoring unit in communications with a national Transport Management Command

Centre using a multi-faceted Satellite/GPRS/GSM/Short Range/Bluetooth enabled wireless communications link facility;

wherein said national Transport Management Command Centre monitors every registered vehicle regardless of its carrier/owner/operator status to provide a real time national transport security management and response platform.

49: The method and system of claim 48, wherein said national Transport Management Command Centre comprises: a computer network supporting an internet on-line facility for carrier dispatchers to create, file, store and track route plans, vehicles, drivers and cargo details; a database of all filed and stored on-road route plans, and vehicle, driver and cargo details; all driver hours of service records; detours; road closures; accident sites; adverse weather areas; a national map database containing a geographical speed zone locations table of every speed zone as displayed by road speed signs throughout the country; a table of state border crossings and a multi-faceted Satellite/GPRS/GSM/Short Range/Bluetooth enabled wireless communications link facility.

50: The method and system of claim 48, wherein said national Transport Management Command Centre communicates with the carrier, driver and the in-vehicle unit using said Satellite/GPRS/GSM/Short Range/Bluetooth enabled wireless communications link facility and said internet on-line facility.

51: The method and system of claim 49, wherein every carrier may utilize said internet on-line carrier dispatcher facility and database of claim 49 to create, file, store and track route plans and vehicle, driver and cargo details for its fleet operations.

52: The method and system of claim 48, wherein every carrier may create route plans, vehicle, driver and cargo details on its own in-house system and download said route plans, vehicle, driver and cargo details to said national Transport Management Command Centre using said internet online facility and said Satellite/GPRS/GSM/Short Range/Bluetooth enabled wireless communications link facility.

53: The method and system of claim 49, wherein said filed on-road route plans, vehicle, driver and cargo details, detours, road closures, accident sites, adverse weather areas, the table of state border crossings and geographical speed zone locations table of claim 49 are downloaded to said in-vehicle monitoring unit using said Satellite/GPRS/GSM/Short Range/Bluetooth enabled wireless communications link facility.

54: The method and system of claim 49, wherein said filed route plans, vehicle, driver and cargo details, the table of state border crossings, detours, road closures, accident sites, adverse weather areas and the geographical speed zone locations table of claim 49 are downloaded to said secure biometric enabled smart cards using said internet on-line facility and said Satellite/GPRS/GSM/Short Range/Bluetooth enabled wireless communications facility.

55: The method and system of claim 48, wherein said national Transport Management Command Centre receives, confirms, alters, maintains, updates, monitors and stores all said filed route plans and driver and cargo details in real time.

56: The method and system of claim 48, wherein said national Transport Management Command Centre receives a signal from said in-vehicle monitoring unit at preset time intervals confirming vehicle and driver adherence to said filed route plans and driver and cargo details.

57: The method and system of claim 48, wherein said national Transport Management Command Centre sends a "reply" request to said in-vehicle monitoring unit whenever said periodic signal from said in-vehicle monitoring unit is not received within the said designated period.

58: The method and system of claim 48, wherein said national Transport Management Command Centre receives an alarm signal from said in- vehicle monitoring unit whenever the vehicle is in violation of said filed route plans, vehicle, driver or cargo details.

59: The method and system of claim 48, wherein said national Transport Management Command Centre intervenes, takes control of and manages the vehicle in case of violation of, or deviation from, said filed route plans, vehicle, driver or cargo details.

60: The method and system of claim 48, wherein said national Transport Management Command Centre sends a "disable" command to said in-vehicle monitoring unit to disable the vehicle in case of emergency or a hostile driver. Further, during police pursuits, a Short Range/Bluetooth communications enabled hand held unit with a limited effective range is used to disable the vehicle.

61: The method and system of claim 48, wherein said national Transport Management Command Centre receives automated accident reports from said in-vehicle monitoring unit and notifies appropriate emergency services.

62: The method and system of claim 48, wherein said national Transport Management Command Centre maintains all driver hours of service records for every licensed driver in the country.

63: The method and system of claim 48, wherein said national Transport Management Command Centre maintenance of all driver hours of service records for every licensed driver in the country eliminates the legal requirement and associated costs to collect and retain driver hours of service supporting documents.

64: The method and system of claim 48, wherein said in-vehicle monitoring unit comprising: a micro computer; a graphical display; an audio interface; a keyboard interface; a touch screen interface; a GPS system; a smart card reader/writer; a fingerprint reader; a USB connector; an accelerometer; a power connector; a battery; a battery charger; an engine management computer interface; a cargo monitoring module interface and a multi-faceted Satellite/GPRS/GSM/Short Range/Bluetooth enabled wireless communications link facility is installed on said vehicle.

65: The method and system of claim 48, wherein said in-vehicle monitoring unit is turned on at installation and remains on indefinitely regardless whether the engine is operating or not.

66: The method and system of claim 48, wherein said in-vehicle monitoring unit enters into 'sleep mode' whenever said vehicle is stationary with the engine turned off.

67: The method and system of claim 64, wherein said in-vehicle monitoring unit instantly enters into "wake mode" whenever said accelerometer of claim 64 senses any vehicle movement.

68: The method and system of claim 48, wherein disconnecting the said in-vehicle monitoring unit from the vehicle engine management computer automatically disables the vehicle and logs this event in both the said in-vehicle monitoring unit and said smart card memory.

69: The method and system of claim 48, wherein all vehicle related details including ownership, registration, classification, license and insurance status are encoded in said in-vehicle monitoring unit memory on installation.

70: The method and system of claim 48, wherein the said in-vehicle monitoring unit is programmed for bidirectional communication with said vehicle engine management computer.

71: The method and system of claim 48, wherein the said in-vehicle monitoring unit is configured to execute an upgradeable operating system having a graphical user interface to display multiple windows.

72: The method and system of claim 48, wherein said in-vehicle monitoring unit is configured with an upgradeable operating system which executes all functions of the said in-vehicle unit.

73: The method and system of claim 48, wherein said secure biometrically enabled smart cards are used to record, maintain and transfer drivers' hours of service records between vehicles

74: The method and system of claim 64, wherein the vehicle engine is enabled and the driver is logged in by inserting said secure biometric enabled, valid driver smart card containing the driver's fingerprints into said in-vehicle monitoring unit and presenting a valid fingerprint to said fingerprint reader of claim 64, and wherein further removing said valid driver smart card from said in-vehicle monitoring unit disables the vehicle engine and logs the driver out.

75: The method and system of claim 74, wherein the driver log in of claim 74 automatically downloads the current data from said biometrically enabled smart card to said in-vehicle monitoring unit.

76: The method and system of claim 75, wherein said in-vehicle monitoring unit displays the data of claim 75.

77: The method and system of claim 48 wherein said in-vehicle monitoring unit further displays the driver hours of service records for the last 8 days wherein every duty status is represented by a different colored horizontal progress bar on a 24 hour log sheet graph.

78: The method and system of claim 48, wherein said in-vehicle monitoring unit displays a "crumb trail" of the filed route plan showing key way points, all state border crossings and all relevant points of driver duty status changes.

79: The method and system of claim 48, wherein said in-vehicle monitoring unit displays all driver duty status violations showing duration of the violations with a horizontal red progress bar representing the duty status being violated.

80: The method and system of claim 48, wherein said in-vehicle monitoring unit displays the scheduled end of every driver duty status with a vertical bar, and further a numerical hour and minute display shows the time remaining in every driver duty status.

81: The method and system of claim 48, wherein said in-vehicle monitoring unit continuously monitors, calculates, updates, records and graphically displays all daily driver log information required to comply with the regulation that logs be updated at regular 15 minute intervals.

82: The method and system of claim 48, wherein said in-vehicle monitoring unit displays the time duration an offending driver must be placed out of service before he is allowed to resume work.

83: The method and system of claim 48, wherein said in-vehicle monitoring unit displays local time zones for the filed route plan as a half tone overlay over the filed route the vehicle will travel.

84: The method and system of claim 48, wherein said in-vehicle monitoring unit is configured with a voice control capability.

85: The method and system of claim 48, wherein the said in-vehicle monitoring unit records all loading/unloading, fuelling, maintenance and wash times by driver input via the audio, keyboard or touch screen interface.

86: The method and system of claim 48, wherein said in-vehicle monitoring unit uses its GPS system and an accelerometer to determine the location and duration of the vehicle's stationary position to record all loading/unloading, fuelling, maintenance and wash times whenever the driver fails to do so.

87: The method and system of claim 48, wherein said GPS system of said in-vehicle monitoring unit continuously monitors the route adherence, position and location of the vehicle in real time, and further the system notifies said national Transport Management Command Centre whenever the vehicle diverts from said filed route plan.

88: The method and system of claim 48, wherein said in-vehicle monitoring unit continuously compares the current GPS vehicle position with said table of geographical speed zone locations to determine what speed zone the vehicle is traveling in.

89: The method and system of claim 48, wherein said in-vehicle monitoring unit always knows what speed zone it is traveling in and using said GPS based cruise control continuously adjusts the engine management computer to automatically maintain the appropriate vehicle speed limit within each speed zone without driver input to provide intelligent speed adaptation.

90: The method and system of claim 48, wherein said in-vehicle monitoring unit audibly and visually notifies the driver of impending speed zone changes and in progress speeding violations within each speed zone.

91: The method and system of claim 48, wherein said intelligent speed adaptation provided by said GPS based cruise control is always active while the engine is running.

92: The method and system of claim 48, wherein applying the brakes disengages said GPS based cruise control allowing the vehicle to slow or stop normally, and further applying the accelerator disengages the GPS based cruise control and allows the vehicle to speed up but only until it reaches an absolute maximum speed limit preset on the said in-vehicle monitoring unit.

93: The method and system of claim 48, wherein said in-vehicle monitoring unit automatically records and displays the date, time, location and actual speed of the vehicle in case of speeding violations within each speed zone.

94: The method and system of claim 48, wherein said in-vehicle monitoring unit automatically reports speeding violations to said national Transport Management Command Centre via said Satellite/GPRS/GSM/Short Range/Bluetooth communications link facility.

95: The method and system of claim 48, wherein said national Transport Management Command Centre processes said automatically reported speeding violations and sends out fine payment notices for enforcement.

96: The method and system of claim 48, wherein said in-vehicle monitoring unit audibly and visually notifies the driver of impending mandated rest breaks.

97: The method and system of claim 49, wherein the said in-vehicle monitoring unit continuously monitors cargo status via the cargo monitoring module interface of claim 49.

98: The method and system of claim 48, wherein said in-vehicle monitoring unit continuously monitors and records the vehicle operating parameters via said engine management computer interface and makes these records available to the national Transport Management Command Centre.

99: The method and system of claim 48, wherein said in-vehicle monitoring unit records and reports all state border crossing with associated GPS coordinates, date and time.

100: The method and system of claim 64, wherein said GPS system and said accelerometer of claim 64 determine and record the location, and scale of severity of any sudden deceleration, impact or accident, and further said in-vehicle monitoring unit automatically notifies said national Transport Management Command Centre of such incidents and sends the last **2** minutes of the logged engine management computer data without driver involvement.

101: The method and system of claim 48, wherein said in-vehicle monitoring unit downloads all records to the national Transport Management Command Centre daily or on demand.

102: The method and system of claim 48, wherein a second embodiment of the present invention is applied to private vehicles using a smart card driver license to operate the vehicle.

103: The method and system of claim 48, wherein a third embodiment of the present invention is applied to untethered trailers.

104: The method and system of claim 48, wherein every registered vehicle, regardless of carrier/owner/operator status, is monitored by said in-vehicle unit and said national Transport Management Command Centre to provide a national transport security and response platform.

* * * * *

EXHIBIT 1008

U.S. Patent 5,465,079 ("Bouchard")

US005465079A

United States Patent [19]

Bouchard et al.

[11] Patent Number: 5,465,079

[45] Date of Patent: Nov. 7, 1995

[54] METHOD AND APPARATUS FOR DETERMINING DRIVER FITNESS IN REAL TIME

[75] Inventors: Paul J. Bouchard, San Diego; Jerry D. Woll, Poway; Bryan D. Woll, Laguna Niguel; Jimmie R. Asbury, San Diego, all of Calif.

[73] Assignee: Vorad Safety Systems, Inc., San Diego, Calif.

[21] Appl. No.: 186,487

[22] Filed: Aug. 13, 1993

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 930,066, Aug. 14, 1992, Pat. No. 5,302,956, and a continuation-in-part of Ser. No. 930,158, Aug. 14, 1992, abandoned.

[51] Int. Cl.[6] G08B 21/00

[52] U.S. Cl. 340/576; 180/272; 340/425.5; 340/439

[58] Field of Search 340/576, 439, 340/425.5; 180/272

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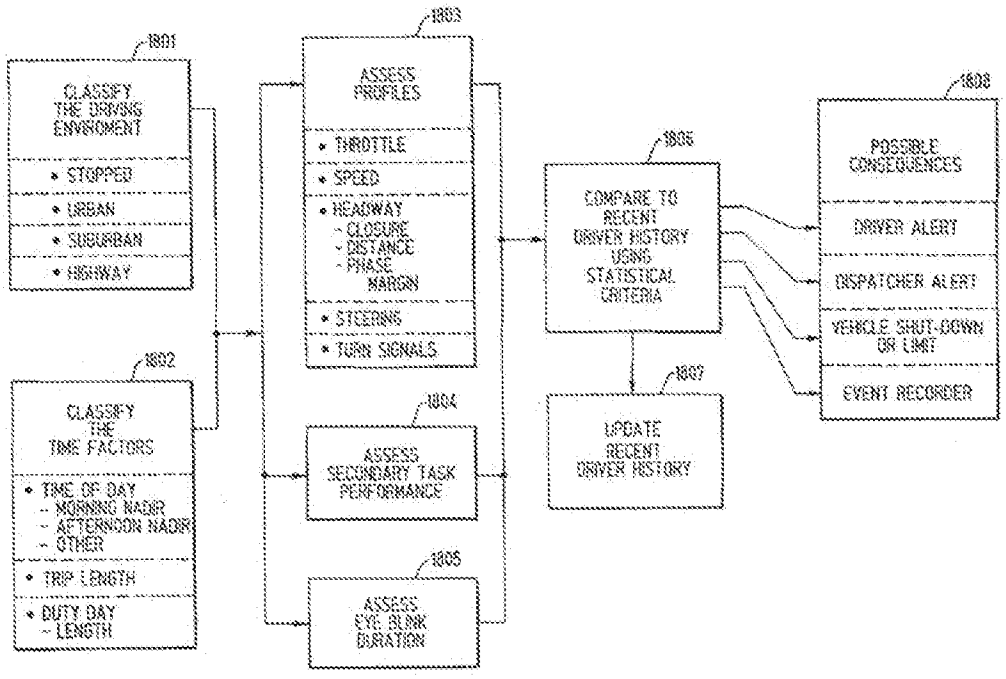
Primary Examiner—Glen Swann

Attorney, Agent, or Firm—Baker, Maxham, Jester & Meador

[57] ABSTRACT

A method and apparatus for evaluating a driver's performance under actual real-time conditions and for using such evaluations to determine the driver's ability to safely operate a vehicle compares the information gathered by a radar system and other sensors with information previously stored in an event recording device. Conditions monitored are used to make a determination as to whether the driver is performing in conformity with normal driving standards and the driver's own past performance. The driver's performance is constantly monitored and compared to that driver's past performance to determine whether the driver's present performance is impaired, and if so, whether the impairment is detrimental to the driver's ability to safely operate the vehicle.

