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Flick

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(54) **VEHICLE SECURITY SYSTEM FOR A VEHICLE HAVING A DATA COMMUNICATIONS BUS AND RELATED METHODS**

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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.

This patent is subject to a terminal disclaimer.

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(22) Filed: **Aug. 25, 1999**

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(63) Continuation of application No. 09/023,838, filed on Feb. 13, 1998, now Pat. No. 6,011,460, which is a continuation-in-part of application No. 08/701,356, filed on Aug. 22, 1996, now Pat. No. 5,719,551.

(51) **Int. Cl.**[7] **B60R 25/10**

(52) **U.S. Cl.** **340/426**; 340/531; 340/533; 307/10.2; 180/287

(58) **Field of Search** 340/425.5, 426, 340/427, 428, 429, 531, 532, 533, 534, 825.31, 825.32, 825.69; 307/10.2, 10.3, 10.5; 180/173, 287

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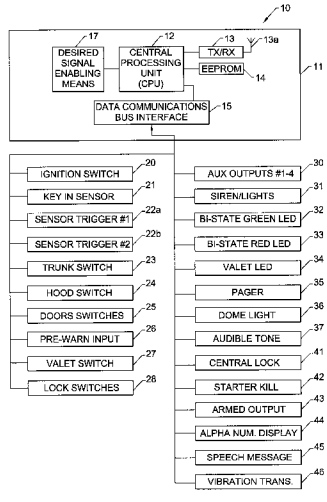
(74) *Attorney, Agent, or Firm*—Allen, Dyer, Doppelt, Milbrath & Gilchrist, P.A.

(57) **ABSTRACT**

A vehicle security system, for a vehicle of a type including a data communications bus, preferably includes at least one security function control circuit and associated interface for interfacing to the data communications bus. The system also includes a security system controller and associated interface for interfacing to the data communications bus, and a desired signal enabling circuit for enabling the security system controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles. This, in turn, permits the security system controller to communicate with the at least one security function control circuit. The at least one vehicle function control circuit may be an engine control circuit, such as a starter control circuit, or at least one of an ignition and fuel control circuit. The vehicle function control circuit may also be a door lock control circuit.

60 Claims, 7 Drawing Sheets



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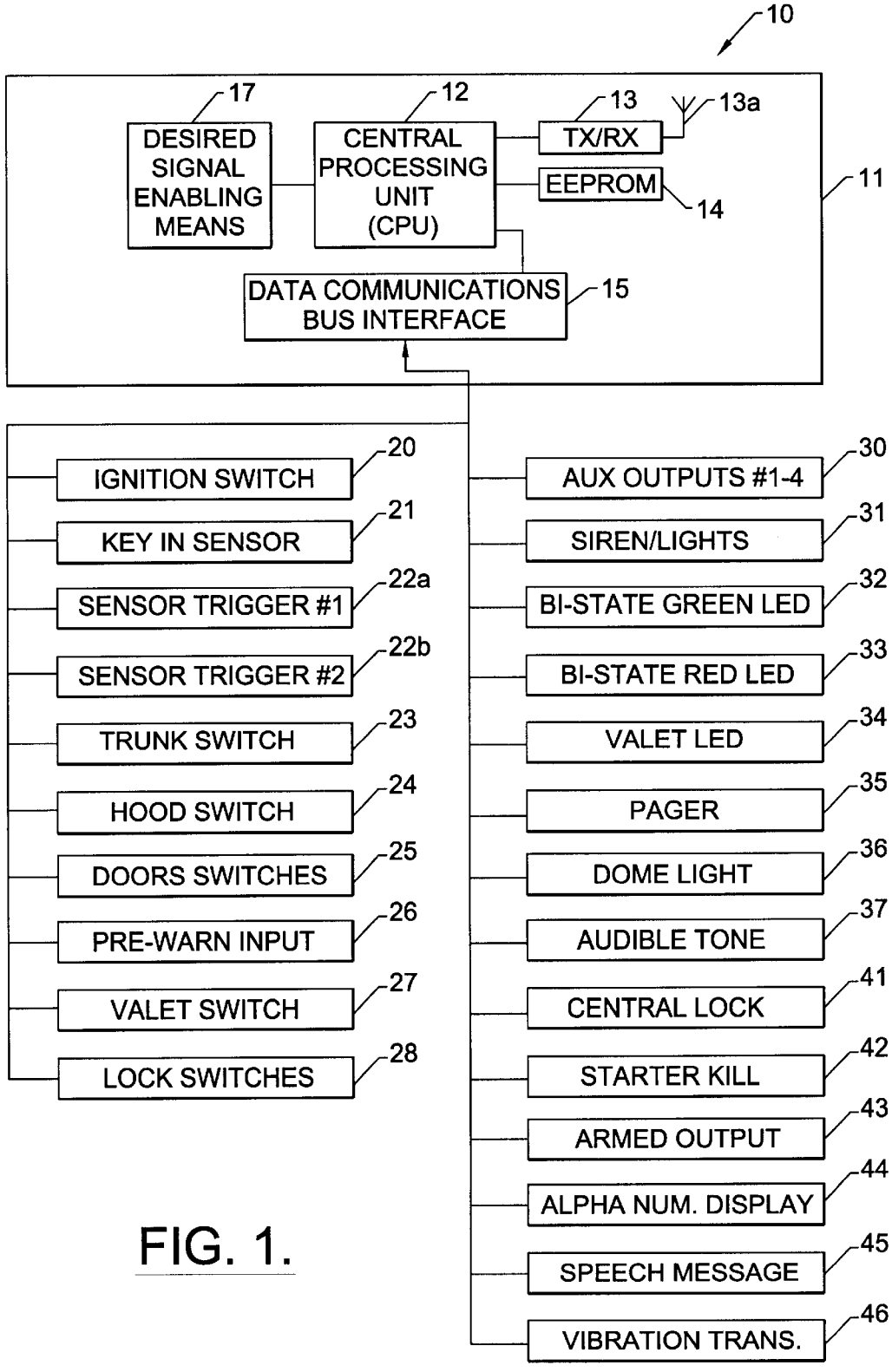
10
17
DESIRED SIGNAL ENABLING MEANS
12
CENTRAL PROCESSING UNIT (CPU)
13
TX/RX
13a
EEPROM
14
11
DATA COMMUNICATIONS BUS INTERFACE
15
20
IGNITION SWITCH
21
KEY IN SENSOR
22a
SENSOR TRIGGER #1
22b
SENSOR TRIGGER #2
23
TRUNK SWITCH
24
HOOD SWITCH
25
DOORS SWITCHES
26
PRE-WARN INPUT
27
VALET SWITCH
28
LOCK SWITCHES
30
AUX OUTPUTS #1-4
31
SIREN/LIGHTS
32
BI-STATE GREEN LED
33
BI-STATE RED LED
34
VALET LED
35
PAGER
36
DOME LIGHT
37
AUDIBLE TONE
41
CENTRAL LOCK
42
STARTER KILL
43
ARMED OUTPUT
44
ALPHA NUM. DISPLAY
45
SPEECH MESSAGE
46
VIBRATION TRANS.

FIG. 1.

