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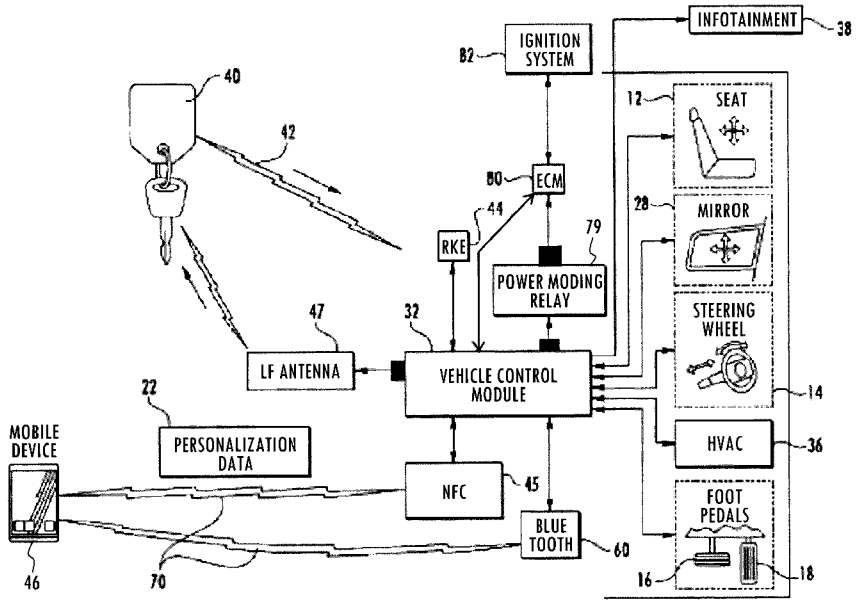
(54) Title: VEHICLE OPERATION SYSTEM USING MOBILE DEVICE



(57) Abstract: A vehicle operation system has a control module configured to wirelessly communicate with a mobile device to upload and download user settings that may be stored in the mobile device. The mobile device may also be configured to enable the ignition system after the control module authenticates the mobile device and remote keyless entry system. The memory stored in the mobile device is read and write capable, allowing for data to be used by the control module in conjunction with several automobile systems, and allowing data to be transferred from the systems to the portable memory device by the control module, thus facilitating vehicle operation.

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Description

Title of Invention: VEHICLE OPERATION SYSTEM USING MOBILE DEVICE

Field

[0001] This present disclosure relates to a vehicle operation system using a mobile device such as a smartphone interfacing and communicating with the vehicle operation system of a target vehicle. For example, the mobile device stores specific user settings and provides an interface to control vehicle settings.

Background

[0002] Conventionally, a system for vehicle access control includes a vehicle access control component that is configured to provide access to a vehicle and an interface for communication with a wireless communication device. Access to the vehicle is provided when a vehicle reservation is received from the wireless communication device (see US2011/0,112,969A1)

[0003] Technologies surrounding smartphones are changing and innovating rapidly day by day. Not only is device computing power and memory increasing exponentially, access to the Internet is now, for all practical purposes, omnipresent. Recent developments with the cloud technology have made smartphones to have great resources for both personalized storage capacity and computing power.

[0004] Automobiles have devices that are personalized for the comfort, convenience, and safety of the vehicle occupant. The devices may include a seat having an adjustable seat position, a mirror having an adjustable position, and an air conditioner having various preferred settings such as a preferred temperature. However, the adjustable parts are mounted in the vehicle and not truly personalized for a specific user.

[0005] Modern vehicles are also equipped with remote keyless entry (RKE) systems and have been available for many years. A key fob is equipped with pushbuttons, and when the pushbuttons are depressed, an RKE transmitter in the key fob transmits a short range signal to the RKE system in the vehicle. The RKE system validates the signal and decodes it so that the particular vehicle function can be executed while sending a signal to the particular vehicle system.