7 Claims, 18 Drawing Sheets



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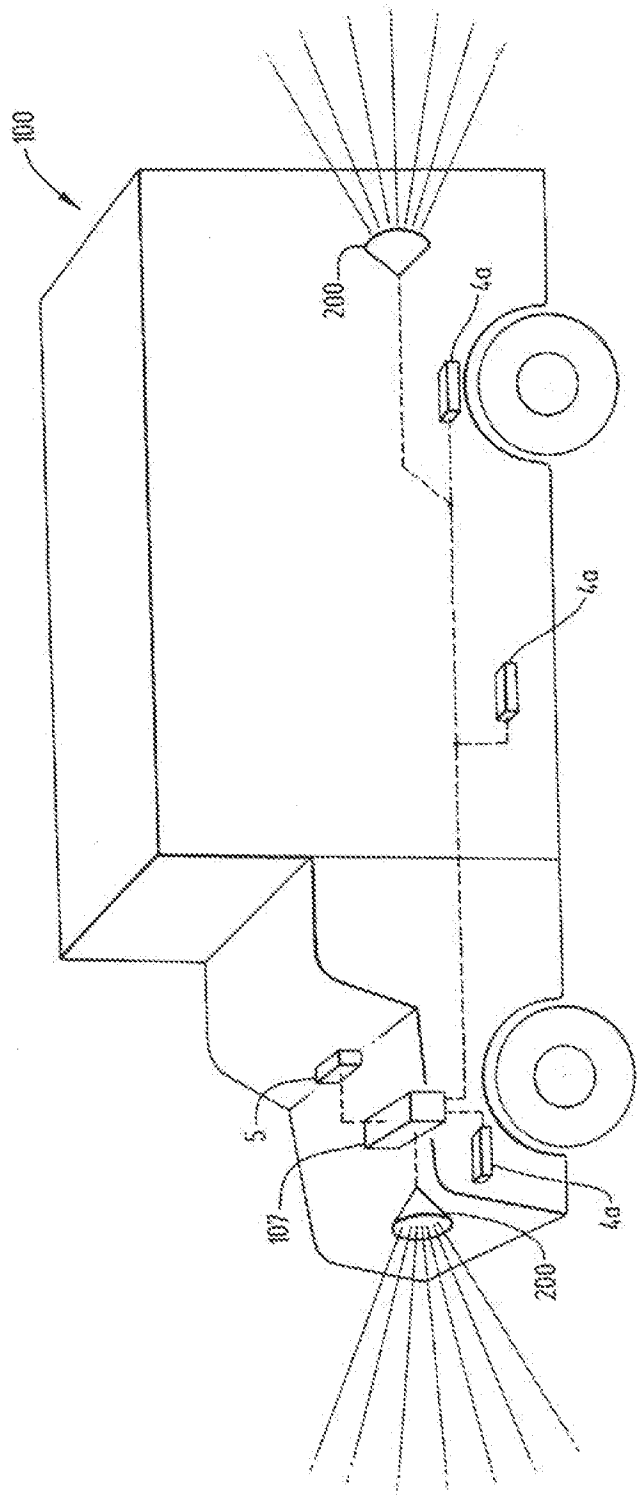


FIG. 1

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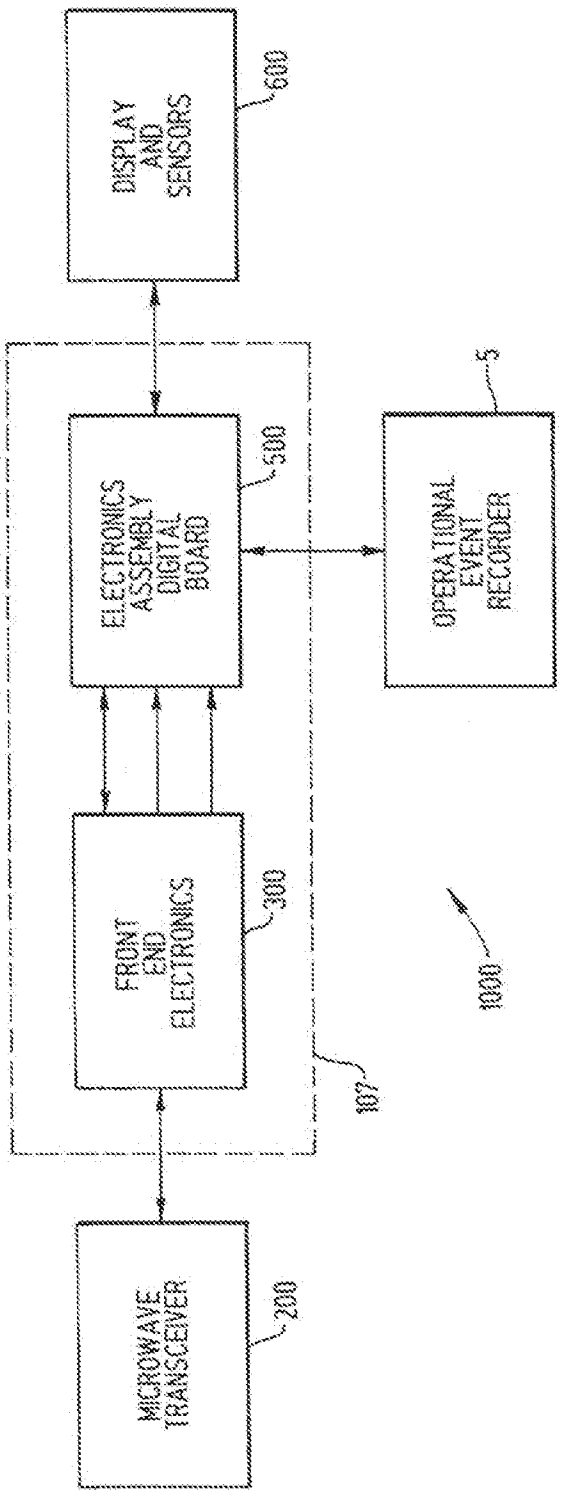


FIG. 2

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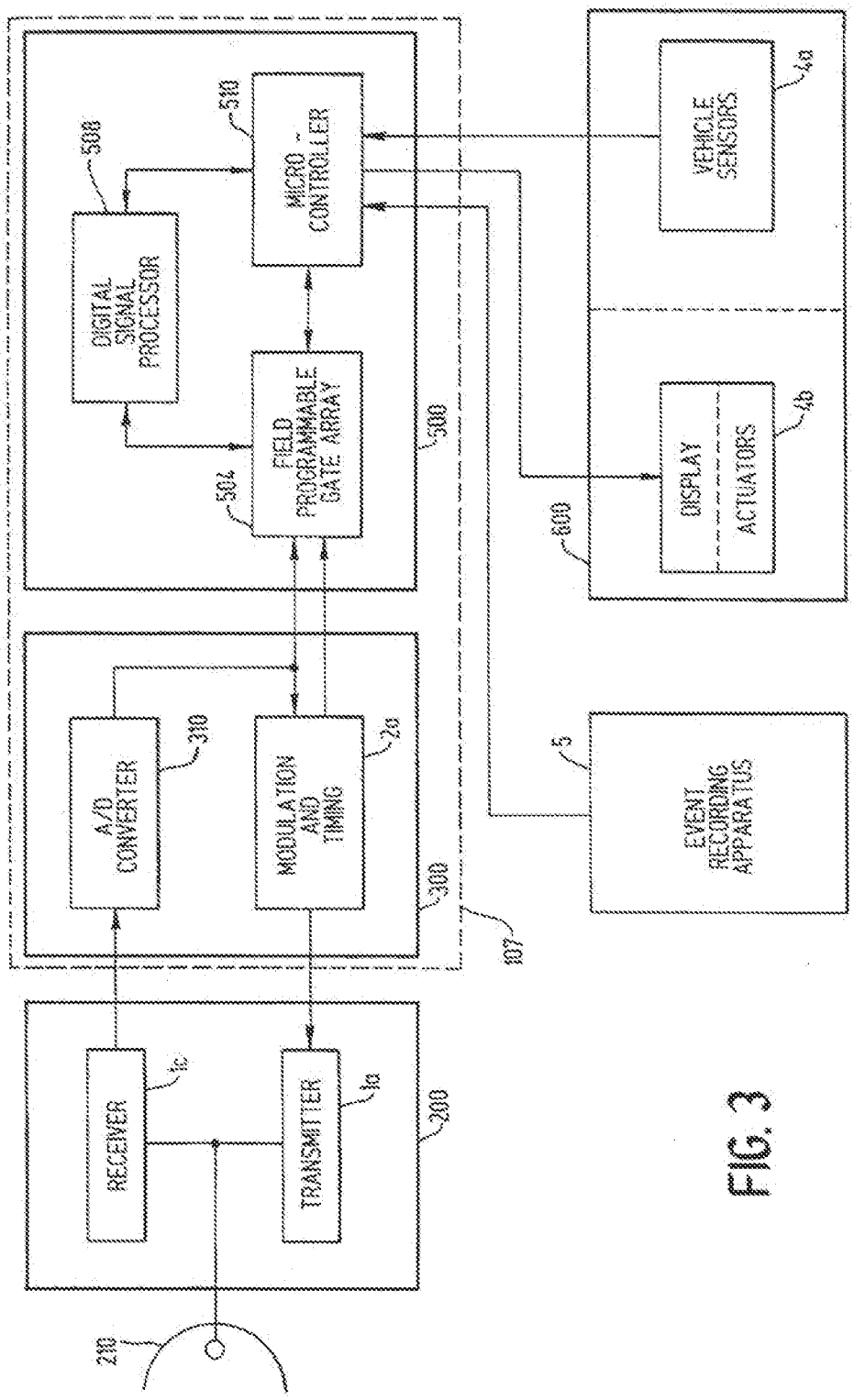


FIG. 3

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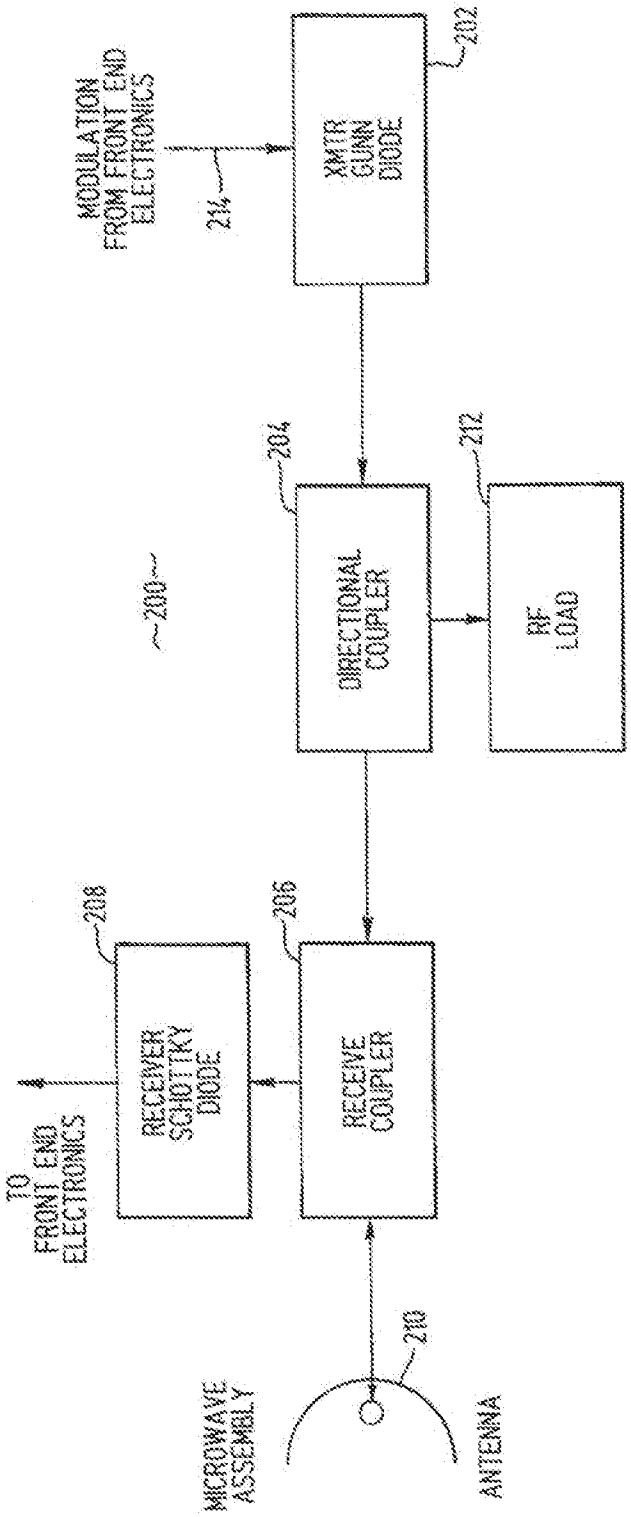


FIG. 4

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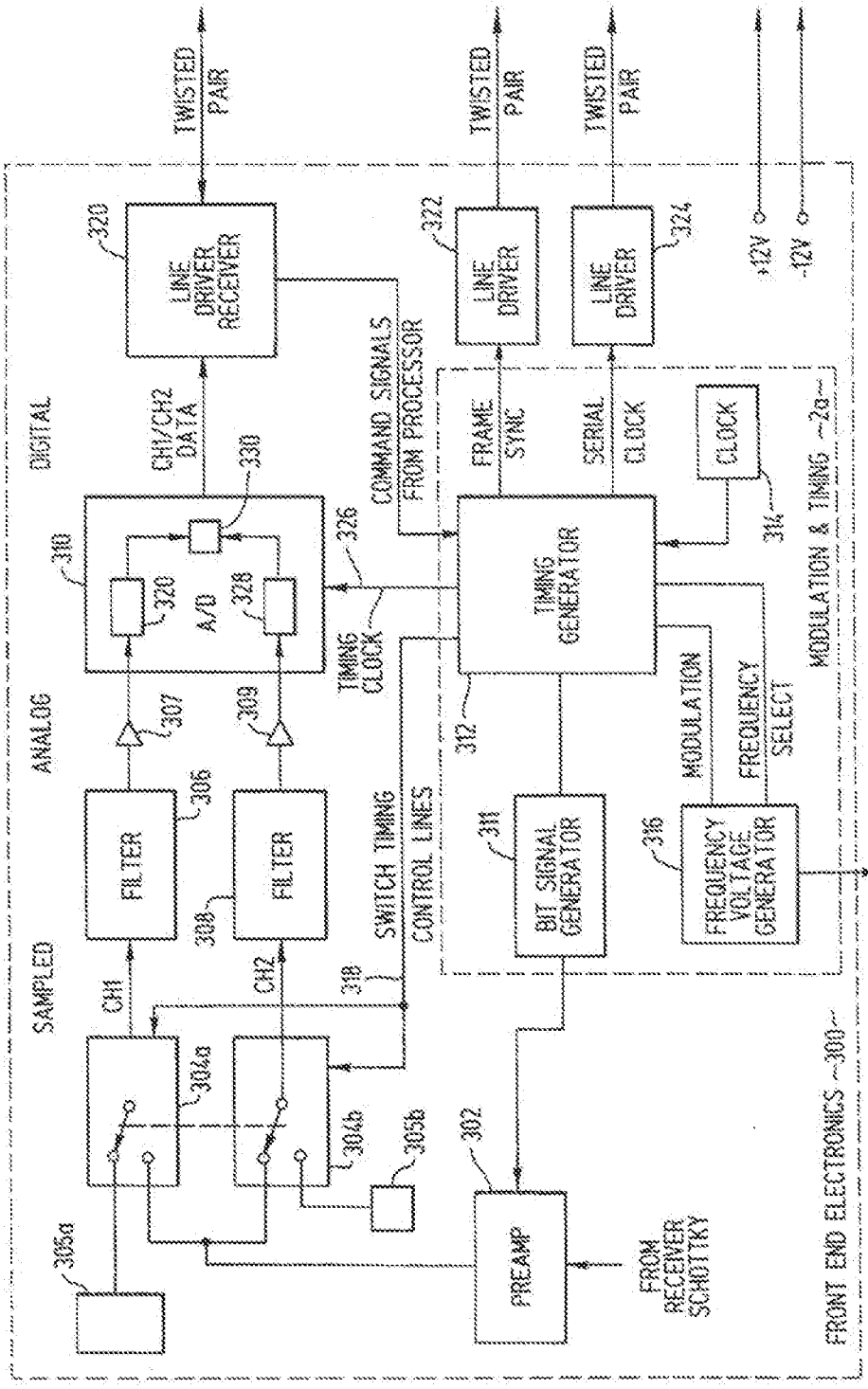