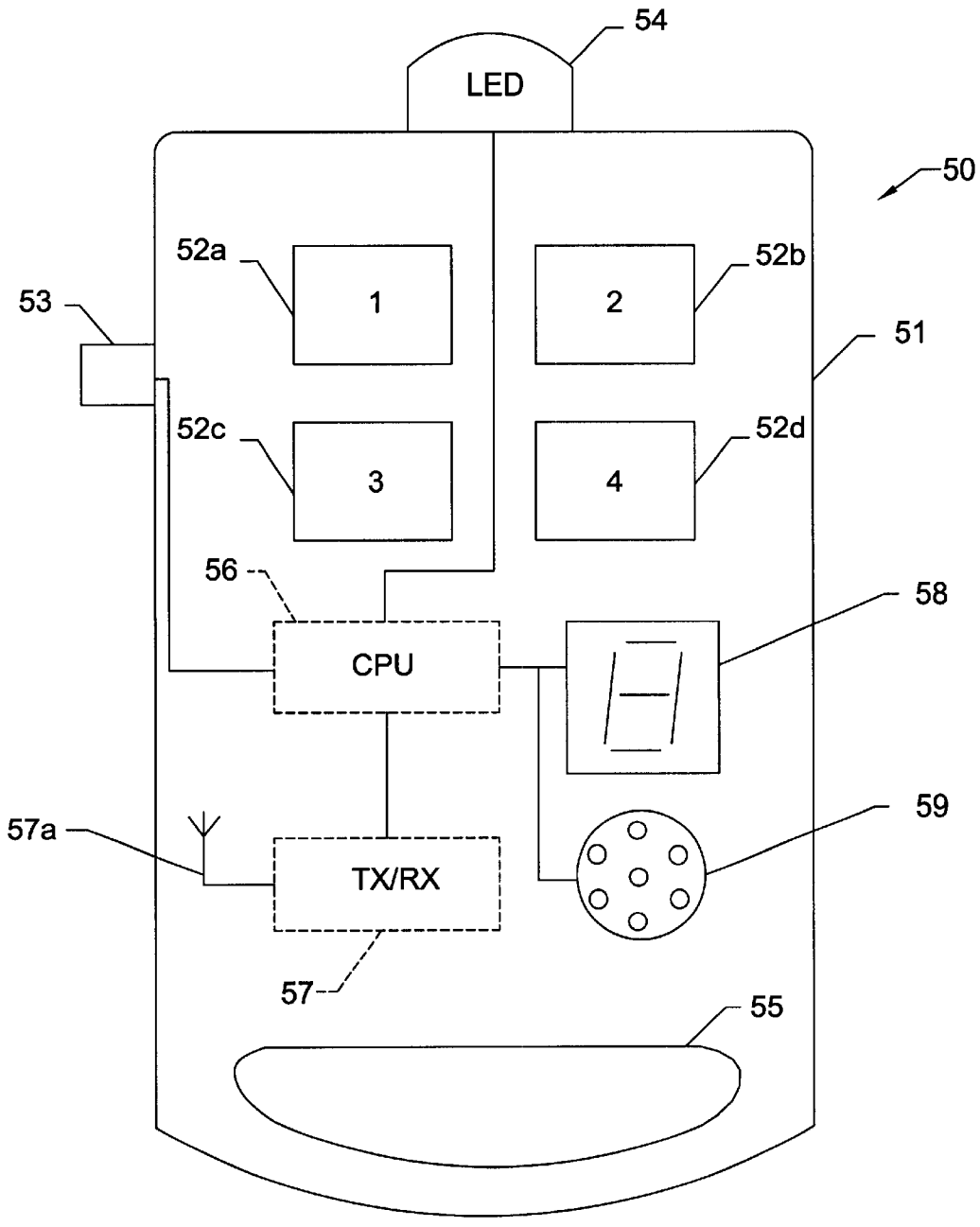

FIG. 2.

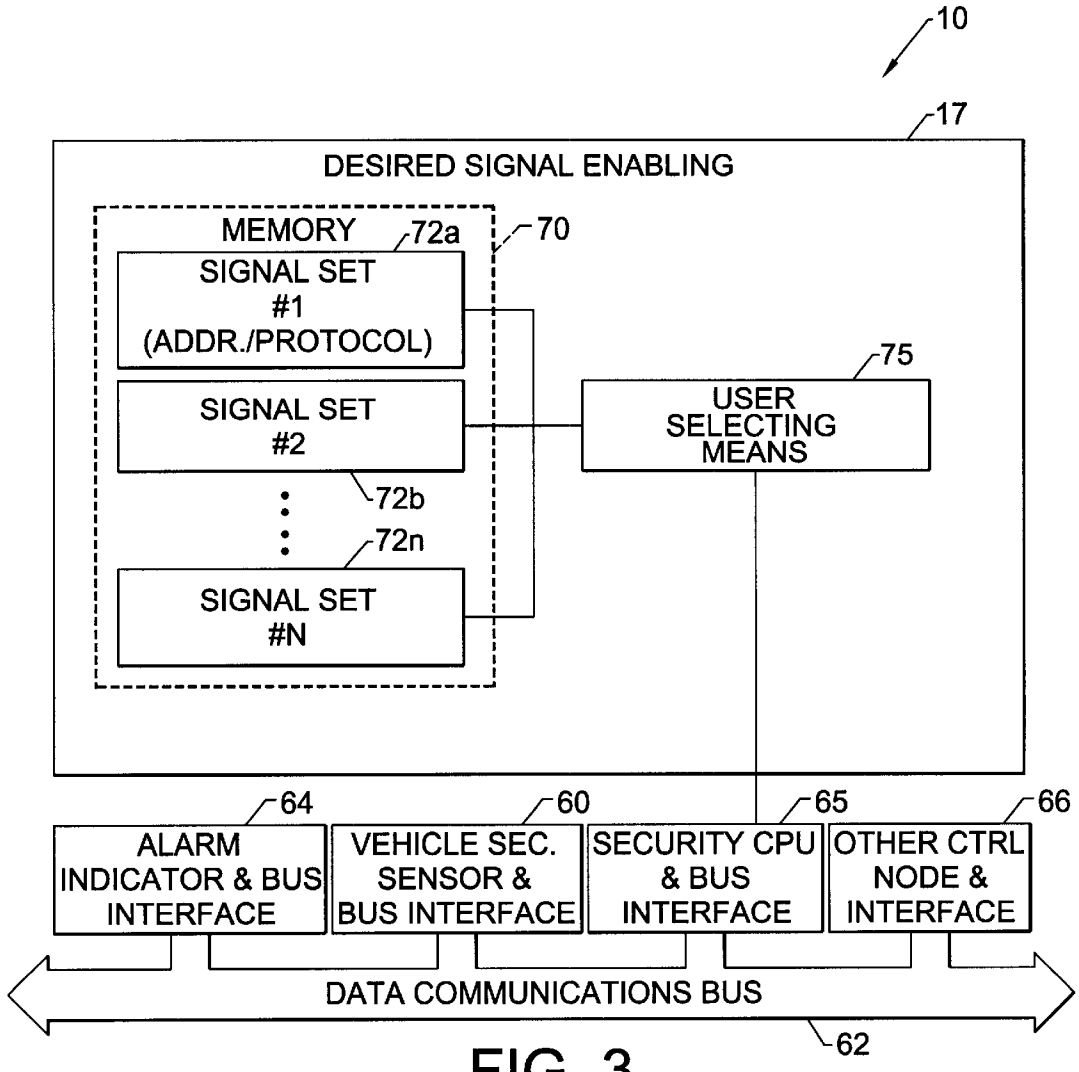
10
17
DESIRED SIGNAL ENABLING
MEMORY
72a
70
SIGNAL SET #1 (ADDR./PROTOCOL)
SIGNAL SET #2
72b
72n
SIGNAL SET #N
75
USER SELECTING MEANS
64
60
65
66
ALARM INDICATOR & BUS INTERFACE
VEHICLE SEC. SENSOR & BUS INTERFACE
SECURITY CPU & BUS INTERFACE
OTHER CTRL NODE & INTERFACE
DATA COMMUNICATIONS BUS
62

FIG. 3.