[0006] By using the key fob, the RKE system controls vehicle doors to lock or unlock and a vehicle trunk to open, or operates a vehicle alarm or horn in an emergency. Recent trends in remote vehicle access and control continue to expand beyond the basic short-range, unidirectional RKE systems toward longer-range, bidirectional communication systems or smart fobs. The longer-range, bidirectional communication systems or smart fobs have many features including vehicle access, keyless engine start, and com-

munication with a smartphone.

Summary

[0007] It is an objective of the present disclosure to provide a vehicle operation system using a mobile device.

[0008] In the preferred embodiment, the vehicle operation system utilizes a control module that can electronically communicate to all features and electronic components of a vehicle. The control module is connected to a transponder to wirelessly transmit and receive data. The control module is also connected to a remote keyless entry system which has an antenna that wirelessly communicates with a key fob. Additionally, a mobile device that contains memory and an antenna sending and receiving data may be able to communicate with the control module wirelessly. The control module is connected to an ignition system used to start and stop an internal combustion engine (i.e., engine) of the vehicle. The mobile device is configured to communicate with the control module, and the control module allows the mobile device, after authenticated by the key fob, to control the ignition system. The vehicle contains a near field communication pad; which can wirelessly charge the battery of the mobile device. The vehicle may also contain adjustable features such as a driver seat, a passenger seat, a heating/ventilation/air conditioning system, a infotainment system, a brake pedal, an accelerator pedal, and a side view mirror, all of which are connected to the control module. The control module wirelessly communicates with user settings of the adjustable features, and the user settings may be stored in the mobile device when the vehicle is shut off. The mobile device then can send the user settings stored in the mobile device to the control module when an ignition is turned on, and the control module will prompt the adjustable components to conform to the user settings. A wireless transmission between the mobile device and the control module can be of near field communication or Bluetooth.

Brief Description of Drawings

[0009] The drawings described herein are for illustrative purposes only of selected embodiments and not all possible implementations, and are not intended to limit the scope of the present disclosure.

[fig.1]Figure 1 is a perspective view showing a portion of a passenger compartment for occupants of a vehicle;

[fig.2]Figure 2 is a block diagram of the vehicle operation system for an electronic communication;

[fig.3A]Figure 3A is a front view of a mobile device;

[fig.3B]Figure 3B is a rear view of the mobile device;

[fig.4]Figure 4 is a flowchart of the vehicle operation system for a mobile device reg-

istration;

[fig.5]Figure 5 is a flowchart of the vehicle operation system for a mobile device authentication;

[fig.6]Figure 6 is a flowchart of the vehicle operation system, in which a mobile device learns and stores personal data;

[fig.7]Figure 7 is a flowchart of the vehicle operation system, in which a control module initiates an engine starter;

[fig.8]Figure 8 is a flowchart of the vehicle operation system in which the control module shuts engine off;

[fig.9]Figure 9 is a flowchart of the vehicle operation system when the control module is completed communication with the mobile device; and

[fig.10]Figure 10 is a schematic diagram showing a center console and two mobile devices thereon.

[0010] Corresponding reference numbers indicate corresponding parts throughout the several views of the drawings.

Description of Embodiments

[0011] Example embodiments will now be described more fully with reference to the accompanying drawings. The following description is merely exemplary in nature and is not intended to limit the present disclosure, application, or uses. It should be understood that throughout the drawings, corresponding reference numbers indicate like or corresponding parts and features.

[0012] FIG. 1 shows an interior of a vehicle 10. The vehicle 10 has a number of vehicle devices, which includes adjustable features such as a driver seat 12 for the driver of the vehicle 10 to occupy, a steering wheel 14 for controlling the direction of the vehicle when the vehicle is moving, a brake pedal 16 for decelerating or stopping the vehicle, and an accelerator pedal 18 for accelerating the vehicle. A position of the driver seat 12 within the interior can be adjusted in accordance with a preference of a user. The position of the driver seat 12 may be adjusted using a seat position controller 20. The adjustable aspect of the driver seat 12 may include moving forward, back, up, down, or tilting the backrest portion of the driver seat 12. A position of the passenger seat 23 can be adjusted in accordance with a preference of a passenger of the vehicle. The steering wheel 14 may be adjustable, and a position of the steering wheel 14 can be adjusted in accordance with a preference of the user. The position of the steering wheel 14 may be adjusted using a steering wheel position controller 24. The adjustable aspect of the steering wheel 14 may include tilting the steering wheel 14 up or down, or telescoping the steering wheel 14 in or out. The brake pedal 16 and the accelerator pedal 18 may have adjustable positions so the distance from the user to the brake pedal 16 and the