FIG. 5

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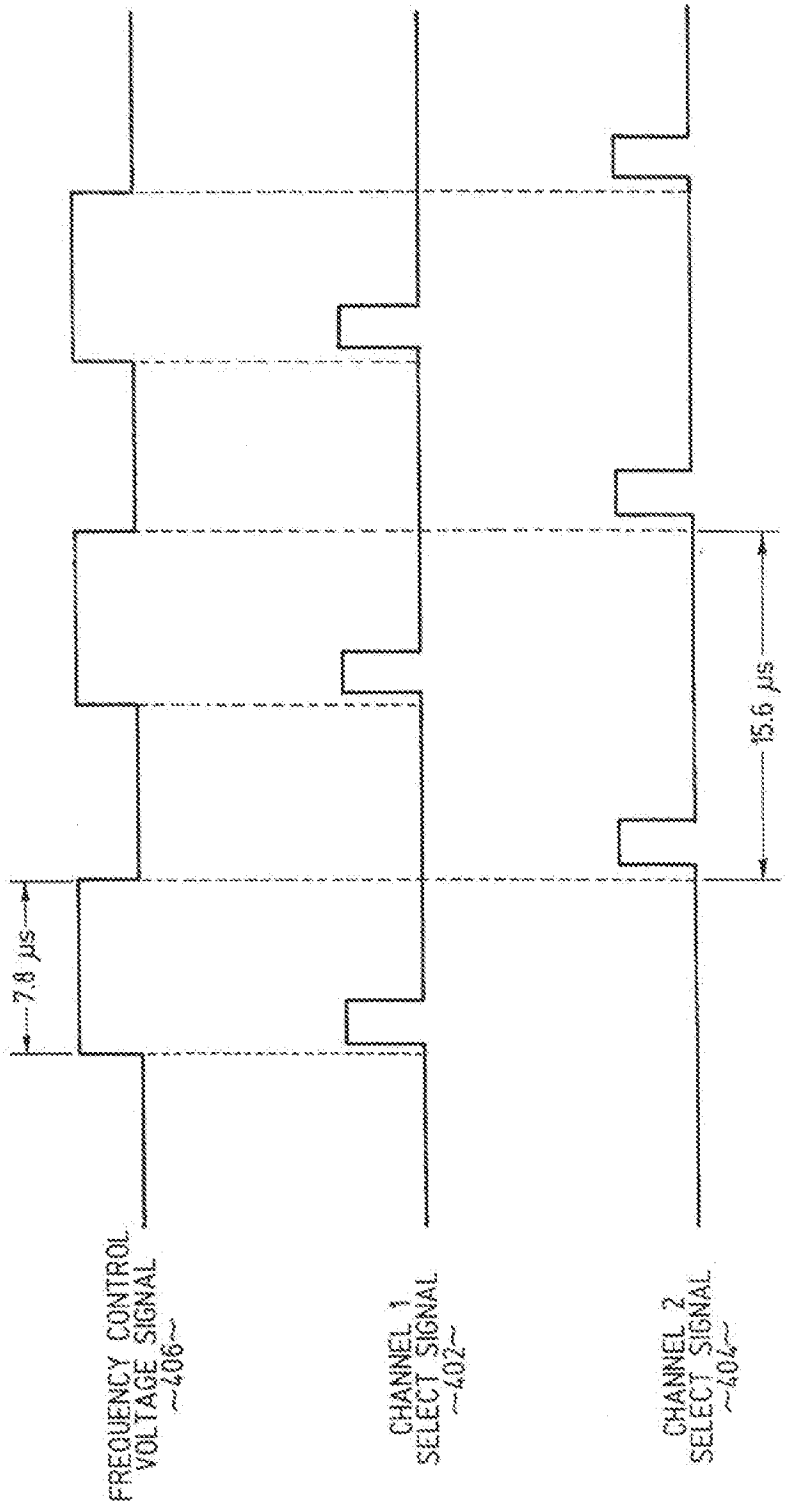


FIG. 6

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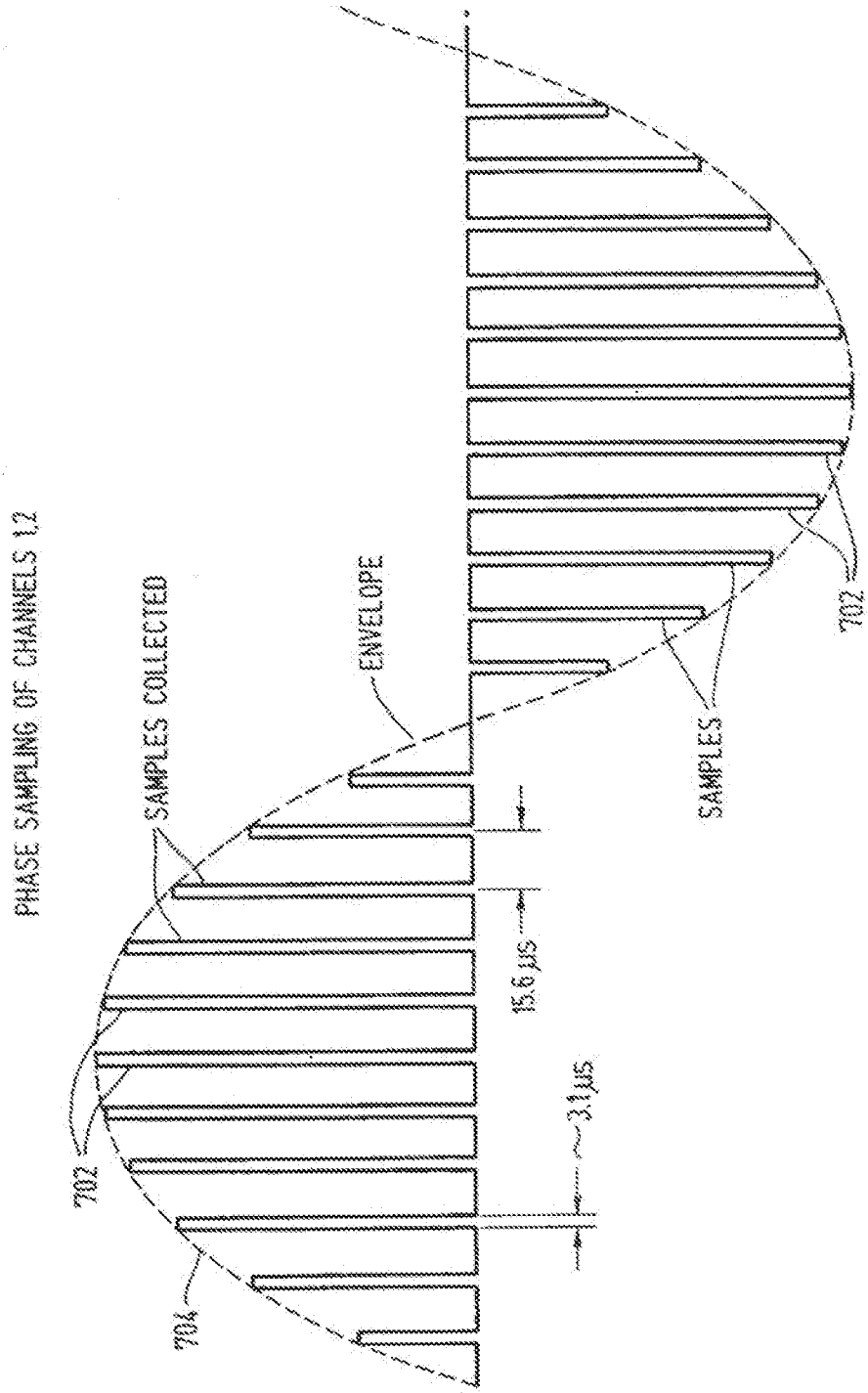


FIG. 7

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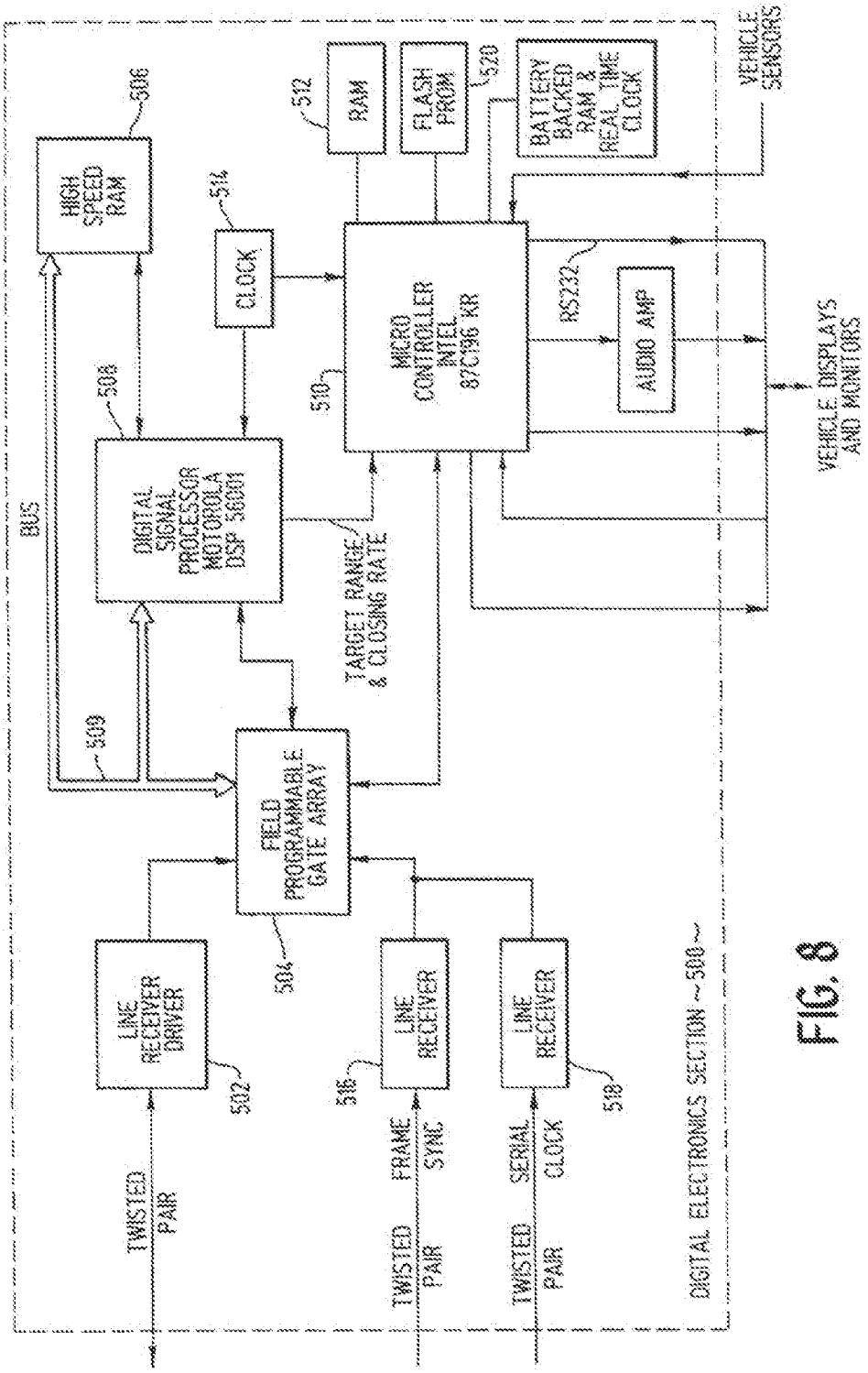


FIG. 8

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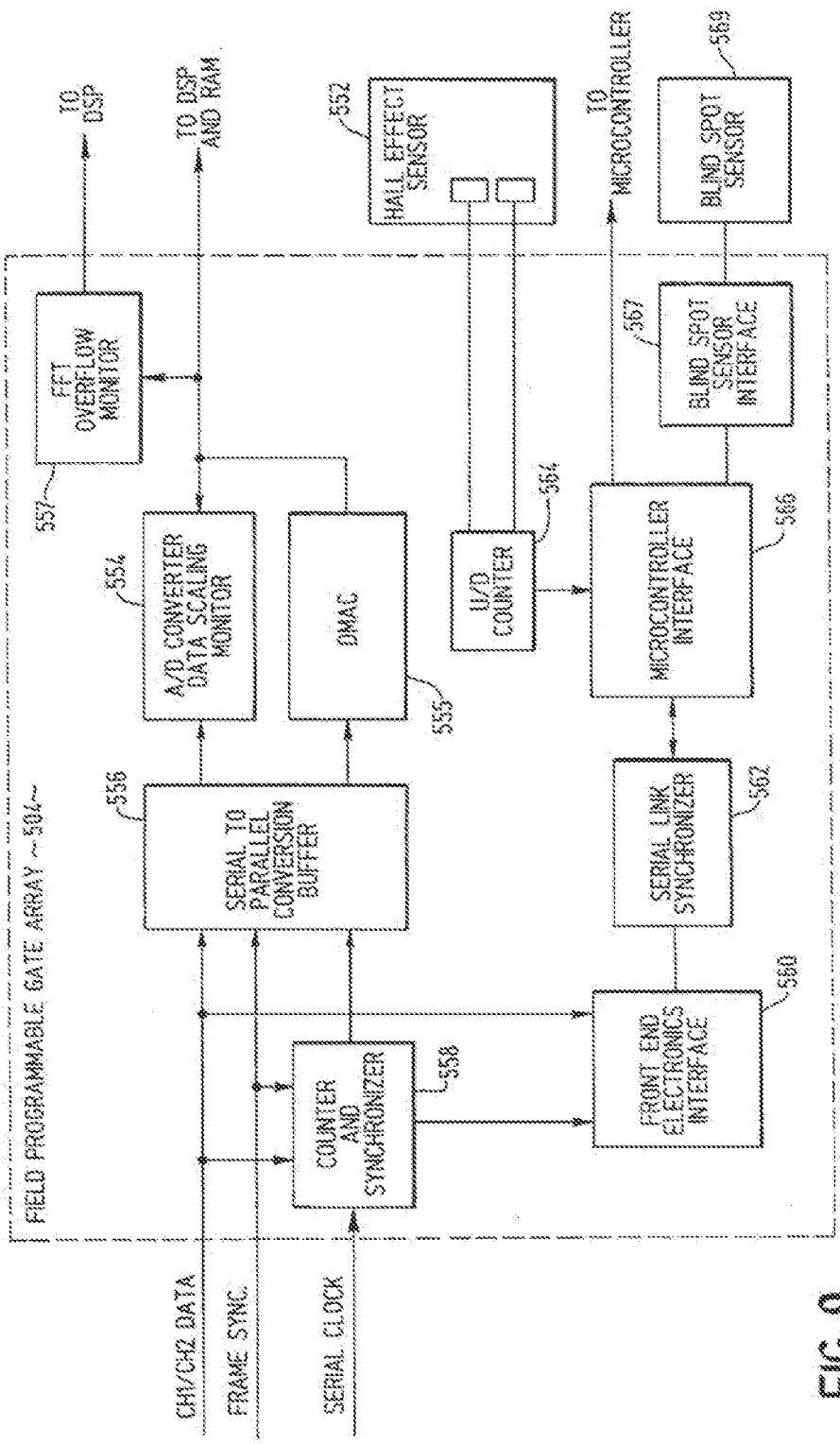