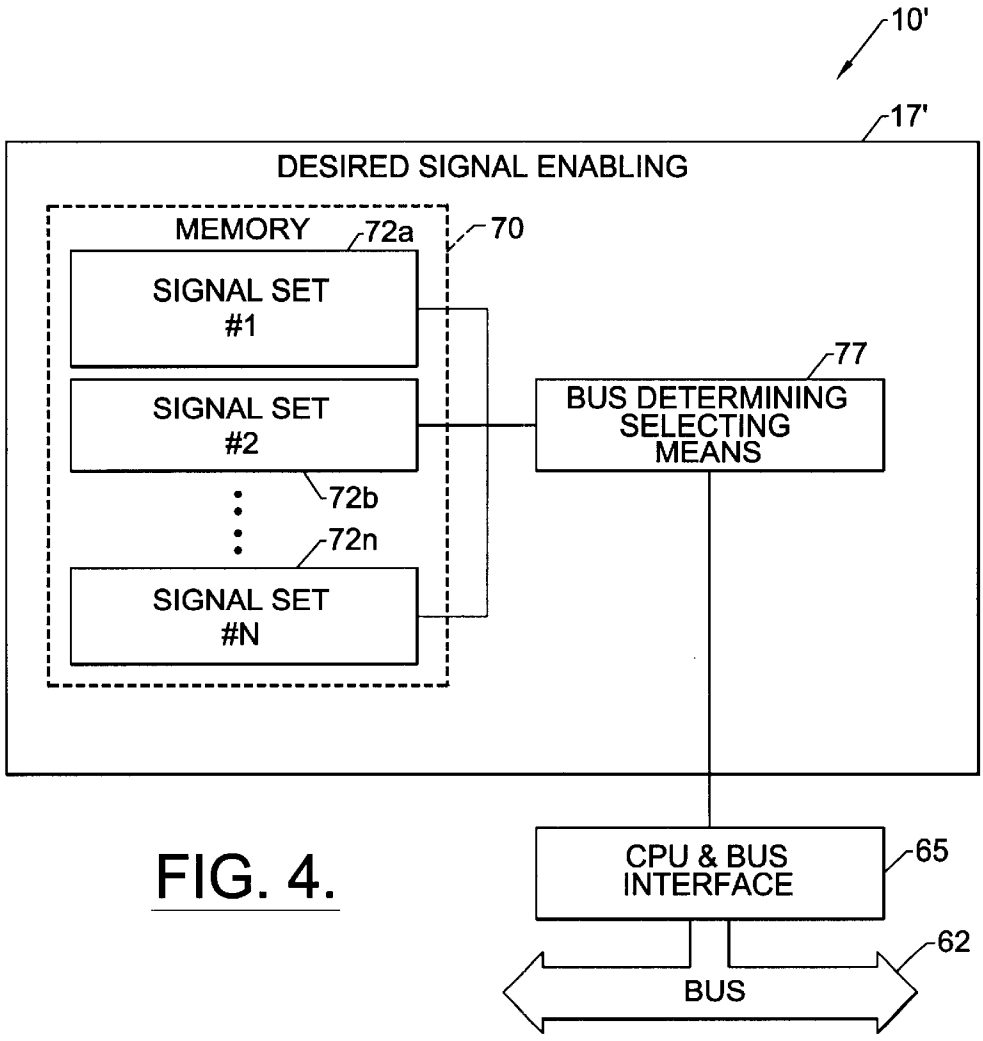
10'
17'
DESIRED SIGNAL ENABLING
MEMORY
72a
70
SIGNAL SET #1
SIGNAL SET #2
72b
72n
SIGNAL SET #N
77
BUS DETERMINING SELECTING MEANS
CPU & BUS INTERFACE
65
62
BUS

FIG. 4.

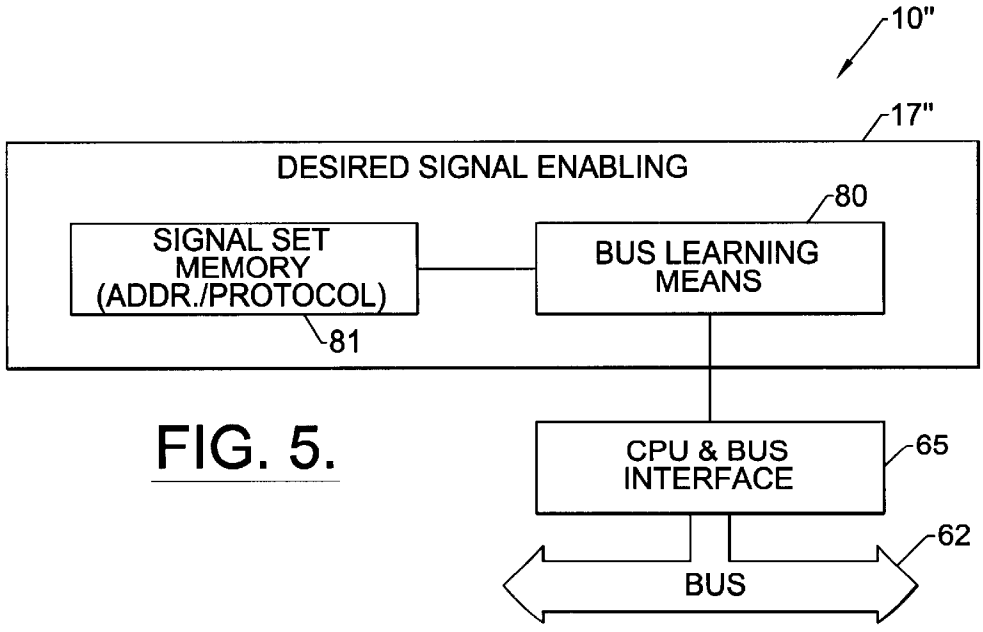
10"
17"
DESIRED SIGNAL ENABLING
80
SIGNAL SET MEMORY (ADDR./PROTOCOL)
81
BUS LEARNING MEANS
CPU & BUS INTERFACE
65
62
BUS

FIG. 5.

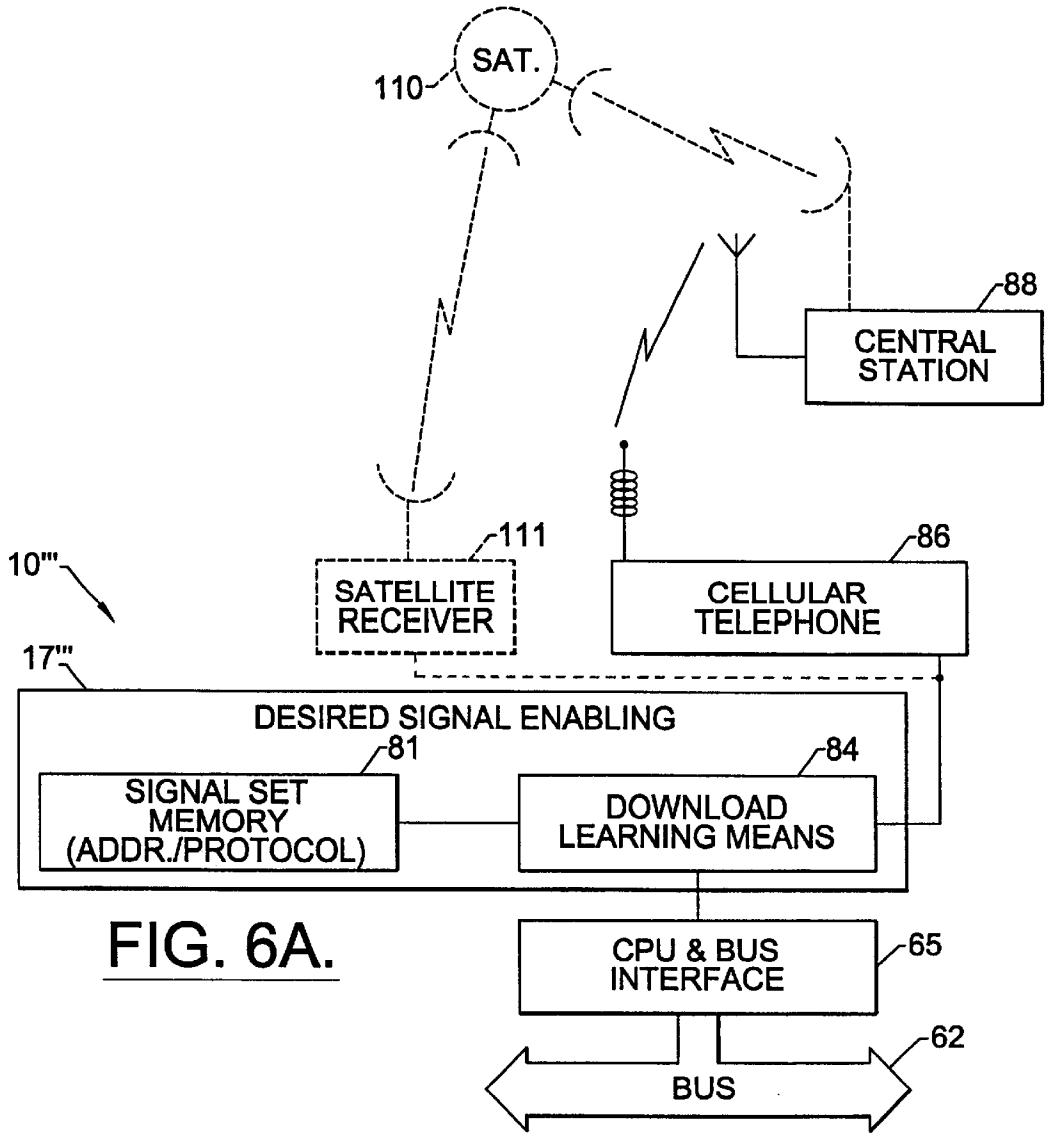
SAT.
110
88
CENTRAL STATION
111
86
10'''
SATELLITE RECEIVER
CELLULAR TELEPHONE
17'''
DESIRED SIGNAL ENABLING
81
84
SIGNAL SET MEMORY (ADDR./PROTOCOL)
DOWNLOAD LEARNING MEANS
CPU & BUS INTERFACE
65
62
BUS

FIG. 6A.