accelerator pedal 18 can be adjusted in accordance with a preference of the user. The brake pedal 16 and the accelerator pedal 18 may be adjusted using a pedal position controller 26. The brake pedal 16 and the accelerator pedal 18 may be moved closer to or further from the driver seat 12. The vehicle 10 also has a mirror 28 to assist the user in observing an area alongside or behind the vehicle. A position of the mirror 28 is adjustable, so the area observed can be adjusted in accordance with a preference of the user. The position of the mirror 28 may be adjusted using a mirror position controller 30.

[0013] As shown in FIG. 2, the vehicle 10 also has a control module 32 communicably coupled to one or more of the vehicle devices such as the driver seat 12, the steering wheel 14, the brake pedal 16, the accelerator pedal 18, and the mirror 28. The control module 32 may include several interconnected components such as a memory component, a logic component, and an input/output component. The control module 32 may also be a commercially available single-chip microprocessor. A connection may be provided between the control module 32 and each of the vehicle devices by individual wires. The connecting may be provided by a shared communications bus, local interconnect protocol, controller area network or the like. The control module 32 is adapted to adjust or personalize the one or more of the adjustable vehicle devices in accordance with a personal data 22 received by the control module 32. The vehicle may further have a heating/ventilation/air conditioning (HVAC) system operated using a HVAC controller 36. The HVAC controller 36 includes a temperature setting device which assists the user to control the temperature of a passenger compartment. An entertainment or an infotainment system has an entertainment controller 38 for adjusting an entertainment setting such as a preferred broadcasting station. The user may adjust these systems manually through the controllers communicably coupled to the respective systems. The control module 32 may be communicably coupled to the HVAC system or the entertainment system. The personal data 22 may include corresponding personal settings for the temperature in the passenger compartment and the entertainment.

[0014] The vehicle may also be equipped with a remote keyless entry (RKE) system 44. The RKE system 44 authenticates a key fob (i.e., a portable unit) 40, and performs a door lock control, a door unlock control, an engine starting control, and the like based on an authentication result. A smart key is applicable for the key fob 40. Specifically, the RKE system 44 authenticates the key fob 40 by transmitting radio waves 42 from the key fob 40 to the RKE system 44. The RKE system 44 is disposed inside the vehicle and connected to the control module 32 which authenticates the key fob 40 and also determines what function to perform based on user input. It is appreciated in the art that the RKE system can be an active system or a passive system, also known in the art

as a Passive Entry Passive Start system (PEPS). The active system requires a user input to unlock, lock or start vehicle, whereas the PEPS system is based on a proximity communication and an unlock function will perform automatically when the user is close to the vehicle. The PEPS system functions similar to the standard RKE system. However, in the PEPS system, the control module, through an antenna (e.g., a low frequency (LF) antenna 47), may send an authentication signal to the key fob 40. It can also be appreciated that the PEPS system allows the user to start the vehicle by pushing a button, rather than inserting a key into the ignition and turning it to start the vehicle. The key fob 40 is authenticated wirelessly, and the control module 32 allows the key fob 40 to start the ignition.