FIG. 9

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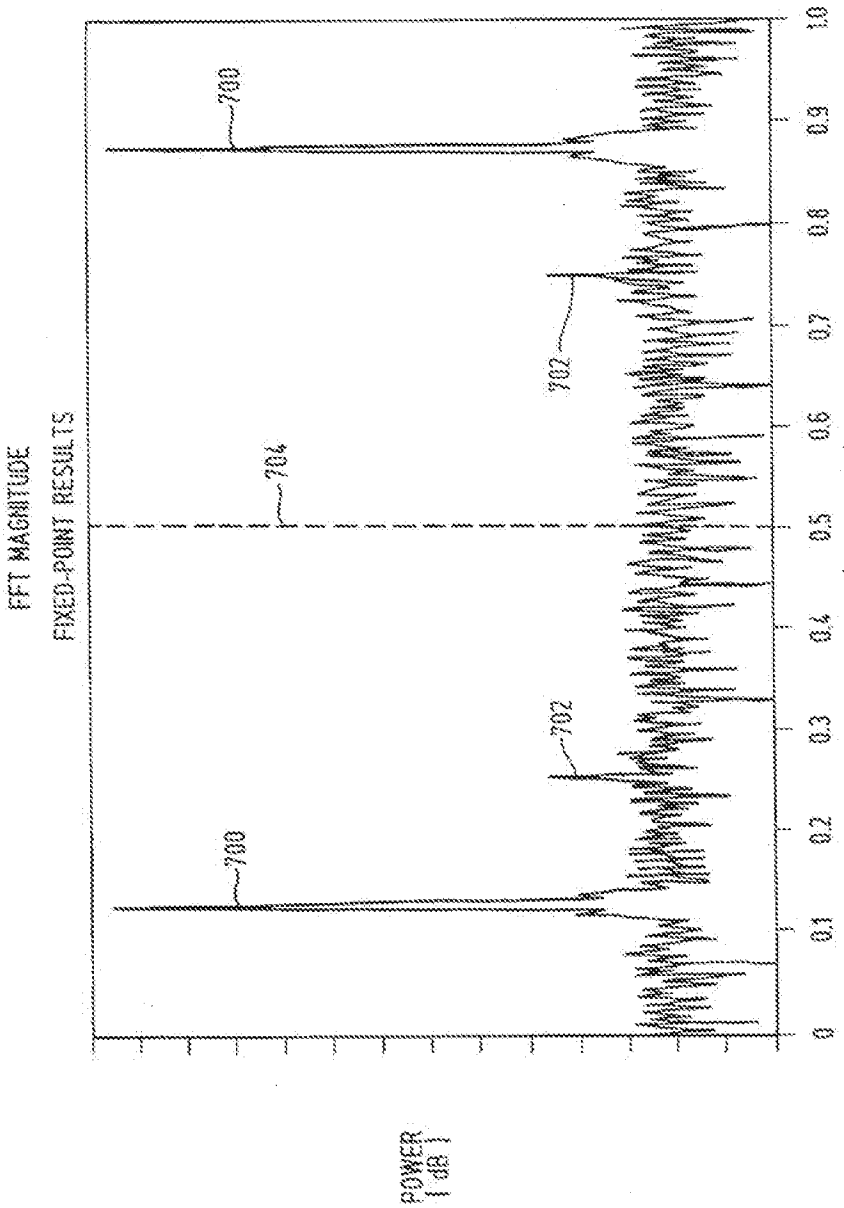

FFT MAGNITUDE
FIXED-POINT RESULTS
POWER (dB)
700
702
704
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
f (f = f/fs)

FIG. 10

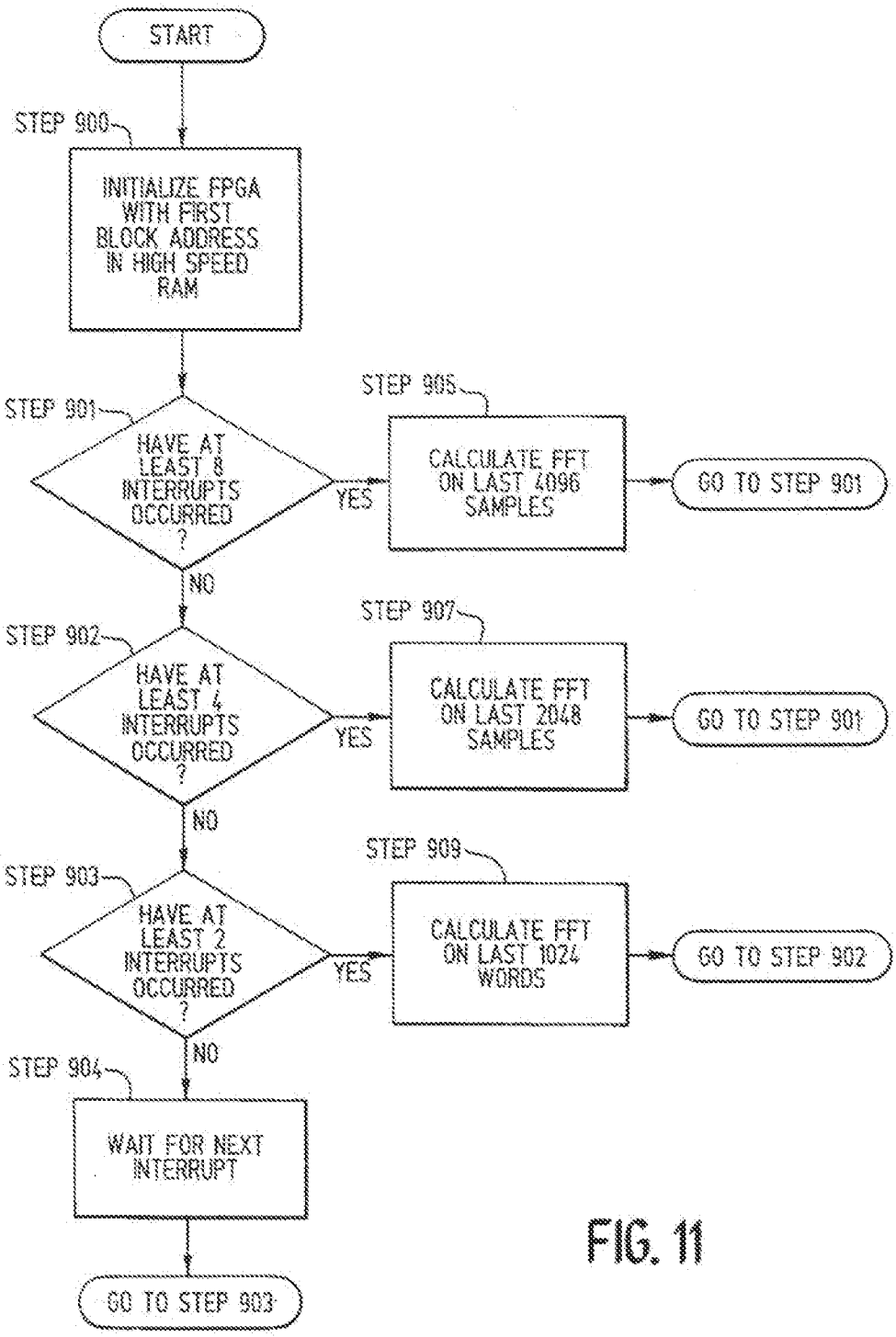
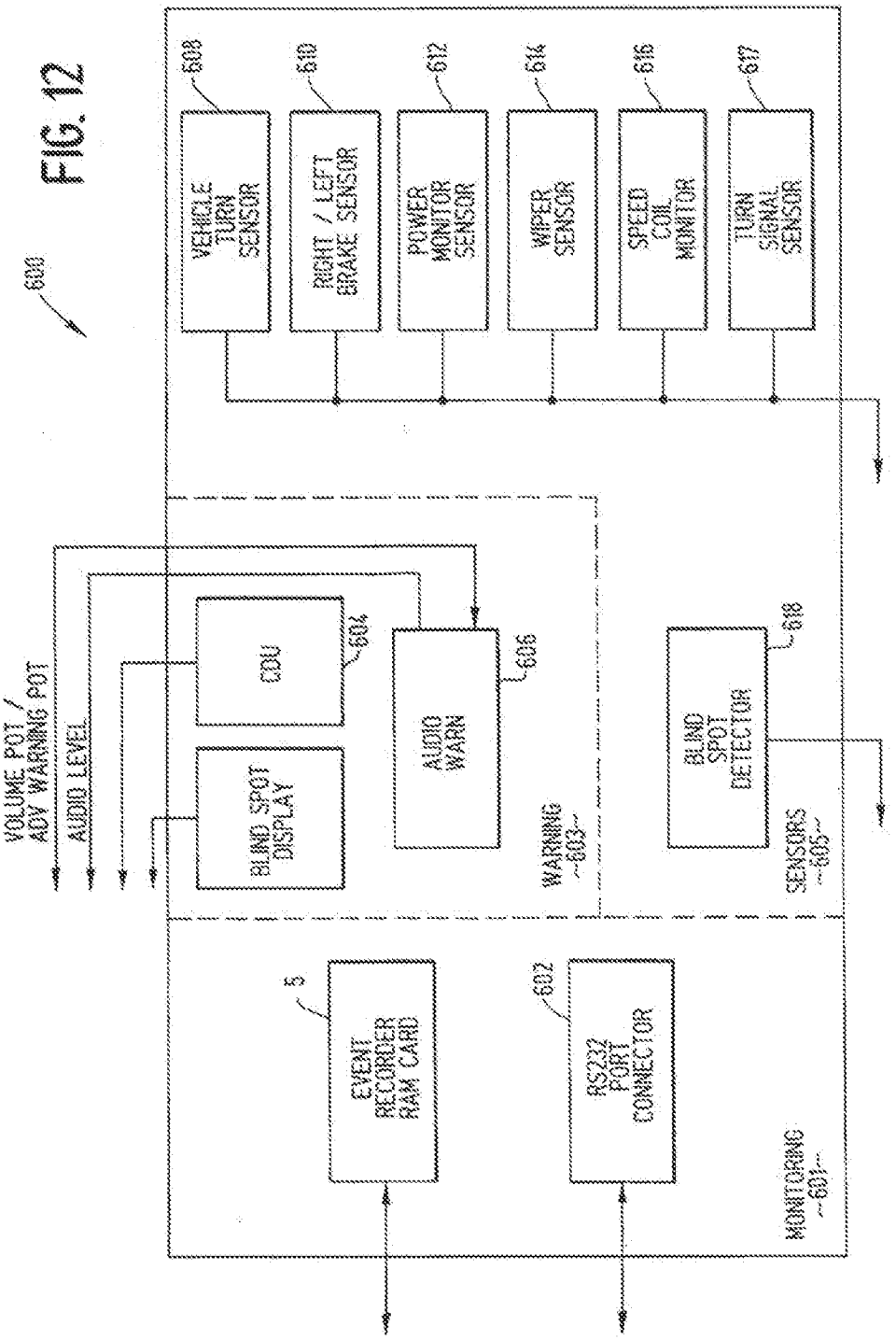


FIG. 11

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FIG. 12



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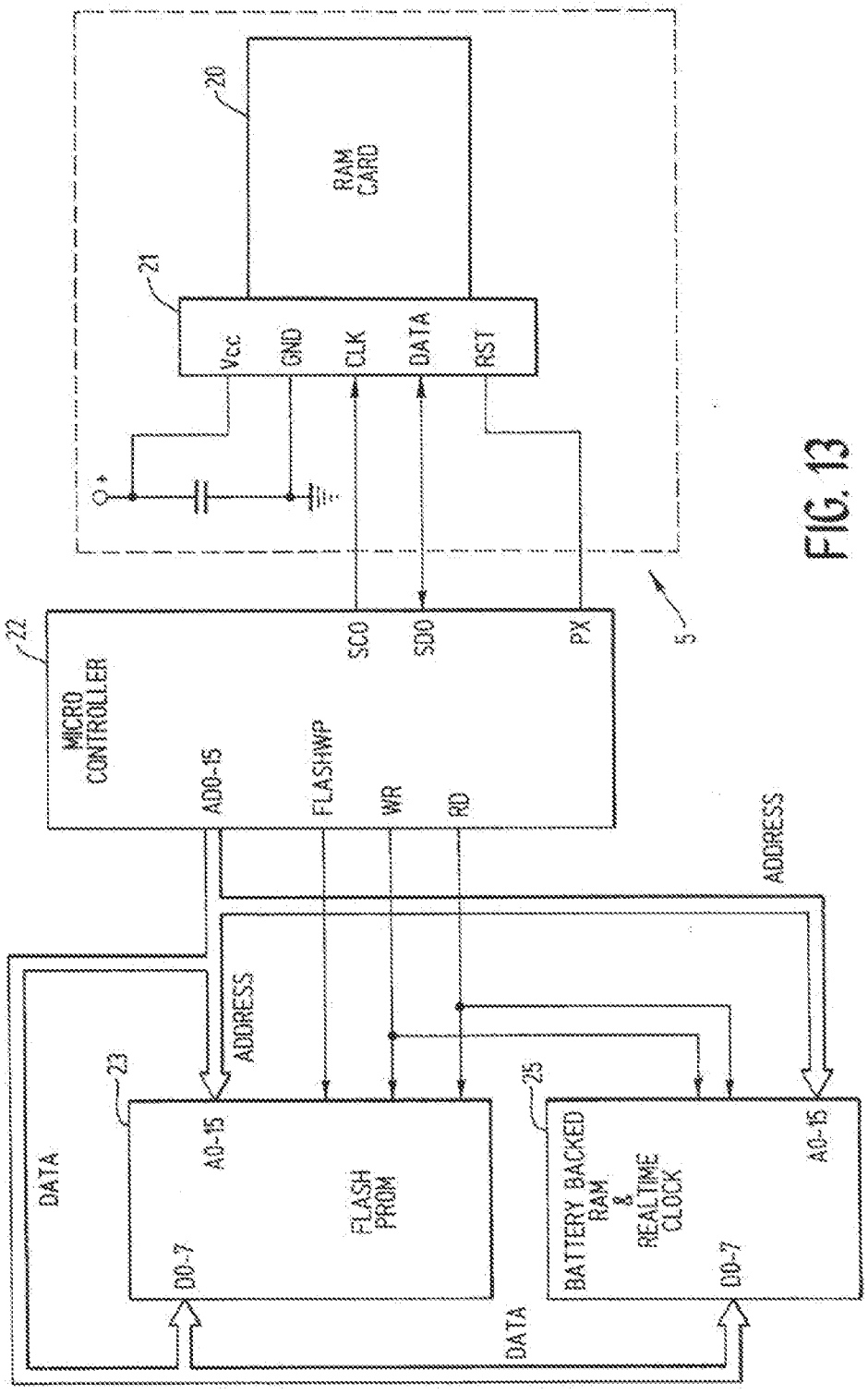