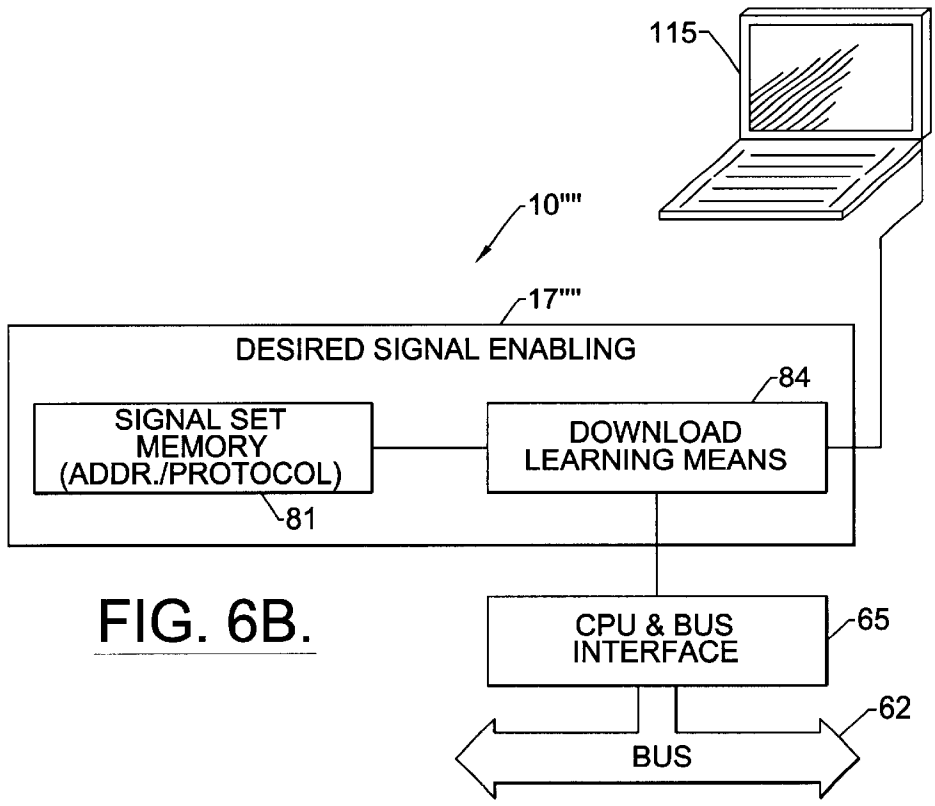
115
10''''
17''''
DESIRED SIGNAL ENABLING
84
SIGNAL SET MEMORY (ADDR./PROTOCOL)
81
DOWNLOAD LEARNING MEANS
CPU & BUS INTERFACE
65
62
BUS

FIG. 6B.

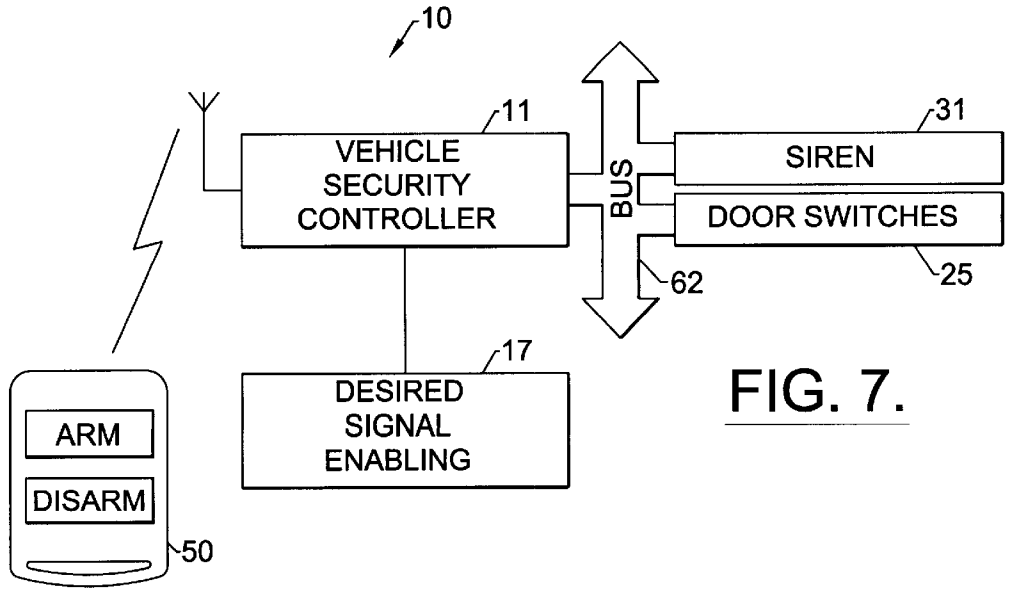
10
11
VEHICLE SECURITY CONTROLLER
BUS
31
SIREN
DOOR SWITCHES
25
62
17
DESIRED SIGNAL ENABLING
ARM
DISARM
50

FIG. 7.

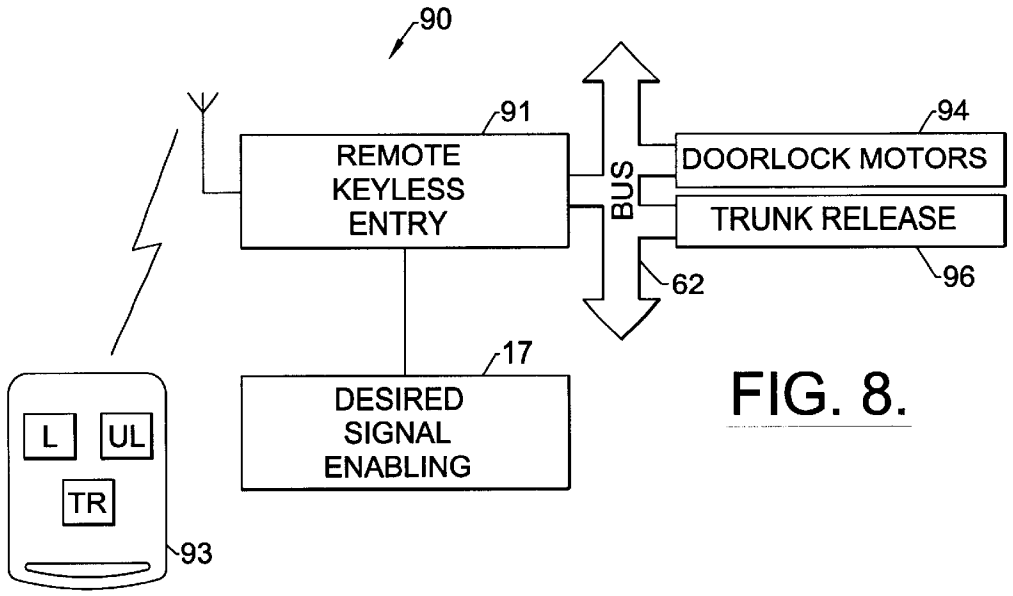
90
91
REMOTE KEYLESS ENTRY
BUS
94
DOORLOCK MOTORS
TRUNK RELEASE
96
62
17
DESIRED SIGNAL ENABLING
L
UL
TR
93

FIG. 8.