[0015] Further, referring to FIG. 1, the vehicle 10 is equipped with an antenna or/and a wireless transponder (e.g., an in-vehicle near field communications (NFC) transponder 45). An NFC transponder is a known, commercially available, short-range wireless communication transponder that communicates with another NFC transponder for transferring data. The communications range between NFC transponders is normally less than one meter and sometimes limited to less than a few centimeters. As shown in FIG. 1, a mobile device 46 such as a cell phone, a smart phone, and a tablet is taken into the passenger compartment. The mobile device 46 is shown in more detail in FIG.S 3A and 3B. The mobile device 46 has an internal memory device 48 which stores the personal data 22 of the user for the vehicle devices, and has an antenna or/and a wireless transponder (e.g., an NFC transponder 50) which is communicably coupled to the internal memory device 48 and configured to transmit the personal data 22. Therefore, the personal data 22 is transmitted from the internal memory device 48 to the in-vehicle NFC transponder 45 via the NFC transponder 50. The mobile device 46 may also contain a wireless transponder (e.g., a Bluetooth transceiver 52) for communication by Bluetooth.

[0016] The in-vehicle NFC transponder 45 is incorporated in what is known in the art as an NFC pad 56, which is located in a center console 58 of the vehicle 10. It is understood in the art that the NFC pad 56 may allow the mobile device 46 to communicate wirelessly through the in-vehicle NFC transponder 45 and the NFC transponder 50. It also can charge a battery of the mobile device 46 wirelessly through inductance, by way of a non-limiting example. The Bluetooth transceiver 52 can wirelessly communicate with a hands free device that can be placed on ears of the user (not shown). The Bluetooth transceiver 52 can also communicate with a corresponding Bluetooth module (e.g., an in-vehicle Bluetooth module 60) in the vehicle 10. The in-vehicle Bluetooth module 60 would allow the user to use the mobile device 46 that functions through a hands-free speakerphone function in the vehicle (not shown). The in-vehicle Bluetooth module 60 in the vehicle 10 is configured to transmit and receive data.

However, Bluetooth wireless communication may also allow another mode of wireless personal data 22 communication with the vehicle 10. When the mobile device 46 is registered and the key fob 40 and the mobile device 46 are authenticated, the control module 32 is allowed to download the personal date 22 from the mobile device 46. Based on the personal data 22, the control module 32 emits signals for starting the engine or the like, in other words, the control module 32 allows the mobile device 46 to be used to start the engine or the like.

[0017] FIG. 2 is a block diagram showing communications performed in the vehicle operation system using the mobile device 46. As shown in FIG. 2, the control module 32 authenticates the key fob 40 and receives the personal data 22 from the mobile device 46 either by NFC or Bluetooth communication. The personal data 22 is downloaded from the mobile device 46 to the control module 32. The personal data 22 may also be recalled from the internal memory device 48. The personal data 22 is transmitted by either the NFC transponder 50 or the Bluetooth transceiver 52, and received by the in-vehicle NFC transponder 45 or the in-vehicle Bluetooth module 60. The personal data 22 is downloaded from the mobile device 46 to the in-vehicle NFC transponder 45 or the in-vehicle Bluetooth module 60 over a communication path 70. The mobile device 46 may be a personal item used by a single user so that it may be useful for storing personal data 22. Although it is known in the art that vehicles have memory for storing personal data, the personal data 22 may not be exchanged from one vehicle to the next. Additionally, it is an added cost to a vehicle to have extra memory storage for personal settings of users. By storing the personal data 22 in the mobile device 46, the personal data 22 is readily downloaded to the in-vehicle NFC transponder 45 or the in-vehicle Bluetooth module 60 of the vehicle 10, or of any other vehicle the user may occupy. Further, having the control module 32, which authenticates the key fob 40 before allowing the personal data 22 to be downloaded to the vehicle 10 from the mobile device 46, ensures a level of security to allow for added features such as starting the engine. The control module 32 is communicably coupled to the in-vehicle NFC transponder 45 or the in-vehicle Bluetooth module 60 to input the received personal data 22, and is adapted to adjust the vehicle devices to preferred settings in accordance with the received personal data 22.

[0018] It can be appreciated that the personal data 22, when prompted, is uploaded from the vehicle 10 to the mobile device 46. The personal data 22 is uploaded in a manner that the personal data 22 is output by the control module 32, transferred to the in-vehicle NFC transponder 45 or the in-vehicle Bluetooth module 60, and transferred wirelessly and stored in the internal memory device 48.