FIG. 13

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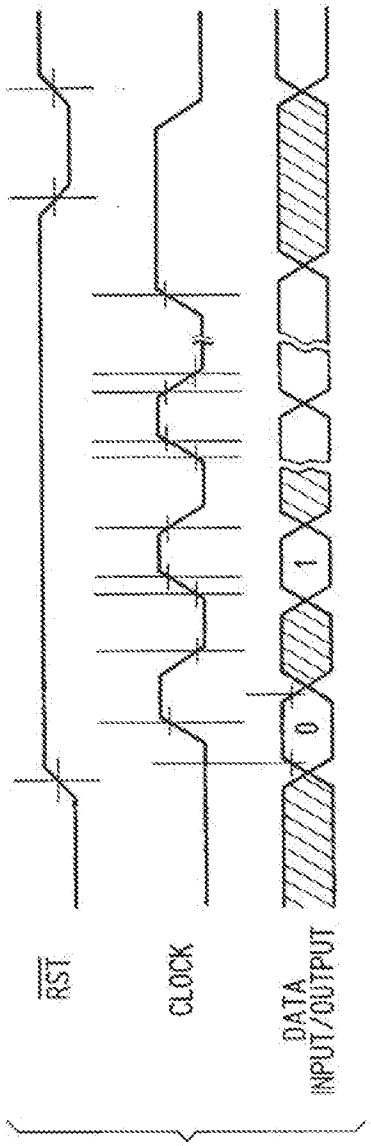


FIG. 14

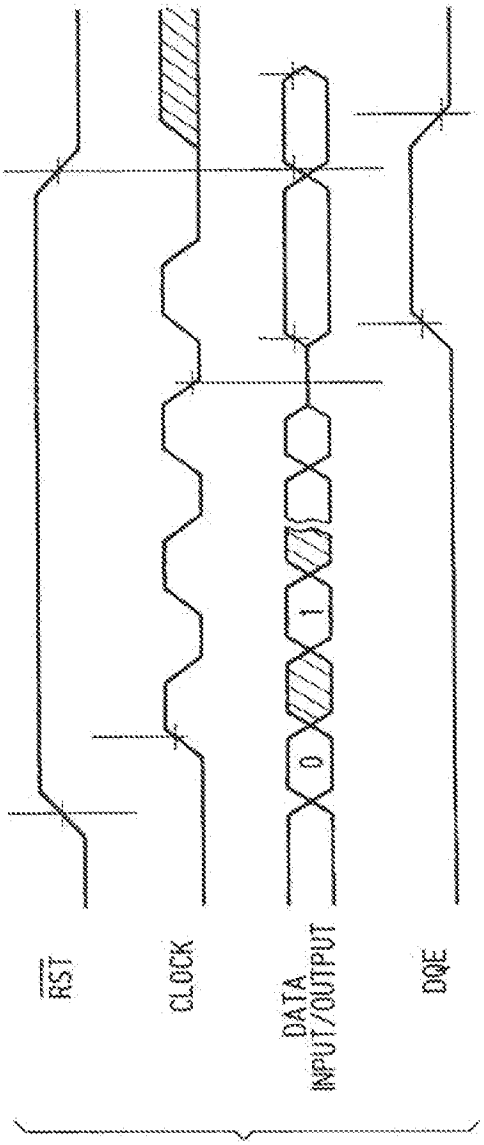


FIG. 15

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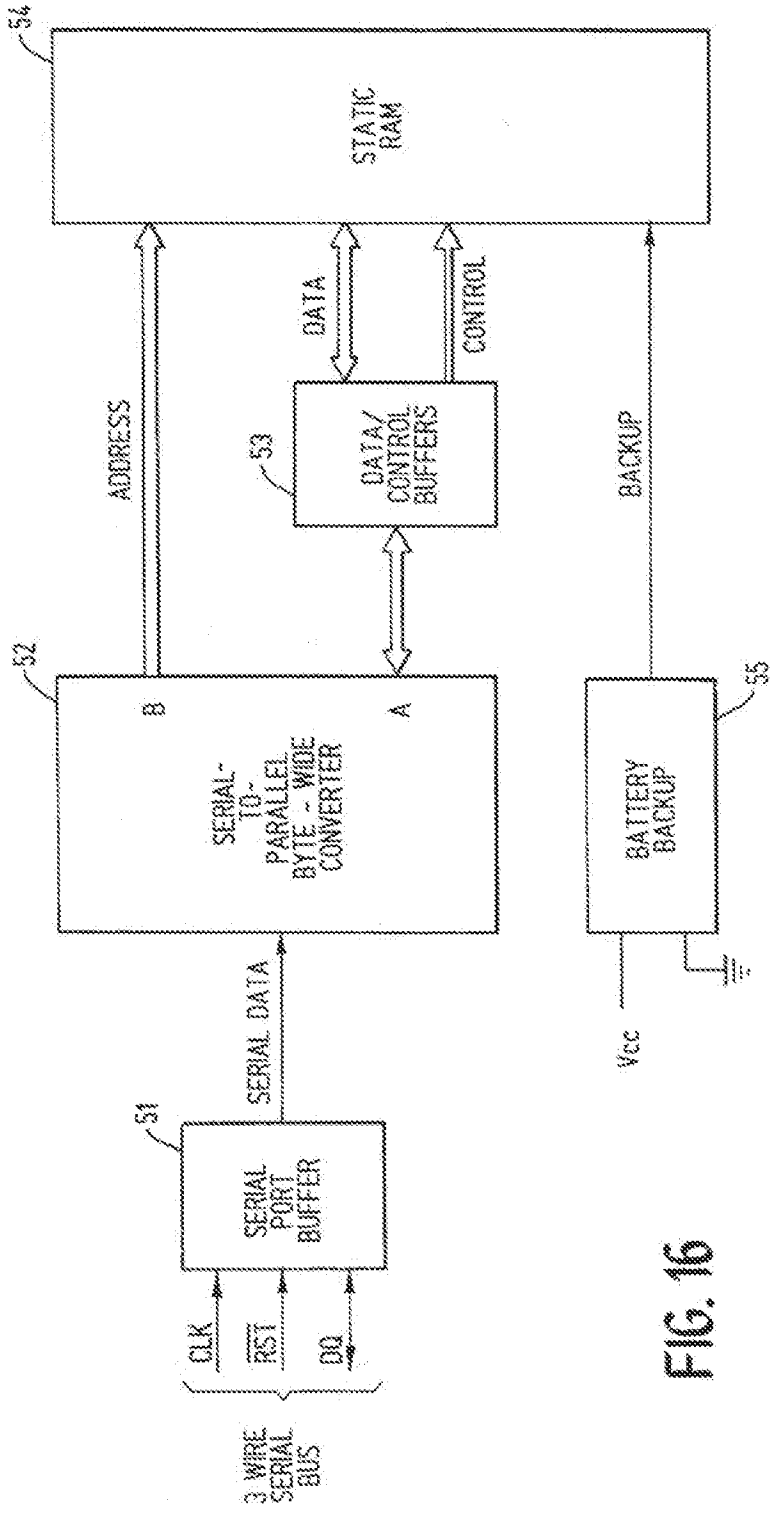


FIG. 16

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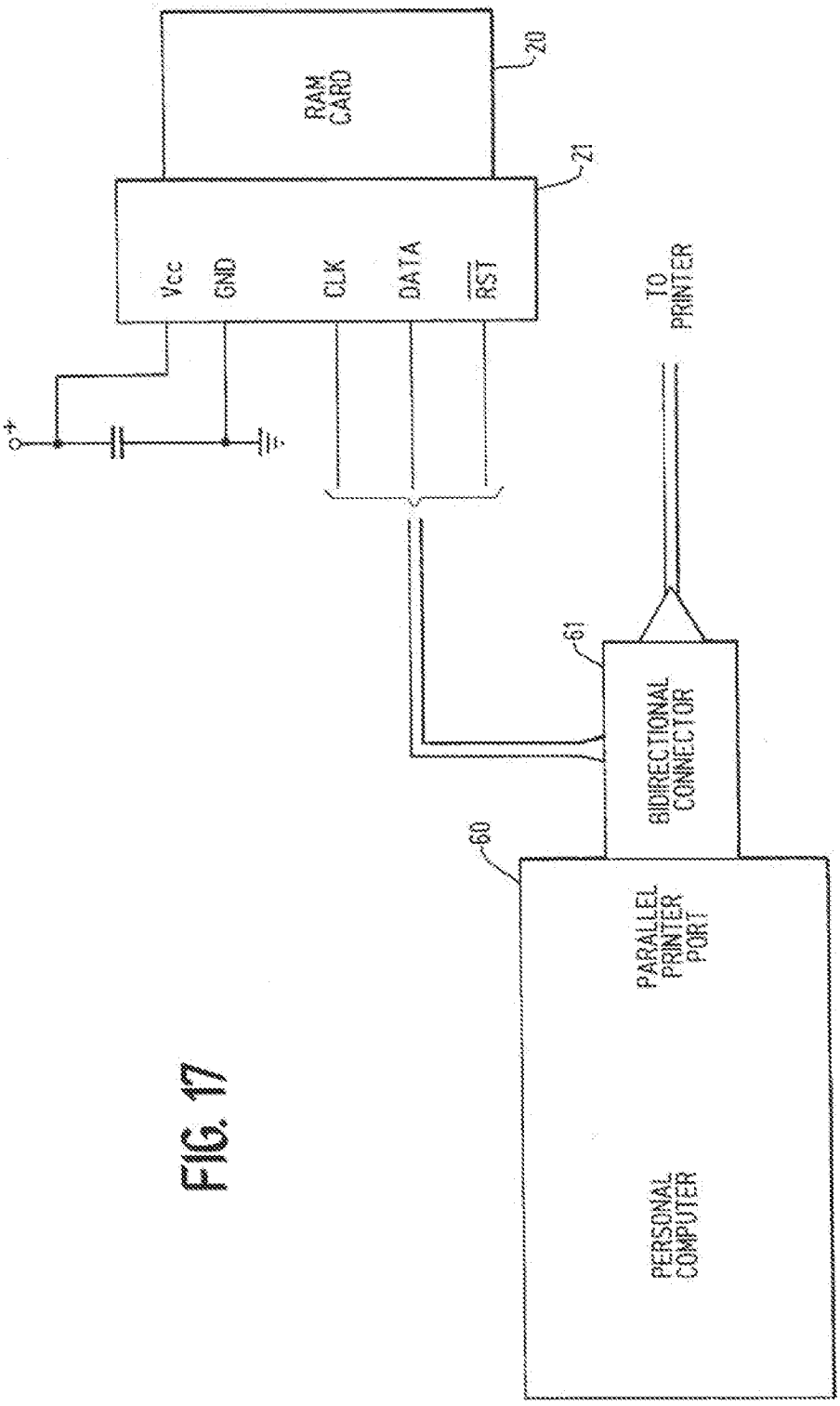


FIG. 17

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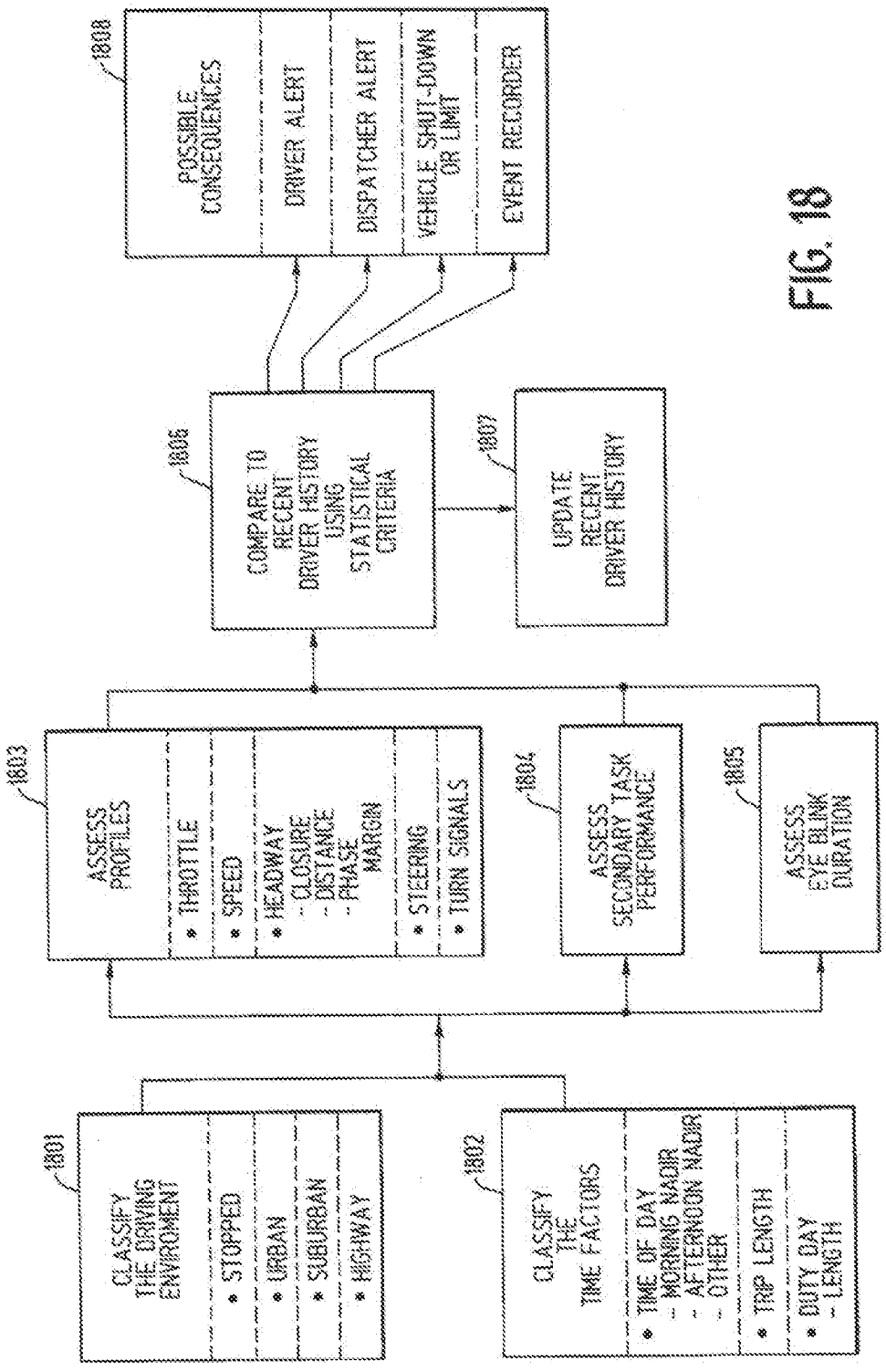
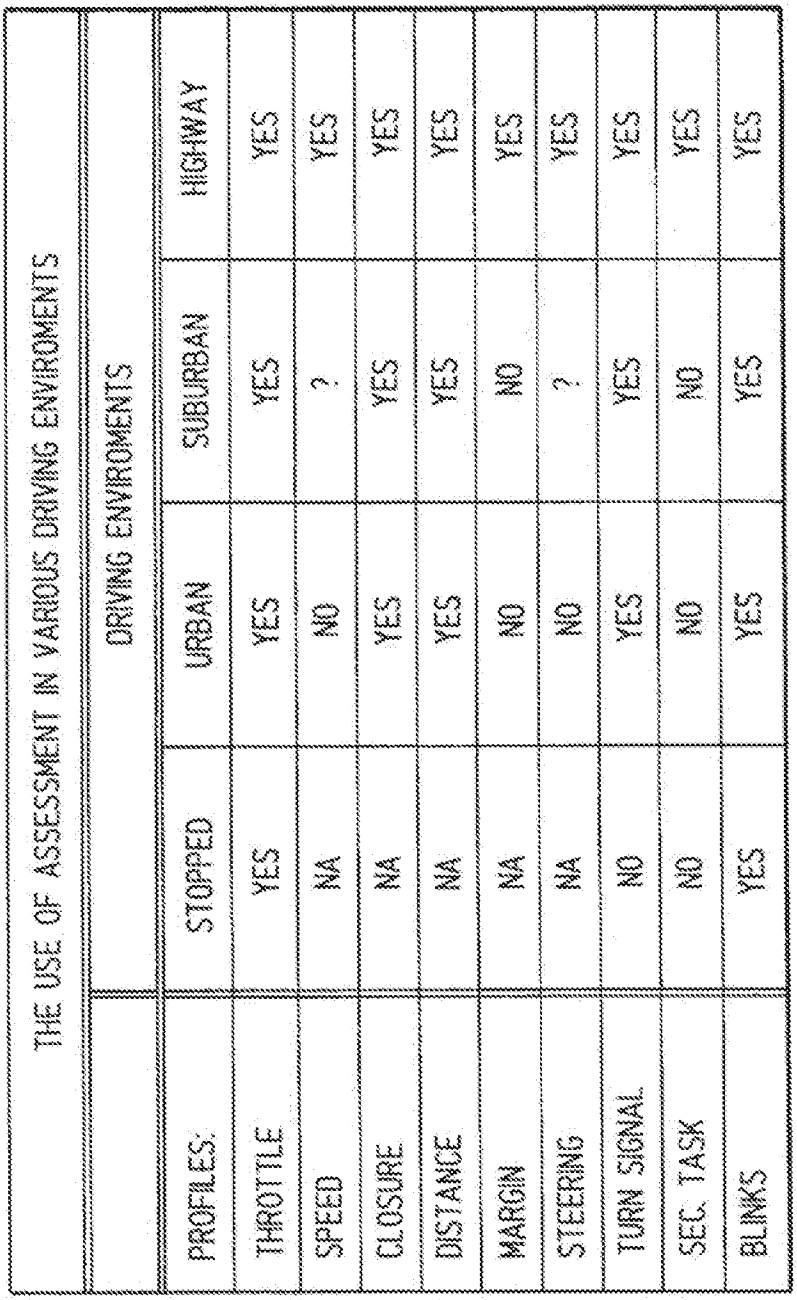