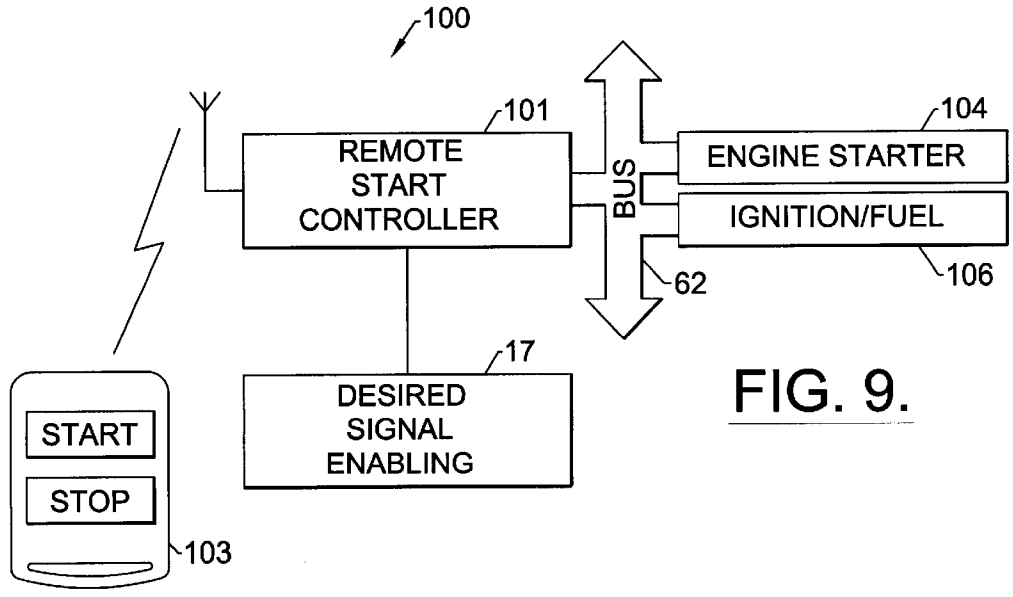
100
101
REMOTE START CONTROLLER
BUS
104
ENGINE STARTER
IGNITION/FUEL
106
62
17
DESIRED SIGNAL ENABLING
START
STOP
103

FIG. 9.

VEHICLE SECURITY SYSTEM FOR A VEHICLE HAVING A DATA COMMUNICATIONS BUS AND RELATED METHODS

RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 09/023,838 filed Feb. 13, 1998, now U.S. Pat. No. 6,011,460, which, in turn, is a continuation-in-part of U.S. patent application Ser. No. 08/701,356 filed Aug. 22, 1996, now U.S. Pat. No. 5,719,551, the entire disclosures of each of which are incorporated herein by reference.

FIELD OF THE INVENTION

This application is related to the field of security systems and, more particularly, to a security system and related methods for vehicles.

BACKGROUND OF THE INVENTION

Vehicle security systems are widely used to deter vehicle theft, prevent theft of valuables from a vehicle, deter vandalism, and to protect vehicle owners and occupants. A typical automobile security system, for example, includes a central processor or controller connected to a plurality of vehicle sensors. The sensors, for example, may detect opening of the trunk, hood, doors, windows, and also movement of the vehicle or within the vehicle. Ultrasonic and microwave motion detectors, vibration sensors, sound discriminators, differential pressure sensors, and switches may be used as sensors. In addition, radar sensors may be used to monitor the area proximate the vehicle.

The controller typically operates to give an alarm indication in the event of triggering of a vehicle sensor. The alarm indication may typically be a flashing of the lights and/or the sounding of the vehicle horn or a siren. In addition, the vehicle fuel supply and/or ignition power may be selectively disabled based upon an alarm condition.

A typical security system also includes a receiver associated with the controller that cooperates with one or more remote transmitters typically carried by the user as disclosed, for example, in U.S. Pat. No. 4,383,242 to Sassover et al. and U.S. Pat. No. 5,146,215 to Drori. The remote transmitter may be used to arm and disarm the vehicle security system or provide other remote control features from a predetermined range away from the vehicle. Also related to remote control of a vehicle function U.S. Pat. No. 5,252,966 to Lambropoulous et al. discloses a remote keyless entry system for a vehicle. The keyless entry system permits the user to remotely open the vehicle doors or open the vehicle trunk using a small handheld transmitter.

Unfortunately, the majority of vehicle security systems need to be directly connected by wires to individual vehicle devices, such as the vehicle horn or door switches of the vehicle. In other words, a conventional vehicle security system is hardwired to various vehicle components, typically by splicing into vehicle wiring harnesses or via interposing T-harnesses and connectors. The number of electrical devices in a vehicle has increased so that the size and complexity of wiring harnesses has also increased. For example, the steering wheel may include horn switches, an airbag, turn-signal and headlight switches, wiper controls, cruise control switches, ignition wiring, an emergency flasher switch, and/or radio controls. Likewise, a door of a vehicle, for example, may include window controls, locks, outside mirror switches, and/or door-panel light switches.

In response to the increased wiring complexity and costs, vehicle manufacturers have begun attempts to reduce the amount of wiring within vehicles to reduce weight, reduce wire routing problems, decrease costs, and reduce complications which may arise when troubleshooting the electrical system. For example, some manufacturers have adopted multiplexing schemes to reduce cables to three or four wires and to simplify the exchange of data among the various onboard electronic systems as disclosed, for example, in "The Thick and Thin of Car Cabling" by Thompson appearing in the IEEE Spectrum, February 1996, pp. 42–45.

Implementing multiplexing concepts in vehicles in a cost-effective and reliable manner may not be easy. Successful implementation, for example, may require the development of low or error-free communications in what can be harsh vehicle environments. With multiplexing technology, the various electronic modules or devices may be linked by a single signal wire in a bus also containing a power wire, and one or more ground wires. Digital messages are communicated to all modules over the data communications bus. Each message may have one or more addresses associated with it so that the devices can recognize which messages to ignore and which messages to respond to or read.

The Thompson article describes a number of multiplexed networks for vehicles. In particular, the Grand Cherokee made by Chrysler is described as having five multiplex nodes or controllers: the engine controller, the temperature controller, the airbag controller, the theft alarm, and the overhead console. Other nodes for different vehicles may include a transmission controller, a trip computer, an instrument cluster controller, an antilock braking controller, an active suspension controller, and a body controller for devices in the passenger compartment.

A number of patent references are also directed to digital or multiplex communications networks or circuits, such as may be used in a vehicle. For example, U.S. Pat. No. 4,538,262 Sinniger et al. discloses a multiplex bus system including a master control unit and a plurality of receiver-transmitter units connected thereto. Similarly, U.S. Pate. No. 4,055,772 to Leung discloses a power bus in a vehicle controlled by a low current digitally coded Communications system. Other references disclosing various vehicle multiplex control systems include, for example, U.S. Pat. No. 4,760,275 to Sato et al.; U.S. Pat. No. 4,697,092 to Roggendorf et al.; and U.S. Pat. No. 4,792,783 to Burgess et al.

Several standards have been proposed for vehicle multiplex networks including, for example, the Society of Automotive Engineers "Surface Vehicle Standard, Class B Data Communications Network Interface", SAE J1850, July 1995. Another report by the SAE is the "Surface Vehicle Information Report, Chrysler Sensor and Control (CSC) Bus Multiplexing Network for Class 'A' Applications", SAE J2058, July 1990. Many other networks are also being implemented or proposed for communications between vehicle devices and nodes or controllers.

Unfortunately, conventional vehicle security systems for hardwired connection to vehicle devices, such as aftermarket vehicle security systems, are not readily adaptable to a vehicle including a data communications bus. Moreover, a vehicle security system if adapted for a communications bus and devices for one particular model, model year, and manufacturer, may not be compatible with any other models, model years, or manufacturers. Other systems for remote control of vehicle functions may also suffer from such shortcomings.

SUMMARY OF THE INVENTION

In view of the foregoing background, it is therefore an object of the present invention to provide a vehicle security

system and associated method which is readily adapted or adaptable for installation in a vehicle having a data communications bus.

This and other objects, advantages and features in accordance with the present invention are provided by a vehicle security system for a vehicle of a type including a data communications bus connecting a plurality of vehicle devices and preferably includes at least one security function control circuit and associated interface for interfacing to the data communications bus, and a security system controller and associated interface for interfacing to the data communications bus. In addition the system also preferably includes a desired signal enabling circuit or means for enabling the security system controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles. This, in turn, permits the security system controller to communicate with the at least one security function control circuit. For example, the at least one vehicle function control circuit may be an engine control circuit, such as a starter control circuit, or at least one of an ignition and fuel control circuit. The vehicle function control circuit may also alternately be, or additionally include, a door lock control circuit.