[0019] FIG. 2 is a block diagram depicting the connection between the control module 32 and the vehicle devices including the driver seat 12, the mirror 28, the steering wheel

14, the brake pedal 16, the acceleration pedal 18, the HVAC system, or the entertainment controller 38. The connection may be supplied by wires or may be a communication bus where multiple vehicle devices communicate over the communication bus, a media oriented system transport (MOST) driver, or a controller area network bus could be used by way of non-limiting example. The arrow at each end of the lines depicting the connection indicates that data is communicated in both directions. For example, data can be communicated from the control module 32 to the driver seat 12 for adjusting the position of the driver seat 12, or data can be communicated from the driver seat 12 to the control module 32 for indicating the present position of the driver seat 12. The control module 32 is also communicably coupled to the in-vehicle NFC transponder 45 or the in-vehicle Bluetooth module 60. Arrows in FIG. 2 at each end of the line depicting the connection indicate that data is communicated or transferred from the in-vehicle NFC transponder 45 to the control module 32 or from the control module 32 to the in-vehicle NFC transponder 45, by way of non-limiting example. The control module 32 is also communicably coupled to a power mode relay 79 and an engine control module (ECM) 80. The ECM 80 starts or stops the engine, through an ignition system 82. When the vehicle 10 starts, the control module 32 will be indicated to the power mode relay 79, and the power mode relay 79 will prompt the ECM 80 to initiate the ignition system 82 of the vehicle 10. It is known in the art that the brake pedal 16 needs to be depressed in order for the engine (not shown) to be started, in a typical PEPS system. When the user pushes a start/stop button (not shown) instead of pressing the brake pedal 16, the power mode relay 79 will not allow the engine to start but will allow the accessory electronics to function.

[0020] FIG. 4 is a flowchart 200 of the vehicle operation system for a registration of the mobile device 46 with the vehicle 10. The registration is initiated when a user places the mobile device 46 on the NFC pad 56 at step 202. At step 204, the user is prompted to register the mobile device 46 with the vehicle 10 in a manner that an icon or the like to prompt the user is displayed on a user interface screen (e.g., a mobile device screen 72). When the user selects the icon, the control module 32 searches to authenticate the key fob 40 of the RKE system at step 206. When the user does not select the icon, the registration will stop at step 204. At step 208, a communication or learning sequence with the mobile device 46 is initiated, either by NFC, Bluetooth, or any other cipher encrypted wireless communication. When the mobile device 46 completes the communication or the learning sequence, the registration of the mobile device 46 with the vehicle 10 is completed.

[0021] FIG. 5 is a flowchart 300 of the vehicle operation system showing an authentication of the mobile device 46 after the registration shown in the flowchart 200 is completed. The authentication would be initiated in any subsequent use of a particular vehicle. The

authentication is started when the user places the mobile device 46 on the NFC pad 56. At step 302, the control module 32 wirelessly searches for an appropriate key fob of the RKE system. At step 304, the control module 32 authenticates the appropriate key fob. In a case where the mobile device 46 is registered previously, the control module 32 authenticates the mobile device 46, as shown at step 306. At step 308, communication can commence when authentication is completed.

[0022] FIG. 6 is a flowchart 400 of the vehicle operation system in which the mobile device learns the various user preferences of the vehicle. At step 402, the mobile device 46 is placed on the NFC pad 56. At step 404, the mobile device 46 is previously registered and authenticated.

Registration and authentication are the same as those described in flowcharts 200 and 300. At step 406, the engine is stopped. At step408, an icon or the like displayed on the mobile device screen 72 prompts the user to download user settings for the vehicle devices. The user settings includes, for example, positions of the driver seat 12, the passenger seat 23, the steering wheel 14, and of the mirror 28, and settings of the HVAC and the entertainment as shown in FIG. 2. At step 410, the user accepts or denies the downloading of the user settings. When the user accepts the downloading, the control module 32 sends the personal data 22 having information about the user settings by wireless communication to the mobile device 46, as shown at step 412. At step 414, the mobile device 46 learns the user settings and stores them in the internal memory device 48 of the mobile device 46.