FIG. 18

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THE USE OF ASSESSMENT IN VARIOUS DRIVING ENVIROMENTS				
	DRIVING ENVIROMENTS			
PROFILES:	STOPPED	URBAN	SUBURBAN	HIGHWAY
THROTTLE	YES	YES	YES	YES
SPEED	NA	NO	?	YES
CLOSURE	NA	YES	YES	YES
DISTANCE	NA	YES	YES	YES
MARGIN	NA	NO	NO	YES
STEERING	NA	NO	?	YES
TURN SIGNAL	NO	YES	YES	YES
SEC. TASK	NO	NO	NO	YES
BLINKS	YES	YES	YES	YES

FIG. 19

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METHOD AND APPARATUS FOR DETERMINING DRIVER FITNESS IN REAL TIME

RELATED APPLICATION

This application is a continuation-in-part of (1) application Ser. No. 07/930,066 of Jimmie R. Asbury, Bryan D. Woll, and Van R. Malan, which application was filed Aug. 14, 1992 and is entitled MULTI-FREQUENCY, MULTI-TARGET VEHICULAR RADAR SYSTEM USING DIGITAL SIGNAL PROCESSING, now U.S. Pat. No. 5,302,956 and (2) application Ser. No. 07/930,158 of Jerry D. Woll, Bryan D. Woll and Van R. Malan, which was filed on Aug. 14, 1992 and is entitled RECORDING OF OPERATIONAL EVENTS IN AN AUTOMOTIVE VEHICLE, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a method and apparatus for determining whether a person is capable of performing specific tasks, and more particularly, whether a person is fit to operate a motor vehicle.

2. Description of Related Art

There is a continuing need to increase the density of vehicles traveling the world's roadways, and simultaneously to improve the safety of highway vehicle operations by preventing highway vehicles from colliding with stationary and moving objects (such as roadside obstacles and other vehicles). One means for accomplishing these seemingly contradictory goals is to monitor the relative speed, direction of travel, and distance between vehicles sharing the roadway, and to use such information to provide direct indications to the vehicle's operator of potential danger. It is becoming increasingly more common for automotive engineers to consider the use of microwave radar systems as a means to monitor and warn drivers of such environmental conditions. Another means for accomplishing these diverse goals is to ensure that the driver of each vehicle is fit to operate the vehicle for which the driver is responsible.

Whenever a person is responsible for operating a motor vehicle, it is critical that the person be capable of demonstrating basic cognitive and motor skills at a level that will assure the safe operation of the vehicle. A number of conditions can impair a person's ability to perform the basic cognitive and motor skills that are necessary for the safe operation of a motor vehicle. For example, consumption of alcohol or narcotic drugs, or lack of sleep can make it impossible for a person to react appropriately to a potentially hazardous situation with sufficient speed to avoid danger to the operator, the vehicle, and other people and property which might be in the potential zone of danger. Therefore, it is very important to continuously evaluate a driver's ability to identify an appropriate action and react under the conditions encountered while operating a motor vehicle. Such conditions can cause a driver to experience extreme boredom and fatigue. For example, a truck driver carrying a load of merchandise cross-country is likely to experience boredom and fatigue under the conditions of such a long and monotonous interstate highway trip.

A number of pre-trip tests have been developed which allow a driver's fitness to operate a motor vehicle to be evaluated before the driver enters the vehicle. In one such test, a potential driver is requested to stand or sit before a panel that simulates the dashboard of a vehicle which the potential driver is to operate. A screen, such as a cathode ray tube (CRT) screen, simulates the view the driver would have when looking out the windshield of the vehicle. A mock steering wheel, brake pedal, and accelerator pedal are monitored to detect the reactions of the potential driver to events displayed on the screen. The potential driver's reactions are evaluated to determine whether the potential driver is performing adequately to safely operate a vehicle. The problem with such a pre-trip test is that the driver is only tested at the outset of his shift and it is quite possible for his fitness to deteriorate dramatically in the hours following his pre-trip test.

In a variation of the pre-trip test described above, a potential driver enters a specially-equipped vehicle and pulls down a screen located in the sun visor. Images are displayed on the screen and the driver must react to the images using the actual vehicle controls, such as the brake pedal, the accelerator pedal, and the steering wheel. As is the case in the previously described test, the driver's performance is evaluated by comparing the drivers remeasured reactions to a predetermined standard to determine whether the driver is fit to safely operate the vehicle. Only if the potential driver performs adequately will the engine of the vehicle operate. While this test more closely approximates the conditions encountered by the driver on the road, it nonetheless is not performed under actual conditions or in real-time. Furthermore, the condition of the driver may change during the course of the trip. For example, the driver may consume alcohol or a narcotic drug, or may become sleepy after operating the vehicle for a period of time. Thus, a need exists for dynamic, continuous, real-time testing of a driver's ability to safely operate a vehicle.

Turning the reader's attention now to vehicle borne radar systems as another means for enhancing the safe operation of vehicles, a number of vehicle borne radar systems which monitor the relationship of the vehicle to other vehicles and to obstacles are known. For example, systems are known that transmit and receive at three different frequencies on a time division basis, with two of the frequencies being used to determine range, and the third being combined with one of the first two to determine closing speed and likelihood of collision, are presently known. One such system is disclosed in U.S. Pat. No. 3,952,303 to Watanabe et al., which teaches an analog radar signal processing front end.

However, analog systems such as the one disclosed in Watanabe are sensitive to temperature changes, difficult to calibrate, limited in resolution and reliability, and are require complex processing. Furthermore, such systems are dedicated to particular tasks, such as determining the range and relative rate of motion of other objects, and therefore are difficult to upgrade and customize to meet varying requirements. Still further, the transmit and receive frames in such three frequency systems can be wasteful, in that only small portions thereof are needed to determine the range and relative rate of motion of a target, with the remaining portions of the frame being unused.

Another recent example of an automotive radar system that uses analog signal processing techniques to analyze reflected radar signals is described in U.S. patent application Ser. No. 08/020,600, entitled "Multi-Frequency Automotive Radar System", and assigned to the assignee of the present invention. In that system, a transmit signal and the reflected received signal are coupled to an RF mixer. The relevant output from the RF mixer is a signal that has a frequency equal to the difference between the transmit and receive frequencies. The frequency of the reflected received signal

may be shifted from the frequency of the transmit signal upon its return due to the "Doppler" effect. The Doppler effect occurs whenever a transmitted signal reflects off a target that has a motion relative to a transceiver. The resulting frequency shift is referred to as a "Doppler shift".

The transmit signal changes at regular intervals between three frequencies spaced 250 kHz apart. Two of the frequencies are used to generate range information as described therein, while a third frequency is used to determine Doppler closing rate and target selection. After substantial analog waveform detection, amplification, shaping, and gating, the information regarding range, closing rate, and target selection of a single target can be input to a microcontroller for digital processing.

The use of analog processing techniques is fast and allows real time processing. However, the cost of analog circuitry is typically much greater than the cost of digital circuitry. In addition, digital circuitry is more reliable and capable of higher precision and more complex processing than analog circuitry. Thus, the sooner the analog signal can be converted to a digital signal and handled by digital circuitry, the lower the cost, the greater the performance, and the higher the reliability of the system. Additionally, digital signal processing circuits are much less sensitive to temperature and manufacturing variations and interference from noise than are analog signal processing circuits. Furthermore, the use of analog signal processing techniques limits the number of features that can be added to a system since each new feature typically requires all new processing hardware. In contrast, many additional features can be added to a system in which digital signal processing is used to determine range and relative motion simply by adding or modifying software. Still further, in analog systems the level of sophistication that can be achieved is limited by the available hardware and the cost of such hardware.

Furthermore, in vehicular radar systems, only a small part of the reflected signal is returned to the antenna. Thus, target detection runs from very good to non-existent, even when a strongly reflecting target is present. Improving the ability to detect targets requires sophisticated signal processing and tracking algorithms. Under many circumstances, such sophisticated signal processing is the only means by which meaningful information can be attained. Without sophisticated information processing, it may be difficult to identify and interpret the reflected signal. This requirement for sophisticated processing makes digital signal manipulation especially advantageous.

Another means by which roadways are being made more safe is by recording operational information regarding drivers and vehicles during vehicle operation. A number of electronic devices exist that record data on various aspects of vehicle performance and/or environment information. Such devices have used magnetic tape and paper strips to record such information. These devices primarily function as trip recorders, storing information such as trip distance, trip time, miles per gallon consumed, and average speed.

A drawback of such devices is that magnetic tapes and paper strips are susceptible to the detrimental effects of heat and vibration commonly found in a vehicular environment. A further drawback is that prior art vehicular recording devices have not been used in conjunction with an automotive radar system to record such information as the closing rate (CR) between the recording vehicle and other vehicles located by the vehicle's radar system, the distance (D) between the recording vehicle and other vehicles, vehicle speed (VS), and such vehicle performance and environment information as braking pressure, vehicle acceleration or deceleration in one or more dimensions, rate of turning of the vehicle, steering angle, hazard levels determined from a radar system processor, detected vehicle direction, and cruise control status, to name a few.

Further, it is believed that such automotive recording devices have not been used to record information to be used for accident reconstruction. Most commercial aircraft and some private aircraft are equipped with an event recording device commonly called a "black box". This device records pertinent data from the aircraft's major subsystems as the aircraft is operating. If an accident occurs, the "black box" generally can be retrieved from the aircraft and the recorded information extracted to determine the status of subsystems of the aircraft just before the accident. Such information is then used to reconstruct the events leading up to the accident, and can help determine the cause of the accident. Black box recording devices have proven invaluable in aircraft accident reconstruction. However, this type of technology is quite expensive, and its use has been limited to more expensive vehicles such as aircraft. In addition, it is believed that all such devices operate using a cumbersome magnetic tape to record data. These devices also tend to be larger, heavier, consume more power, and cost more than would be acceptable for automotive use.

In the area of automobile accident reconstruction, an accident analyst determines how an accident most probably occurred by measuring, among other things, the length of skid marks, the extent of vehicle and nearby property damage, and the condition of the road at the time of the accident. This method of reconstructing accidents has been shown to be expensive and inaccurate at times. Accordingly, it would be desirable for automotive vehicles to have a system that would function as an event recording "black box". Such a system should record information relating to the vehicle and the environment around the vehicle prior to an accident. Such data should be readable after an accident for use in reconstructing the events leading up to the accident. An accident could then be reconstructed using real historical data, as opposed to post-accident estimated data.

In addition to recording data useful for accident reconstruction, it would also be desirable for such a device to record more standard vehicle performance, operational status, and/or environment data. In addition, it would be desirable that such a device be configurable for a driver's particular preferences, or to provide an authorization function that prohibits unauthorized personnel from driving the vehicle, and/or to provide a convenient means for upgrading system-wide software for an automotive electronic control system or an automotive radar system.

Accordingly, there is a need for an automotive event recording system. In addition, there is a need for an automotive radar system that converts signals received into digital form before processing of those signals. Furthermore, there is a need for a simplified system in which only two frequencies are broadcast and in which a larger portion of the transmit signal is useful. The present invention provides a system which accomplishes these desired objectives.

Still further, it would be desirable to have a method and apparatus which utilizes the information that is gathered by a radar system and other sensors, and the information that has been recorded during past trips and a present trip, to evaluate a driver's performance in real-time and under actual conditions. It would also be desirable for such a system to predict when a driver is near the point of being unfit to safely operate a vehicle and determine when the

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driver is actually unfit to safely operate a vehicle.

The present invention meets these needs.

SUMMARY OF THE INVENTION

The present invention provides a method and apparatus which functions as an event recording device that can personalize a vehicle to the driver associated with that event recording device. Further, the present invention provides a method and apparatus that converts automotive radar signals into digital signals before processing those signals, and both displays the results and stores the results of the digital processor in the event recording device. Still further, the present invention provides a method and apparatus for evaluating a driver's performance under actual real-time conditions to determine the driver's ability to safely operate a vehicle, utilizing the information that is gathered by the radar system and other sensors, together with information that was previously stored in the event recording device.

The present invention operates by monitoring conditions external to a driver of a motor vehicle. Each of the conditions monitored are used to make a determination as to whether the driver is performing in conformity with normal driving standards and the driver's past performance. The driver's performance is constantly monitored and compared to that driver's past performance to determine whether the driver's present performance is impaired, and if so, whether the impairment is detrimental to the driver's ability to safely operate the vehicle. Some of the conditions are monitored by sensors which provide independent outputs. Additionally, some of the conditions are determined by a vehicular radar system.

In the preferred embodiment of the present invention, the radar system operates as a part of three distinct systems: (1) a collision warning system, (2) an operational event recording system, and (3) a driver fitness evaluation system. The three functions are distinct, but share a single radar system that provides information to all three systems, and thereby allows a substantial cost benefit to be realized when the three systems are used together. In an alternative embodiment, each system may operate completely independent of each other system.

The radar system of the preferred embodiment of the present invention includes an antenna/microwave transceiver section, a front-end electronics section, a digital electronics section, and a display and sensor section. In the preferred embodiment of the present invention, information regarding each target is output by a microcontroller that includes an audio warning unit, a control display unit, a plurality of sensors, and a digital interface to allow communications with outside devices.

The preferred embodiment of the present invention also provides a removable, externally readable, non-volatile solid-state memory event recording apparatus (ERA) that records selectable vehicle performance, operational status, and/or environment information. The ERA preferably records information useful for accident analysis and driver fitness evaluation. In the preferred embodiment of the present invention, the information that is recorded is also used to determine a baseline performance standard based on the driver's past performance against which a driver's present performance can be measured. In addition, the ERA of the preferred embodiment of the present invention can be used to store updated software for use by a system processor capable of reading data from the ERA. The ERA system is configured to store a wide variety of vehicle information gathered by sensors dispersed throughout a vehicle. The ERA can also be configured to function as a common trip recorder.

In the preferred embodiment of the present invention, each driver maintains a removable ERA that is personalized to that particular driver. Each ERA has information that identifies the driver, and a record of that driver's driving history and performance. The driver must insert the ERA before the driver may start the engine of a vehicle equipped with a system in accordance with the preferred embodiment of the present invention. A system processing unit, which in the preferred embodiment of the present invention is shared by the radar system, the ERA, and the driver fitness evaluating system, generates a profile of the driver based upon the information that is stored in the ERA.