Accordingly, the desired signal enabling means permits the alarm controller to communicate with the vehicle security function control circuit, such as the engine control or door lock circuit via the data communications bus. The security system is thus advantageously compatible with many different types of vehicle data communications formats or protocols.

The desired signal enabling means may preferably include a memory for storing a plurality of sets of signals for different vehicles, and selecting means for selecting the desired set of signals from the plurality of different sets of signals. In one embodiment, the selecting means may comprise user selecting means for permitting a user to select the desired set of signals. In another embodiment, the selecting means may comprise determining means for determining the desired set of signals based upon signals on the data communications bus.

The memory may include device address memory means for storing a plurality of different sets of signals representative of different device addresses for different vehicles. Alternatively, or in addition thereto, the memory may comprise protocol memory means for storing a plurality of different protocols for different vehicles.

In yet another embodiment, the desired signal enabling means may comprise learning means for learning the desired set of signals. For example, the learning means may comprise downloading learning means for learning the desired set of signals from another device, such as a temporarily connected portable laptop computer, and/or central station. In particular, the security system may interface to a cellular telephone or satellite receiver and the desired set of signals may be downloaded from a central station, or may be downloaded from a computer temporarily connected to the security system. In another variation, the learning means may comprise bus learning means for learning the desired set of signals based upon signals on the data communications bus. The security system, according to another aspect of the invention, may also interface with an existing vehicle controller or a communications bus node which is operatively connected to the data communications bus.

A method aspect of the invention is for controlling a vehicle security function for a vehicle of a type including a data communications bus, and at least one security function control circuit and associated interface for interfacing to the data communications bus. The method preferably comprises the steps of: interfacing a security system controller to the data communications bus, and enabling the security system controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting the security system controller to communicate with the at least one security function control circuit. The at least one vehicle function control circuit may comprise an engine control circuit. Alternately, or in addition, the security function control circuit may comprise a door lock circuit.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic block diagram of the vehicle security system in accordance with the invention.

FIG. **2** is a schematic diagram of a remote transmitter of the vehicle security system in accordance with the invention.

FIG. **3** is a schematic block diagram of a portion of a first embodiment of the vehicle security system in accordance with the present invention.

FIG. **4** is a schematic block diagram of a portion of a second embodiment of the vehicle security system in accordance with the present invention.

FIG. **5** is a schematic block diagram of a portion of a third embodiment of the vehicle security system in accordance with the present invention.

FIG. **6A** is a schematic block diagram of a portion of a fourth embodiment of the vehicle security system in accordance with the present invention.

FIG. **6B** is a schematic block diagram of a portion of a variation of the fourth embodiment of the vehicle security system in accordance with the present invention.

FIG. **7** is a schematic block diagram of the vehicle security system in accordance with the present invention.

FIG. **8** is a schematic block diagram of a remote keyless entry system in accordance with the present invention.

FIG. **9** is a schematic block diagram of a remote engine starting system in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will now be described more fully hereinafter with reference to the accompanying drawings in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the illustrated embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout. Prime and multiple prime notation are used in alternate embodiments to indicate similar elements.

Referring now to the schematic block diagram of FIG. **1**, a vehicle security system **10** according to one aspect of the invention is first described. The security system includes a controller **11** which, in turn, in the illustrated embodiment includes a central processing unit (CPU) or microprocessor **12** operating under stored program control.

In the illustrated embodiment, a transmitter and receiver **13** are connected to the CPU **12** for receiving signals from a remote transmitter and for transmitting signals to a remote unit, as will be described in greater detail below. As would

be readily understood by those skilled in the art, the transmitter portion of the controller **11** may not be needed in some embodiments of the invention. An antenna **13***a* is illustratively connected to the transmitter and receiver **13**.

In the illustrated embodiment, the CPU **12** is also operatively connected to a memory (EEPROM) **14** and a data communications bus interface **15** which provides both input and output interfaces to various vehicle devices. As would be readily understood by those skilled in the art, the CPU **12** may alternately or additionally have its own on-board memory.

The data communications bus interface **15** is illustratively connected to various vehicle input devices including: an ignition switch **20**; a key in the ignition sensor **21**; two zone sensors **22***a*, **22***b*; conventional trunk hood and door pin sensors or switches **23**, **24**, and **25**, respectively; and door lock switches **28**. In addition, a pre-warn sensor **26** and valet switch **27** also provide inputs to the controller **11** in the illustrated embodiment. As would be readily understood by those skilled in the art, other inputs are also contemplated by the present invention and are generally described herein by the term sensor. In addition, an input signal may also be received from a remote transmitter **50** (FIG. **2**).

The data communications bus interface **15** of the controller **11** may also preferably be connected to a plurality of output devices. The outputs may include auxiliary relay outputs **30**, such as for window control, remote starting, or a remote alarm indication, as would be readily understood by those skilled in the art. A siren and/or lights **31**, and green and red light emitting diodes (LEDs) **32**, **33** for dashboard mounting are also illustratively connected to the controller **11**. Other outputs may be directed to a valet LED **34**, a dome light **36**, a central lock relay or lock control unit **41**, a starter kill circuit **42**, and an armed relay output **43**. In addition, other outputs may be directed to one or more of an audible tone generator **37**, an alphanumeric display **44**, a speech message annunciator **45**, and a vibration transducer **46**, as will be readily appreciated by those skilled in the art. Other similar indicating devices are also contemplated by the present invention, as would be readily understood by those skilled in the art. Some of the illustrated devices may be hardwired to various control nodes as would be readily understood by those skilled in the art. The control nodes may be connected by the data communications bus as would also be known to those skilled in the art.

Referring now more particularly to FIG. **2**, a remote transmitter **50** in accordance with the invention is described. The remote transmitter **50** illustratively includes a housing **51** and a plurality of first momentary contact switches **52***a*–**52***d* carried by the housing. A second momentary contact switch **53** and an indicating light, such as the illustrated LED **54** are also carried by or mounted on the housing **51**. As would be readily understood by those skilled in the art, the remote transmitter **50** is typically relatively small and includes an opening **55** for facilitating connection to a vehicle key ring, for example. In addition, the remote transmitter **50** includes a central processing unit or microprocessor **56** operatively connected to the plurality of first switches **52***a*–**52***d*, the second switch **53**, and the LED **54**. The microprocessor is also connected to a transmitter and/or receiver circuit **57** and its associated antenna **57***a* for transmitting and/or receiving signals to and from the controller **11** of the vehicle security system **10**. Accordingly, the term "remote transmitter" is used broadly herein to describe the embodiment also including receiver means.

The remote transmitter **50** may also include a numeric or alphanumeric display **58**, and a speaker **59** coupled to an audible tone generator or a speech message generator, as may be provided by the microprocessor **56**. A vibration transducer, not shown, may also be incorporated into the remote transmitter **50** for communicating to the user as would be readily understood by those skilled in the art.

Of course, as will be readily appreciated by those skilled in the art, the remote transmitter may be a central station, for example, rather than a handheld unit **50** as shown in FIG. **2**. Also the remote transmitter may include a handheld unit that communicates first to a central station. Other forms of remote transmitters are also contemplated by the invention as will be understood by those skilled in the art.

Turning now additionally to FIG. **3** a first embodiment of the desired signal enabling means **17** is described. The vehicle security system **10** preferably comprises a vehicle security sensor and associated sensor bus interface means **60** for interfacing the vehicle security sensor to the data communications bus **62**. The vehicle security system **10** also preferably includes an alarm indicator and associated alarm indicator bus interface means **64** for interfacing the alarm indicator to the data communications bus. Examples of vehicle security sensors and alarm indicators are described above in greater detail with reference to FIG. **1**.

The security system **10** further preferably comprises desired signal enabling means **17** for enabling the alarm controller **10** to operate using a desired set of signals for a desired vehicle from among a plurality of possible sets of signals for different vehicles. As would be readily understood by those skilled in the art, the term different vehicles may include vehicles from different manufacturers, different models, or even different trim levels of the same make and model. Accordingly, the desired signal enabling means **17** permits the alarm controller, that is, the security CPU and bus interface **65**, to communicate with the vehicle security sensor and the alarm indicator via the data communications bus **62** so that the CPU is capable of operating the alarm indicator responsive to the vehicle security sensor.