[0023] FIG. 7 is a flowchart 500 of the vehicle operation system for the starting of the engine using an interface of the mobile device 46. At step 502, the system operates by placing the mobile device on the NFC pad 56. At step 504, the control module 32 determines whether the mobile device 46 is previously registered and authenticated with the key fob 40. Processes of the registration and the authentication are described in flowcharts 200 and 300. At step 508, the control module 32 determines whether the user has applied the brake pedal 16. At step 508, when the control module 32 determines that the user has applied the brake pedal 16, an engine-start icon prompting the user to start the engine is displayed on the mobile device screen 72. At step 510, if the user selects the engine-start icon displayed on the mobile device screen 72, the engine is started, as shown at step 512. When the user does not depress the brake pedal 16, the engine-start icon is not displayed on the mobile device screen 72. Additionally, when the user does not select the engine-start icon, the engine can be started by conventional ways known in the art, for example, by a key in the ignition or by pushing a button on a dash board.

[0024] FIG. 8 is a flowchart 600 of the vehicle operation system for turning the engine off using the mobile device 46. At step 602, the mobile device 46 is placed on the NFC

pad 56. At step 604, the mobile device 46 is registered and authenticated. The processes of registration and authentication are described in flowcharts 200 and 300. At step 606, the user shifts the vehicle into park. At step 608, an engine-stop icon is displayed on the mobile device screen 72 to prompt the user to stop the engine. At step 610, if the user presses the engine-stop icon, the engine is shut off, as shown at step 612. Even when the user does not select the engine-stop icon, the engine can be stopped by conventional ways known in the art, for example, by a key in the ignition or by pushing a button on the dashboard.

[0025] FIG. 9 is a flowchart 700 of the vehicle operation system illustrating how the mobile device 46 requests to the vehicle devices such as the brake pedal 16 and the accelerator pedal 18, the steering wheel 14, or the mirror 28 to be adjusted. At step 702, the mobile device 46 is placed on the NFC pad 56. At step 704, the control module 32 completes the authentication process. At step 706, the user is prompted to upload the personal data 22 by an icon which is displayed on the mobile device screen 72. At step 708, the user selects the icon displayed on the mobile device screen 72. The mobile device 46 transmits the personal data 22 wirelessly through NFC or Bluetooth as way of non-limiting example. At step 710, the control module 32 downloads the personal data 22 about the user settings for the vehicle devices such as the driver seat 12, the steering wheel 14, the brake pedal 16 and the accelerator pedal 18, mirror 28, the HVAC system, or the entertainment controller 38. The vehicle devices move to desired positions at step 712. After the control module 32 determines that the adjustment of the vehicle devices is completed, the control module 32 communicates wirelessly to the mobile device 46 completion of the tasks, as shown at 714.

[0026] Additionally, the same steps can be taken by another user in the vehicle to adjust the vehicle devices as needed, or the another user may use saved configurations. FIG. 10 displays two mobile devices 46 placed on the NFC pad 56. The vehicle operation system may be able to communicate with the two mobile devices 46 and may allow two users to customize seat settings, HVAC settings by way of non-limiting example.

[0027] Alternatively, the vehicle operation system may be put in a commercial delivery truck, a construction vehicle or an aircraft, whereby the personal data 22 may include data for any device in such vehicles that can be adjusted to correspond to a preference of the user.

[0028] While this disclosure has been described in terms of the preferred embodiments thereof, it is not intended to be so limited, but rather only to the extent set forth in the claims that follow.