The system processor monitors each of the external conditions and activities that are relevant to determining the fitness of the driver to operate the vehicle. In the preferred embodiment of the present invention, if driving performance is found to be below the individual standard calculated for that particular driver at any time during a trip, the driver is alerted to the fact that driving performance is not up to the calculated individual minimum standard. If the driver's performance continues to degrade (or, in an alternative embodiment, does not improve), an indication of the driver's performance is communicated to a remote site to alert a dispatcher or controller. If the driver's performance degrades still further, the vehicle ceases operating after a sufficient warning is provided to the driver that such action is imminent. Each step of the process, along with the data that is collected at each step of the process, is recorded in the ERA.

The details of the preferred embodiment of the present invention are set forth in the accompanying drawings and the description below. Once the details of the invention are known, numerous additional enhancements and changes will become obvious to one skilled in the art.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an perspective view of a vehicle in which the inventive system is installed.

FIG. 2 is a simplified block diagram of the vehicular radar system of the present invention.

FIG. 3 is an overall block diagram showing the inventive event recording apparatus being used in conjunction with an automotive radar system using digital signal processing.

FIG. 4 is a block diagram of the antenna/microwave transceiver section of the vehicular radar system of the present invention.

FIG. 5 is a block diagram of the front end electronics section of the vehicular radar system of the present invention.

FIG. 6 is a timing diagram of the frequency control voltage signal referenced to the channel 1 and channel 2 select signals.

FIG. 7 is an illustration of the envelope of the output of one channel of the signal switch of the vehicular radar system of the present invention.

FIG. 8 is a block diagram of the digital electronic section of the vehicular radar system of the preferred embodiment of the present invention.

FIG. 9 is a block diagram of the field programmable array of the vehicular radar system of the preferred embodiment of the present invention.

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FIG. **10** is a graph of the results of a fast Fourier transform (FFT) operation as performed by the digital signal processor (DSP) of the preferred embodiment of the present invention.

FIG. **11** is a high level flow chart of the method by which the DSP of the preferred embodiment determines the number of samples upon which to perform an FFT calculation.

FIG. **12** is a block diagram of the display and sensor section of the vehicular radar system of the present invention.

FIG. **13** is a block diagram of a RAM card in accordance with the present invention, shown connected to the radar system microcontroller and a non-volatile memory device.

FIG. **14** is a timing diagram of a Write cycle to a RAM card in accordance with the present invention.

FIG. **15** is a timing diagram of a Read cycle from a RAM card in accordance with the present invention.

FIG. **16** is a detailed block diagram of a RAM card in accordance with the present invention.

FIG. **17** is a block diagram of an interface between a RAM card in accordance with the present invention and a personal computer.

FIG. **18** is a flowchart of the fitness algorithm used to determine the fitness of a motor vehicle driver in accordance with the preferred embodiment of the present invention.

FIG. **19** is a table illustrating the use of assessments in the various driving environments.

Like reference numbers and designations in the various drawings refer to like elements.

DETAILED DESCRIPTION OF THE INVENTION

Throughout this description, the preferred embodiment and examples shown should be considered as exemplars, rather than as limitations on the present invention.

Overview

The present invention is a system for determining whether a driver is fit to operate a motor vehicle. The preferred embodiment of the invention operates in cooperation with an obstacle detection and collision avoidance system, and an operational event recording system. However, the inventive system may operate as a stand alone system in which information is dynamically gathered by sensors which are dedicated to the purpose of determining a driver's fitness to operate a vehicle.

FIG. **1** is a perspective view of a vehicle **100** in which the preferred embodiment of the present invention is installed. A plurality of sensors **4***a* and receiver/transmitter modules (such as the antenna/microwave transceiver **200** illustrated in FIG. **2**) are strategically located within the vehicle **100**. As depicted in FIG. **1**, one antenna/microwave transceiver **200** is located in the front of the vehicle **100** and one antenna/microwave transceiver **200** is located in the rear of the vehicle **100**. Each of the sensors **4***a* and antenna/microwave transceivers **200** are electrically coupled to a system processor **107**, as represented by connecting broken lines. In the preferred embodiment of the present invention, the system processor **107** includes a front end electronics section **300** and a digital electronics section **500** (refer to FIG. **2**). In an alternative embodiment of the present invention, each antenna/microwave transceiver **200** is associated with a front end electronics section **300** which is placed in close proximity to the associated antenna/microwave transceiver **200**.

In another alternative embodiment, transceivers **200** may also be installed on the sides of the vehicle to detect obstacles in the vehicle's "blind spot". Such a system is disclosed in U.S. patent application Ser. No. 07/936,079 assigned to the assignee of the present invention.

In the preferred embodiment of the present invention, each of the sensors **4***a* independently collect information about the environment in which the vehicle is operating, or the condition or operation of the vehicle.

FIG. **2** is a high level block diagram of the radar system of the preferred embodiment of the invention. The system **1000** detects objects (targets) in the environment surrounding the system **1000**, determines the range and relative motion of each target with respect to the system **1000**, and alerts the automotive operator of potential hazards that could result from the presence or motion of such targets.

The antenna/microwave transceiver section **200** of the system **1000** transmits and receives Radio Frequency (RF) signals. The received signals are compared to the transmitted signals. A difference signal is generated having a frequency equal to the difference between the frequency of the transmit and the receive signal. The difference signal is coupled to the front end electronics section **300**. The front end electronics section **300** digitizes the difference signal. The digitized difference signal is coupled to the digital electronics section **500** which determines the range and relative motion of each target. The digital electronics section **500** is coupled to an input/output module, such as a display and sensor section **600**. The display and sensor section **600** has a plurality of sensors that indicate to the system the status of various vehicle controls. The display and sensor section **600** also produces audio and visual indications for presentation to the automotive operator. In the present invention the radar system is capable of determining the rate at which a target is approaching or retreating, and distance to a plurality of different targets. In an alternative embodiment of the present invention, the radar system may be capable of determining the spacial relationship of the vehicle to the roadway (i.e., whether the vehicle is centered within an appropriate travel lane and whether the roadway is straight or curved and the radius of curvature).

A removable, externally readable, non-volatile solid-state memory event recording apparatus (ERA) **5** is coupled to the system processor **107**. The ERA records the output of each of the sensors and information about targets detected by the radar system.

FIG. **3** is an overall block diagram showing the inventive ERA **5** being used in conjunction with an automotive radar system using digital signal processing. Such a system is described in greater detail in co-pending U.S. patent application Ser. No. 07/936,066, entitled MULTI-FREQUENCY, MULTI-TARGET AUTOMOTIVE RADAR SYSTEM USING DIGITAL SIGNAL PROCESSING, of which this application is a continuation-in-part, and which is assigned to the assignee of the present invention. This radar system is referenced by way of example. However, the invention could be readily adapted to be used in conjunction with other automotive radar systems known in the art, such as the systems described in U.S. Pat. No. 4,673,937, entitled AUTOMOTIVE COLLISION AVOIDANCE AND/OR AIR BAG DEPLOYMENT RADAR, and U.S. Pat. No. 4,916,450, entitled RADAR SYSTEM FOR HEADWAY CONTROL OF A VEHICLE, both of which are assigned to the assignee of the present invention.

Using the present ERA invention in conjunction with such

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a radar system allows recording of important data relating to obstacles in the path of the vehicle that were detected by the radar system. This type of information is particularly useful in accident reconstruction and in determining a driver's ability to safely operate a vehicle.

Referring to FIG. 3, a antenna/microwave transceiver **200** transmits a radar signal from a radar transmitter *1a* via a radar antenna **210**, and receives reflected Doppler shifted radar echoes in a receiver *1c* through the antenna **210**. A comm module (such as the front end electronics section **300** of FIG. 2) coupled to the antenna/microwave transceiver **200** contains a modulation and timing circuit *2a* that controls the transmission of the radar signal, and an A/D converter **310** for converting the received echo signal into a digital data stream. A signal processing module (such as the digital electronics section **500** of FIG. 2) includes a digital signal processor (DSP) **508**, a microcontroller **510**, and a field programmable gate array **504**, configured to control the flow of digital radar data to the DSP **508** under the control of the microcontroller **510**. The digital electronics section **500** is also coupled to the display and sensor section **600**.

The display and sensor section **600** which provides information from a variety of vehicle sensors *4a* to the microcontroller **510** for use in calculating the hazard level presented by targets indicated from the received radar signal and/or to indicate the operational status and environment of the vehicle. Commonly known sensors may be used, for example, to measure distance travelled, vehicle speed (momentary and average), fuel consumption, fuel remaining, direction of travel, engine temperature, oil pressure, engine RPM, oil temperature, transmission fluid temperature, coolant temperature, engine timing and other values relating to the environment or performance of the vehicle. The digital electronics section **500** itself generates information from the transmitted and received radar signal, such as the closing rate (CR) of a target with respect to the vehicle, the distance (D) of various targets, and the direction of movement (towards or away from) of the targets with respect to the vehicle. Additional information can be obtained by providing other sensors, such as a brake pedal pressure sensor, brake hydraulic line pressure sensor, tire pressure, accelerometer sensors (for example, fore and aft acceleration/deceleration, and/or left and right (yaw) acceleration of the vehicle), turning rate, turn angle, and/or impact sensors (such as the type used to trigger vehicle air bags), windshield wiper status (to determine if it is raining), fog light status, outside temperature, defroster status, and geographic positioning information. Recording some or all of this data or similar relevant data would make accident reconstruction more reliable and less expensive.

The display and sensor section **600** also has a display and/or actuators *4b*, for displaying indications to a user and/or controlling various aspects of vehicle operation (for example, flashing a dashboard warning light to a user if a vehicle is approaching too rapidly, and/or, in extreme conditions, automatically activating the vehicle brakes and/or air bag or disabling a vehicle from unauthorized or unfit drivers).

By selecting appropriate outputs from the sensors and radar system which have been recorded in the ERA, (which may include the outputs recorded during past and present trips) a profile of the driver is formed. The driver's performance over a recent period of time is compared to a standard derived from the personal profile calculated using the driver's past performance. The results of the comparison are used to determine the driver's current fitness to operate a vehicle. In the preferred embodiment of the present invention, if the driver's performance at any time during a trip is found to be below the personal standard calculated for that driver, the driver is alerted that driving performance is not up to the driver's personal standard. In the preferred embodiment of the invention, if the driver's performance continues to degrade (or, in an alternative embodiment, does not improve), an indication of the driver's performance is communicated to a remote site to alert a dispatcher or controller. In the preferred embodiment of the invention, if the driver's performance degrades still further, the vehicle ceases operating after a sufficient warning is provided to the driver that such action is imminent. Each step of the process, along with the data that is collected at each step of the process, is recorded in the ERA.

Sensors

The present invention includes a plurality of sensors for sensing a wide range of operational conditions and environmental conditions. Commonly known sensors may be used, for example, the preferred embodiment of the present invention has a mechanical speedometer coupled to the drive train of the vehicle in known fashion. A steering wheel position sensor using a dual Hall-effect device senses the location of a magnetic located on the steering wheel shaft. (Further details regarding the means for determining the position and motion of the steering wheel are disclosed below). A tachometer coupled to the engine in known fashion senses the number of revolutions per minute of the engine. A pressure gauge senses the engine oil pressure. A thermometer senses the temperature of the engine oil and/or engine block. A thermometer senses the temperature of the transmission fluid (if the vehicle uses any such fluid). A thermometer senses the temperature of the engine coolant. Accelerometers sense the rate of lateral acceleration in the direction of forward motion and at right angles to the direction of forward motion. Inclinometers sense the attitude of the vehicle with respect to the gravitational field of the earth. An anti-lock braking system, as is known, is provided and a sensor detects activation of this system. Pressure sensors are placed on the accelerator and brake pedals to sense the amount of pressure being applied to each pedal. A vehicle turn signal sensor senses which, of either the right or left vehicle turn signals, is active. An external thermometer senses the temperature outside the vehicle. A sensor is also provided which senses when the windshield wipers are active. This list of sensors is not intended to be exhaustive, nor are these particular sensors important in every instance. It should therefore be understood that the number and type of sensors provided in the present invention is not of particular importance. The important aspect of the present invention is the ability to determine the operational conditions under which the driver and vehicle are operating.

The digital electronics section **500** generates information from the transmitted and received radar signal, such as the closing rate (CR) of a target with respect to the vehicle, the distance (D) of various targets, and the direction of movement (towards or away from) of the targets with respect to the vehicle. Additional information can be obtained by providing other sensors, such as a brake pedal pressure sensor, brake hydraulic line pressure sensor, tire pressure, accelerometer sensors (for example, fore and aft acceleration/deceleration, and/or left and right (yaw) acceleration of the vehicle), turning rate, turn angle, and/or impact sensors (such as the type used to trigger vehicle air bags), windshield wiper status (to determine if it is raining), fog light status, defroster status, turn signal status, anti-skid brake system

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(ABS) status and performance, and geographic positioning information.

Referring to FIG. 3, the display and sensor section **600** provides information from the vehicle sensors **4a** to the microcontroller **510** for use in calculating the hazard level presented by targets indicated from the received radar signal. In the preferred embodiment of the present invention, each of the sensors are coupled to the system processor **107** which controls both the obstacle detection and collision avoidance system, and the operational event recording system. In the preferred embodiment of the present invention, the sensors are sampled or "polled" in known fashion. However, any means for reading the sensors is within the scope of the present invention. For example, the sensors may cause an interrupt to the microcontroller **510** within the digital electronics section **500** of the system processor **107** at intervals. When the microcontroller **510** recognizes the interrupt, the microcontroller **510** reads the output of the sensor **4a** that is responsible for generating the interrupt. Furthermore, it is within the scope of the present invention to include a discrete processor that is dedicated to monitoring each of the sensors and storing the output of each in the ERA. Recording some or all of the data collected from each of the sensors would make accident reconstruction more reliable and less expensive.

Radar System

In addition to the information that is gathered by the sensors **4a**, information is also gathered by the radar system of the preferred embodiment of the present invention.

1. Antenna/microwave transceiver section

FIG. **4** shows the antenna/microwave transceiver **200** in greater detail. The transceiver **200** is relatively conventional, and includes an oscillator **202**, such as a Gunn diode used in the preferred embodiment of the present invention, a directional coupler **204**, a receive directional coupler **206**, a Schottky diode mixer **208**, an antenna **210**, and an RF load **212**. The Gunn diode **202** produces a transmit signal. The frequency of the transmit signal varies as a function of a frequency control voltage signal **406** coupled to the Gunn diode **202** from the front end electronics section **300** on a frequency control voltage signal line **214** (see the timing diagram of FIG. **6**). The voltage level that is presented to the Gunn diode **202** on the frequency control voltage signal line **214** alternates between two voltage levels, thereby causing the transmit frequency to alternate between two frequencies. In the preferred embodiment of the present invention, these two frequencies are approximately 24.125 GHz and 24.125250 GHz. The lower of these frequencies is hereafter referred to as the channel 1 frequency, and the higher frequency as the channel 2 frequency. The channel 1 and channel 2 frequencies are spaced approximately 250 kHz apart in the illustrated embodiment.