The data communications bus **62** may preferably be a multiplexed data bus as would be readily understood by those skilled in the art. Accordingly, the sensor bus interface means, the alarm bus interface means, and the alarm controller bus interface means may each comprise multiplexing means for interfacing with the multiplexed data bus of the vehicle. For example, any of the various multiplexing schemes as disclosed in "The Thick and Thin of Car Cabling" by Thompson appearing in the IEEE Spectrum, February 1996, pp. 42–45 may be used. Other data bus connection schemes are also contemplated by the present invention.

As illustrated in FIG. **3**, one embodiment of the desired signal enabling means **17** may preferably include a memory **70** for storing a plurality of sets **72***a*, **72***b* and **72***n* of signals for different vehicles, and selecting means for selecting the desired set of signals from the plurality of different sets of signals for different vehicles. By storing sets of signals is meant storing information or data necessary to generate the desired signals on the data bus **62** as would be readily understood by those skilled in the art. The memory **70** may include device address memory means for storing a plurality of different sets of signals representative of different device addresses for different vehicles. Alternatively, or in addition thereto, the memory means may comprise protocol memory means for storing a plurality of different protocols for different vehicles. One or more other control nodes and associated bus interfaces **66** may also be connected to the data communications bus **62** as would also be readily

understood by those skilled in the art. For example, other control nodes may include an engine controller thereby permitting the alarm controller to disable the engine, or the body controller thereby permitting the alarm controller to control the vehicle door locks as would be readily understood by those skilled in the art.

In the illustrated embodiment of FIG. **3**, the selecting means may comprise user selecting means **75** for permitting a user to select the desired set of signals. A keypad or other input means may be used to permit the user to select the desired signal set for his vehicle. The valet switch **27** (FIG. **1**), for example, may also be operated by the user to select the desired signal set. The user may select the desired set of signals by entering a unique digital code similar to the selection of signals for a home electronics universal remote control. Other techniques for permitting the user to select the desired signal set from a plurality of stored sets are also contemplated by the invention as would be readily appreciated by those Skilled in the art.

Referring now additionally to FIG. **4** another embodiment of the desired signal enabling means **17'** is described in accordance with the security system **10'** of the present invention. In this embodiment, the selecting means may comprise bus determining means **77** for determining the desired set of signals based upon signals on the data communications bus. For example, the bus determining means could determine the desired set of signals based upon sensed voltage levels or based upon the timing of signal pulses on the data communications bus **62**. The other components of this embodiment of the desired signal enabling means **17'** are similar to those described above with reference to FIG. **3** and need no further description.

Yet another embodiment of the security system **10"** according to the invention is explained with reference to FIG. **5**. In this illustrated embodiment the desired signal enabling means **17"** includes a desired signal set memory **81** operatively connected to the illustrated bus learning means **80**. The bus learning means **80** may determine and store in the signal set memory **81** the protocol and/or device addresses for the vehicle devices. For example, the bus learning means **80** may permit the user to operate various vehicle devices and store a desired signal set based thereon as would be readily understood by those skilled in the art. The other components of the desired signal enabling means **17"** are similar to those described above with reference to FIG. **3** and need no further description.

Still another embodiment of the desired signal enabling means **17'"** is explained with reference to FIG. **6**A. The desired signal enabling means **17'"** includes a signal set memory **81** operatively connected to the schematically illustrated download learning means **84**. The download learning means **84** may include an interface connected to the illustrated vehicle cellular telephone **86** to permit learning or downloading of the desired signal set from a remote or central monitoring and control station **88**, for example. The desired signal set may also alternately be learned from the central station **88** through the satellite link provided by the satellite **110** and vehicle mounted satellite receiver **111** and associated antennas. As would be readily understood by those skilled in the art, the download learning means, as well as the other desired signal enabling leans may be implemented by software in the CPU **12** of the controller **11** or in a separate microprocessor or circuits.

Turning now additionally to FIG. **6**B, another variation of programming, learning or downloading of the download learning means **84** is explained. In this variation the download learning means **84** is temporarily connected to a computer, such as the illustrated portable laptop computer **115**. The connection, may be via a wire cable or wireless communications link as will be readily understood by those skilled in the art. Of course, the desired signal enabling means **17'"'** in this embodiment may be programmed in the vehicle or prior to installation in the vehicle.

One implementation of the security system **10** is shown in FIG. **7** and includes the vehicle security controller **11**. The remote transmitter **50** can switch the controller **11** between the armed and disarmed modes. The controller **11** in the armed mode is capable of generating an alarm indication via the siren **31** (FIG. **1**) and based upon the door switches **25** (FIG. **1**), for example. The communications are via the data communications bus **62**, and are based upon the desired signal set from the desired signal enabling means **17**.

The features and aspects described above may also be readily implemented into other vehicle related systems, such as for performing remote control functions. As shown in FIG. **8**, the invention may be embodied in a remote keyless entry system **90** including a remote keyless entry controller **91** operated by a remote handheld transmitter **93**. The controller **91** communicates with the door lock motors **94** and illustrated trunk release **96** via the data communications bus **62**. The remote keyless entry system **90** also includes the desired signal enabling means **17** which permits the controller **91** to perform the desired door locking and trunk release remote control functions or operations as would also be readily understood by those skilled in the art. As would be readily appreciated by those skilled in the art, any of the desired signal enabling means described herein and equivalent thereto may be used for the remote keyless entry system **90** in accordance with the present invention.

Turning now to FIG. **9**, yet another vehicle associated remote control function is illustrated and now explained. The remote engine starting system **100** includes a remote start controller **101** operable by a remote transmitter **103**. The remote controller **101** may communicate via the data communications bus **62** to enable the ignition and fuel systems **106** and crank the engine starter **104**. Various sensors may also be monitored as would be readily understood by those skilled in the art.

A method aspect of the invention is for operating a vehicle security system **10** for a vehicle of a type including a data communications bus **62** connecting a plurality of vehicle devices. The method preferably comprises the steps of interfacing an alarm controller **11** to the data communications bus **62**, and enabling the alarm controller to operate using a desired set of digital signals for a desired vehicle from a plurality of possible sets of signals for different vehicles to thereby permit the alarm controller to communicate with at least one of a vehicle security sensor **60** and an alarm indicator **64** via the data communications bus **62** (FIG. **3**). Accordingly, the alarm controller is capable of operating the alarm indicator responsive to the vehicle security sensor and via the data communication bus.

Another method of the invention is for remotely controlling a vehicle function for a vehicle of a type including a data communications bus **62** connecting a plurality of vehicle devices, and a vehicle function controller and associated bus interface means for interfacing the vehicle function controller to the data communications bus. The method comprising the steps of: enabling the vehicle function controller to operate using a desired set of signals for a desired vehicle from a plurality of sets of signals for different vehicles for permitting the vehicle function controller to communicate

via the data communications bus with at least one of the vehicle devices; and receiving a signal at the vehicle from a remote transmitter so that the vehicle function controller remotely controls a vehicle function responsive to the remote transmitter.

Those of skill in the art will readily recognize the benefits and advantages of the present invention for aftermarket security systems and other aftermarket systems for implementing remote control functions wherein compatibility with a potentially large number of different protocols and/or device addresses is desired. Of course, many modifications and other embodiments of the invention will come to the mind of one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Accordingly, it is understood that the invention is not to be limited to the illustrated embodiments disclosed, and that the modifications and embodiments are intended to be included within the spirit and scope of the appended claims.

That which is claimed is:

1. A vehicle security system for a vehicle of a type including a data communications bus, said vehicle security system comprising:

at least one security function control circuit and associated interface for interfacing to the data communications bus;

a security system controller and associated interface for interfacing to the data communications bus; and

desired signal enabling means for enabling said security system controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said security system controller to communicate with said at least one security function control circuit.

2. A vehicle security system according to claim **1** wherein said at least one security function control circuit comprises an engine control circuit.

3. A vehicle security system according to claim **2** wherein said engine control circuit comprises a starter control circuit.

4. A vehicle security system according to claim **2** wherein said engine control circuit comprises at least one of an ignition and fuel control circuit.

5. A vehicle security system according to claim **1** wherein said at least one security function control circuit comprises a door lock control circuit.

6. A vehicle security system according to claim **1** further comprising a receiver connected to said security system controller; and wherein said security system controller selectively operates said at least one security function control circuit based upon remote signals received by said receiver.

7. A vehicle security system according to claim **6** further comprising a remote transmitter for generating the remote signals.

8. A vehicle security system according to claim **1** wherein said desired signal enabling means comprises:

a memory for storing a plurality of sets of signals for different vehicles; and

selecting means for selecting the desired set of signals from the plurality of different sets of signals for different vehicles.

9. A vehicle security system according to claim **8** wherein said selecting means comprises user selecting means for permitting a user to select the desired set of signals.

10. A vehicle security system according to claim **8** wherein said selecting means comprises bus determining means for determining the desired set of signals based upon signals on the data communications bus.

11. A vehicle security system according to claim **8** wherein said memory comprises device address memory means for storing a plurality of different sets of signals for different device addresses.

12. A vehicle security system according to claim **8** wherein said memory comprises protocol memory means for storing a plurality of different sets of signals for different protocols.

13. A vehicle security system according to claim **1** wherein said desired signal enabling means comprises bus learning means for learning the desired set of signals based upon signals on the data communications bus.

14. A vehicle security system according to claim **1** wherein said desired signal enabling means comprises download learning means for learning the desired set of signals from a downloading device.

15. A vehicle security system according to claim **14** wherein said downloading learning means comprises means for learning the desired set of signals from a computer temporarily connected thereto.

16. A vehicle security system according to claim **1** wherein said desired signal enabling means comprises protocol providing means for providing a protocol for the desired vehicle.

17. A vehicle security system according to claim **1** wherein said desired signal enabling means comprises device address providing means for providing device addresses for the desired vehicle.

18. A vehicle security system according to claim **1** wherein further comprising a vehicle security sensor and associated interface for interfacing to the data communications bus; and wherein said vehicle security system controller operates responsive to the vehicle security sensor.

19. A vehicle security system according to claim **1** wherein further comprising a vehicle alarm indicator and associated interface for interfacing to the data communications bus; and wherein said vehicle security system controller operates said alarm indicator.

20. A vehicle security system for a vehicle of a type including a data communications bus, said vehicle security system comprising:

an engine control circuit and associated interface for interfacing to the data communications bus;

a security system controller and associated interface for interfacing to the data communications bus; and

desired signal enabling means for enabling said security system controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said security system controller to communicate with said engine control circuit.

21. A vehicle security system according to claim **20** wherein said engine control circuit comprises a starter control circuit.

22. A vehicle security system according to claim **20** wherein said engine control circuit comprises at least one of an ignition and fuel control circuit.

23. A vehicle security system according to claim **20** further comprising a receiver connected to said security system controller; and wherein said security system controller selectively operates said engine control circuit based upon remote signals received by said receiver.

24. A vehicle security system according to claim **23** further comprising a remote transmitter for generating the remote signals.

25. A vehicle security system according to claim 20 wherein said desired signal enabling means comprises:

a memory for storing a plurality of sets of signals for different vehicles; and

selecting means for selecting the desired set of signals from the plurality of different sets of signals for different vehicles.

26. A vehicle security system according to claim 25 wherein said selecting means comprises user selecting means for permitting a user to select the desired set of signals.

27. A vehicle security system according to claim 25 wherein said selecting means comprises bus determining means for determining the desired set of signals based upon signals on the data communications bus.

28. A vehicle security system according to claim 25 wherein said memory comprises device address memory means for storing a plurality of different sets of signals for different device addresses.

29. A vehicle security system according to claim 25 wherein said memory comprises protocol memory means for storing a plurality of different sets of signals for different protocols.

30. A vehicle security system according to claim 20 wherein said desired signal enabling means comprises bus learning means for learning the desired set of signals based upon signals on the data communications bus.

31. A vehicle security system according to claim 20 wherein said desired signal enabling means comprises download learning means for learning the desired set of signals from a downloading device.

32. A vehicle security system according to claim 31 wherein said downloading learning means comprises means for learning the desired set of signals from a computer temporarily connected thereto.

33. A vehicle security system according to claim 20 wherein said desired signal enabling means comprises protocol providing means for providing a protocol for the desired vehicle.

34. A vehicle security system according to claim 20 wherein said desired signal enabling means comprises device address providing means for providing device addresses for the desired vehicle.

35. A vehicle security system for a vehicle of a type including a data communications bus, said vehicle security system comprising:

a door lock control circuit and associated interface for interfacing to the data communications bus;

a security system controller and associated interface for interfacing to the data communications bus; and

desired signal enabling means for enabling said security system controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting said security system controller to communicate with said door lock control circuit.

36. A vehicle security system according to claim 35 further comprising a receiver connected to said security system controller; and wherein said security system controller selectively operates said door lock control circuit based upon remote signals received by said receiver.

37. A vehicle security system according to claim 36 further comprising a remote transmitter for generating the remote signals.

38. A vehicle security system according to claim 35 wherein said desired signal enabling means comprises:

a memory for storing a plurality of sets of signals for different vehicles; and

selecting means for selecting the desired set of signals from the plurality of different sets of signals for different vehicles.

39. A vehicle security system according to claim 38 wherein said selecting means comprises user selecting means for permitting a user to select the desired set of signals.

40. A vehicle security system according to claim 38 wherein said selecting means comprises bus determining means for determining the desired set of signals based upon signals on the data communications bus.

41. A vehicle security system according to claim 38 wherein said memory comprises device address memory means for storing a plurality of different sets of signals for different device addresses.

42. A vehicle security system according to claim 38 wherein said memory comprises protocol memory means for storing a plurality of different sets of signals for different protocols.

43. A vehicle security system according to claim 35 wherein said desired signal enabling means comprises bus learning means for learning the desired set of signals based upon signals on the data communications bus.

44. A vehicle security system according to claim 35 wherein said desired signal enabling means comprises download learning means for learning the desired set of signals from a downloading device.

45. A vehicle security system according to claim 44 wherein said downloading learning means comprises means for learning the desired set of signals from a computer temporarily connected thereto.

46. A vehicle security system according to claim 35 wherein said desired signal enabling means comprises protocol providing means for providing a protocol for the desired vehicle.

47. A vehicle security system according to claim 35 wherein said desired signal enabling means comprises device address providing means for providing device addresses for the desired vehicle.

48. A method for controlling a vehicle security function for a vehicle of a type including a data communications bus, and at least one security function control circuit and associated interface for interfacing to the data communications bus, the method comprising the steps of:

interfacing a security system controller to the data communications bus; and

enabling the security system controller to operate using a desired set of signals for a corresponding desired vehicle from a plurality of sets of signals for different vehicles for permitting the security system controller to communicate with the at least one security function control circuit.

49. A method according to claim 48 wherein the at least one vehicle function control circuit comprises an engine control circuit.

50. A method according to claim 49 wherein the engine control circuit comprises a starter control circuit.

51. A method according to claim 49 wherein the engine control circuit comprises at least one of an ignition and fuel control circuit.

52. A method according to claim 48 wherein the at least one vehicle function control circuit comprises a door lock control circuit.

53. A method according to claim 48 further comprising the steps of receiving remotely generated signals, and caus-

ing the security system controller to selectively operate the at least one security function control circuit based upon the received signals.

54. A method according to claim **48** wherein the step of enabling comprises the steps of:

storing in a memory a plurality of sets of signals for different vehicles; and

selecting the desired set of signals from the plurality of different sets of signals for different vehicles.

55. A method according to claim **54** wherein the step of selecting comprises permitting user selection of the desired set of signals.

56. A method according to claim **54** wherein the step of selecting comprises determining the-desired set of signals based upon signals on the data communications bus.

57. A method according to claim **54** wherein the step of storing in memory comprises storing a plurality of different sets of signals representative of different device addresses.

58. A method according to claim **54** wherein the step of storing in memory comprises storing a plurality of different sets of signals representative of different protocols.

59. A method according to claim **48** wherein the step of enabling comprises the step of learning the desired set of signals based upon signals on the data communications bus.

60. A method according to claim **48** wherein the step of enabling comprises the step of downloading the desired signals from a downloading device.

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