The transmit signal is coupled through the transmit directional coupler **204** to the antenna **210** via the receive directional coupler **206**. The directional coupler **204** reduces the power of the transmit signal and isolates the Gunn diode **202** from received signals. The output power may be reduced to comply with current Federal Communication Commission regulations. An RF load **212** may be used to absorb excess power that is coupled away from the antenna **210**. The receive directional coupler **206** couples signals received by the antenna **210** to the mixer **208** and further isolates the Gunn diode **202** from the received signals. In addition, the receive coupler **206** couples a portion of the transmit signal to the mixer **208**. The mixer **208** produces an output that has frequencies equal to the difference between the frequency of the transmit signal and the frequencies of the received signals, i.e., the RF mixer **208** "down converts" the received signals. (It should be understood that the receive signal may at times have a lower frequency than the transmit signal. Throughout this document the phrase "down convert the received signals" is applied to this case as well as to the case in which the received signals have a greater frequency than the transmit signal). Other frequencies are also produced by the mixer **208**. However, these other frequencies are not of interest and are filtered out at various points within the system, as discussed below.

When a target is present, the target reflects some of the transmitted signal back into the transceiver antenna **210**. Targets that move at different speeds generate different reflected frequencies. For example, the frequency of an RF signal increases when reflected off an approaching target, and decreases when reflected off a retreating target. The frequency change is due to the well-known Doppler shift phenomenon. Therefore, the output of the mixer **208** is, in many cases, the difference between the frequencies of the transmitted signal, and a summation of reflections of the transmitted signal, each Doppler shifted by a different amount and a variety of other signals received signals generated by sources other than the present invention and having various frequencies.

2. Front end electronics section

The output of the mixer **208** is coupled to the front end electronics section **300**. The front end electronics section **300** is shown in greater detail in FIG. **5**. The front end electronics section **300** includes a preamplifier (preamp) **302**, a channel 1 signal switch **304a**, a channel 2 signal switch **304b**, a channel 1 low pass filter **306**, a channel 1 audio amplifier **307**, a channel 2 low pass filter **308**, a channel 2 audio amplifier **309**, an analog to digital converter (A/D) **310**, a BIT (Built-In-Test) signal generator **311**, timing generator circuit **312**, a clock circuit **314**, a frequency control voltage generator **316**, and various line drivers and receivers **320**, **322**, **324**.

The output of the mixer **208** is coupled to the input of the preamp **302** within the front end electronics section **300**. The preamp **302** amplifies the signal coupled from the mixer **208**. The signal that is presented to the preamp **302** is a composite of the various signals that are received and mixed with the transmit frequency. Typically, when the transmit frequency is transmitted, a plurality of targets reflect some of the signal back to the antenna **210**. Some of those targets may be stationary with respect to the antenna **210**, while others may have a relative motion with respect to the antenna **210**. By virtue of the Doppler shift that occurs when a radio wave is reflected off a target in motion relative to the transmitter or receiver, the frequency difference between the transmit frequency and the receive frequency can be used to determine the relative speed of the target and to distinguish one target from another, assuming there is a difference in the relative speed of the targets.

A target with a relative speed of 100 miles per hour with respect to the transmitter causes the frequency of the receive signal with respect to the transmit signal to shift by approximately 7.2 kHz. The frequencies that are of interest in the preferred embodiment of the present invention are those frequencies that are within the frequency range of about 0 to 7.2 kHz. Since the received signal is a composite of a signals reflected off a number of targets, the receive signal typically will not be a single sinusoid. Of course, higher frequencies could be used.

The strength of the transmitted signal is such that most targets of interest are detected at ranges up to about 1600

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feet. The speed at which radio frequency waves propagate through free space is approximately 1 ft/ns. Therefore, at a distance of 1600 feet, there is a round-trip signal delay of about 3.2 μS. Hence, when a received signal is reflected off a target at a distance, the output of the mixer **208** has a frequency of 250 kHz, plus or minus the Doppler frequency, for the amount of time that it takes the transmit signal to reach the target and reflect back to the transceiver (i.e., 3.2 μS for a range of 1600 feet) immediately after the transmit frequency changes from the channel 1 frequency to the channel 2 frequency, and vice versa.

The output of the preamp **302** is coupled to both the signal switches **304***a*, **304***b*. The signal switches **304***a* and **304***b* time demultiplex the signal from the preamp **302** by coupling the preamp **302** to either the channel 1 audio amplifier **307** and low pass filter **306**, or the channel 2 audio amplifier **309** and low pass filter **308**, alternatively. Additionally, each signal switch couples the input of the associated filter **306**, **308** to a circuit **305***a*, **305***b* having an output impedance equal to the output impedance of the preamp **302** (and the input impedance of each filter **306**, **308**). Thus, a constant source impedance is seen by the filters **306**, **308**. By ensuring that the source impedance to each filter remains constant, the filters remain linear and so the power of the intermodulation products of the Doppler frequencies of multiple targets created by the nonlinearity of the filters are held to a minimum (and ideally, eliminated). Such intermodulation products, when created, appear as "phantom" targets.

Paired switch timing control signals **402**, **404**, coupled to respective paired signal switches **304***a*, **304***b* from timing generator circuit **312** on switch timing control lines **318**, determine to which filter **306**, **308** the preamp **302** output is to be coupled, and the timing of such coupling. FIG. **6** is a timing diagram showing the timing of the switch timing control signals **402**, **404** with respect to the frequency control voltage signal **406** coupled to the Gunn diode **202** on the frequency control voltage signal line **214**. In the preferred embodiment of the present invention, the frequency control voltage signal **406** alternates between a relatively high voltage and a relatively low voltage at intervals of 7.8 μS. One period of the frequency control voltage signal **406** is equal to 15.6 μS. Therefore, the output frequency of the Gunn diode **202** alternates between a relatively low frequency (the channel 1 frequency) and a relatively high frequency (the channel 2 frequency) at intervals of 7.8 μS as a function of the frequency control voltage.

The switch timing control signal on switch timing control line **318** includes a channel 1 select signal **402** and a channel 2 select signal **404**. The channel 1 select signal **402** in the high state causes the preamp **302** output to be coupled to the channel 1 low pass filter **306** through the signal switch **304**. The channel 2 select signal **404** in the high state causes the preamp **302** output to be coupled to the channel 2 low pass filter **308** through the signal switch **304**. The signal switch **304** is synchronized to the frequency control voltage signal **406** by the timing generator circuit **312**. Therefore, in the preferred embodiment of the present invention, the signal switch **304** connects the preamp **302** to the channel 1 low pass filter **306** for approximately one-fifth of a period (3.12 μS), synchronized to the time when the transmit signal is at the channel 1 frequency. The signal switch **304** also connects the preamp **302** to the channel 2 low pass filter **308** for approximately one-fifth of a period (3.12 μS), synchronized to the time when the transmit signal is at the channel 2 frequency. Hence, the signal switch **304** time demultiplexes the down converted channel 1 and channel 2 signals. Alternative embodiments, in which the length of the channel 1 and channel 2 select signal **402**, **404** pulses are longer or shorter, are within the scope of the present invention.

The timing diagram of FIG. **6** shows the channel 1 select signal **402** pulses and the channel 2 select signal **404** pulses offset from the respective edges of the frequency control signal **406** to allow the transmit signal time to stabilize and/or to ensure that the receive and the transmit signal are at the same carrier frequency (i.e., both the receive and transmit signals are at either the channel 1 or channel 2 frequency) at the time the channel 1 and channel 2 select signals **402**, **404** are active. However, it should be understood that in alternative embodiments of the present invention, these signals **402**, **404** may occur anywhere at or between the rising edge and the falling edge of the frequency control voltage signal **406**.

In the preferred embodiment of the present invention, each filter **306**, **308** has a 3 dB cutoff frequency of 24 kHz. The filters **306**, **308** reconstruct the output of the signal switch **304** by acting as an envelope detector. The channel 1 low pass filter **306** reconstructs (or "smooths") the time demultiplexed down converted channel 1 signal and the channel 2 low pass filter **308** reconstructs the time demultiplexed down converted channel 2 signal, as shown for one channel in FIG. **7**. The composite of the samples **702** taken by the signal switch **304** under the control of the channel 1 select signal **402** and the channel 2 select signal **404** creates an envelope **704** for each channel that is essentially below the 3 dB cutoff frequency of the low pass filters **306**, **308**. Therefore, the output of each filter is a smooth signal with frequency components equal to the difference between the frequency of the transmit signal corresponding to the channel associated with the filter and the frequency of each signal received during the time that channel is transmitted. For example, the channel 1 low pass filter **306** outputs a smooth signal with a frequency equal to the difference between the channel 1 transmit frequency and the channel 1 receive frequencies reflected from a multitude of targets as if the channel 1 transmit frequency were transmitted in a continuous wave fashion.

The outputs of each filter **306**, **308** are coupled to the A/D converter **310**. The A/D converter **310** includes two discrete channels corresponding to front-end signal channels 1 and 2. Each channel of the A/D converter **310** converts the analog inputs from the corresponding down-converted frequency channel into a stream of digital data words. A digital low pass filter **328** within the A/D converter **310** filters each channel, and a multiplexer **330** within the A/D converter **310** time multiplexes the digital data words from each of the A/D converter channels (i.e., channel 1 and channel 2 digital data words are interleaved). The low pass filters **328** within the A/D converter **310** have a 3 dB cutoff frequency of approximately 7.5 kHz. These filters **328**, in conjunction with low pass filters **306**, **308**, ensure that the Nyquist criteria is satisfied with respect to the sample frequency, thereby preventing aliasing when the FFT operation is performed (i.e., the effective sampling frequency from the A/D converter **310** should exceed twice the frequency of the doppler frequency of interest).

The A/D converter **310** of the preferred embodiment of the present invention is an oversampling analog to digital converter. The output from the A/D converter **310** is a series of 32 bits data words. The first 16 bits represent the amplitude of the analog signal sampled at a particular time (i.e., 16 bit resolution). Bits **17** through **19** indicate whether the A/D converter **310** is near saturation. Bits **20** through the **31** indicate whether the word is associated with channel 1 or channel 2. Knowledge of the proximity of the A/D converter

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310 to saturation aids in compensating for any signal distortion that might occur as the A/D converter 310 approaches saturation. Such compensation may be performed in a number of ways that are well known in the art of digital signal processing, such as using automatic gain control corresponding to each value represented by the last three bits of the A/D converter 310 output. In alternative embodiments of the present invention, the output of the A/D converter 310 is merely the digital representation of the input plus one bit that represents the channel of the A/D converter 310. The A/D converter 310 output in such alternative embodiments may have fewer or more than 16 bits of resolution.

The Timing generator circuit 312 determines the sample rate of the A/D converter 310. In the preferred embodiment of the present invention, the A/D converter 310 has a sample frequency of about 1 MHz, as determined by a timing clock signal coupled from the timing generator circuit 312 to the A/D converter 310 on a timing clock line 326. The A/D converter 310 of the preferred embodiment of the present invention oversamples by 64×, and thus has an equivalent sample rate equal to (1Mz) MHz=16 kHz. In an alternative embodiment of the present invention, the sample rate can be changed dynamically.

The preferred embodiment of the present invention has a real-time Built-In-Test (BIT) capability which verifies the proper operation of the system. The BIT signal generator circuit 313 creates a BIT signal upon receiving a command from the timing generator circuit 312. The BIT signal is coupled to the preamp 302 and simulates a signal from the mixer 208. When the BIT signal is injected into the preamp 302, it is summed with the output of the mixer 208. Therefore, the ongoing operations need not be interrupted. In the preferred embodiment of the present invention, the microcontroller 510 (shown in FIG. 8) determines which frequency is to be injected into the preamp 302. The determination is made based upon the absence of other targets. Therefore, normal operation of the system is not impeded by the BIT function. The BIT signal injected into the preamp 302 propagates through the system along with the output of the mixer 208. The microcontroller compares the range and relative motion expected by the microcontroller 510 for the BIT signal with the values of range and relative motion that actually result after the BIT signal propagates through the front-end electronics. Thus, a high degree of certainty that each component in the front end electronics section 300 and the digital electronics section 500 are operating properly can be had.

The timing generator circuit 312 of the preferred embodiment of the present invention also generates a calibrate signal which is coupled to the A/D converter 310. The calibrate signal initiates a calibrate function within the A/D converter 310 which calibrates the A/D converter 310 for selected offsets. Offset calibration of the A/D converter 310 is performed periodically to ensure the accuracy of the conversion. Calibration functions, such as the calibration function of the preferred embodiment of the present invention, are standard features of many A/D converters, such as the CS5336 A/D converter manufactured by Crystal Semiconductor and used in the preferred embodiment of the present invention.

3. Digital electronics section

The digital output of the A/D converter 310 is coupled to a signal line driver/receiver 320. The line driver/receiver 320 couples the digital signal to the digital electronics section 500. The digital electronics section 500 is shown in greater detail in FIG. 8. A signal line driver/receiver 502 receives the digital output of the A/D converter 310. The signal line driver/receiver 502 is coupled to a field programmable gate array (FPGA) 504, such as a 3042PC84-70 FPGA manufactured by Xilinx. The FPGA 504 accepts the digital data sent from the A/D converter 310 and stores the data in a high-speed random-access-memory 506 (RAM).

The digital data sent from the A/D converter 310 is sent as a synchronous serial data stream to the FPGA 504. A frame synchronization (frame sync) signal and a serial clock (bit sync) signal are generated by the timing generator circuit 312 and transmitted to the FPGA 504 from the front end electronics section 300. The frame sync and serial clock signals are coupled from the timing generator circuit 312 to line drivers 322, 324. The line drivers 322, 324 of the front end section 300 are coupled to line receivers 516, 518, respectively, in the digital electronics section 500. From the line receivers 516, 518, the frame sync and serial clock signals are coupled to the FPGA 504. The frame sync signal identifies the beginning of each digital data word transmitted from the A/D converter 310 to the FPGA 504, and the serial clock signal synchronizes each bit of each digital data word from the A/D converter 310 to the input circuit of the FPGA 504. The generation and use of frame synchronization and serial clock signals to communicate synchronous digital data is well known in the art.

FIG. 9 is a detailed block diagram of the FPGA 504. In the preferred embodiment of the present invention, a direct memory access controller 555 (DMAC), a counter and synchronizer 558, a serial link synchronizer 562, a front end electronics interface 560, a microcontroller interface 566, an up/down counter 564, a serial to parallel conversion buffer 556, an analog-to-digital data-scaling monitor 554, a blind spot sensor interface, and an FFT overflow monitor 557 are implemented in the FPGA 504. The serial to parallel conversion buffer 556 receives the stream of serial data words from the A/D converter 310 along with the frame synchronization and serial clock signals. The counter and synchronizer circuit 558 counts the number of bits being received by the parallel to serial conversion buffer 556 and couples the serial clock signal to the serial to parallel conversion buffer 556. The serial to parallel conversion buffer 556 converts the serial stream to a parallel format. Each data word sent from the A/D converter 310 includes 32 bits, 16 of which represent the amplitude of the samples taken during a particular sample period. The 16 amplitude bits, together with 8 bits set to a known value, such as zero in the preferred embodiment of the present invention, form a 24 bit parallel word.

The FPGA 504 is coupled to a Digital Signal Processor 508 (DSP), such as model DSP56001 manufactured by Motorola Incorporated. The DSP 508 is coupled to a clock 514 that determines the speed at which the DSP 508 operates. The DSP 508 of the preferred embodiment of the present invention operates at approximately 26 MHz. When a complete 32 bit word has been received from the A/D converter 310, the DMAC 555 initiates a DMA (direct memory access) cycle by asserting a bus-request signal to the DSP 508. When this signal is asserted, the DSP 508 releases a bus 509 shared by the FPGA 504, DSP 508, and the RAM 506. When the DSP 508 is off the bus 509, the DSP 508 asserts a bus-grant signal to the DMAC 555, indicating that the DMAC 555 is granted the use of the bus 509. The DMAC 555 directly writes the 16 bit digitized sample as a 24 bit word to the RAM 506. The lower 8 bits are zero filled. When the DMAC 555 is finished with the write to the RAM 506 the DMAC 555 de-asserts the bus-request signal, thereby allowing the DSP 508 to regain control of the bus 509.

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