Claims

[Claim 1] A vehicle operation system using a mobile device, comprising:
a vehicle (10) having an ignition system (82), a control module (32), a first wireless transponder (45, 60), and an antenna (47),;
a key fob (40) communicating wirelessly with the antenna to authenticate the key fob to the vehicle; and
a mobile device (46) having an internal memory device (48) for storing a personal data (22), and a second wireless transponder (50, 52) communicably coupled to the internal memory device, the first wireless transponder configured to communicate with the second wireless transponder, wherein
the control module is communicably coupled to the ignition system, the first wireless transponder, and a remote keyless entry antenna,
the mobile device communicates with the control module through the first wireless transponder after the key fob is authenticated to the vehicle, and
the control module transmits at least one user setting to the mobile device through the first wireless transponder to be stored in the internal memory device when the ignition system is turned off.

[Claim 2] The vehicle operation system according to claim 1, wherein
the mobile device communicates with the ignition system through the control module after the key fob is authenticated.

[Claim 3] The vehicle operation system according to claim 1 or 2, wherein the mobile device contains a battery.

[Claim 4] The vehicle operation system according to any one of claims 1 to 3, wherein
the first wireless transponder is a near field communication transponder (45),
the second wireless transponder is a near field communication transponder (50), and
the first wireless transponder communicates with the second wireless transponder using a near field communication.

[Claim 5] The vehicle operation system according to claim 4, wherein the near field communication pad (56) wirelessly charges the battery of the mobile device.

[Claim 6] The vehicle operation system according to claim 1 or 2, wherein
the first wireless transponder is a Bluetooth module (60),

the second wireless transponder is a Bluetooth transceiver (52), and the first wireless transponder communicates with the second wireless transponder using Bluetooth wireless communication.

[Claim 7] The vehicle operation system according to any one of claims 1 to 6, wherein the vehicle includes adjustable features which are adjustable by a user based on user settings that are communicated from the mobile device to the vehicle.[Claim 8]

The vehicle operation system according to any one of claims 1 to 6, wherein the adjustable features comprises at least one of a driver seat (12), a passenger seat (23), an HVAC system, an entertainment system, a brake pedal (16), an accelerator pedal (18), and a mirror (28).

[Claim 8] The vehicle operation system according to any one of claims 1 to 7, wherein the user settings stored in the internal memory device are transmitted wirelessly to the control module from the mobile device.

[Claim 9] A vehicle operation system using a mobile device, comprising:
a vehicle (10);
an ignition system (82);
a passenger compartment;
a control module (32);
a first antenna (45, 60) for wirelessly receiving and transmitting data;
a second antenna (47) for wirelessly receiving and transmitting data with a key fob (40); and
a mobile device (46) having a third antenna (50, 52) for wirelessly receiving and transmitting data and an internal memory device (48) for storing data, wherein
the third antenna and the internal memory device are electronically linked,
the first antenna, the second antenna, and the ignition system are communicably coupled to the control module,
the first antenna and the third antenna communicate with each other wirelessly, and
the mobile device communicates with the control module to start the ignition system after the control module authenticates the key fob and the mobile device.

[Claim 10] The vehicle operation system according to claim 9, wherein the control module transmits a personal data (22) to the internal memory device of the mobile device.

[Claim 11] The vehicle operation system according to claim 10, wherein the

transmission of the personal data occurs when the ignition system is shut off.

[Claim 12] The vehicle operation system according to claim10, wherein the mobile device wirelessly transmits the personal data to the control module after the key fob is authenticated.

[Claim 13] The vehicle operation system according to any one of claims 9 to 12, wherein
the first antenna is a near field communication transponder (45),
the third antenna is a near field communication transponder (50), and
the first antenna communicates with the third antenna using a near field communication.

[Claim 14] The vehicle operation system according to any one of claims 9 to 12, wherein
the first antenna is a Bluetooth module (60),
the third antenna is a Bluetooth transceiver (52), and
the first antenna communicates with the third antenna using a Bluetooth wireless communication.

[Claim 15] The vehicle operation system according to any one of claims 9 to 14, wherein
the mobile device further comprises a user interface screen (72), which displays an engine-start icon when the ignition system is off and displays an engine-stop icon when the ignition system is on.

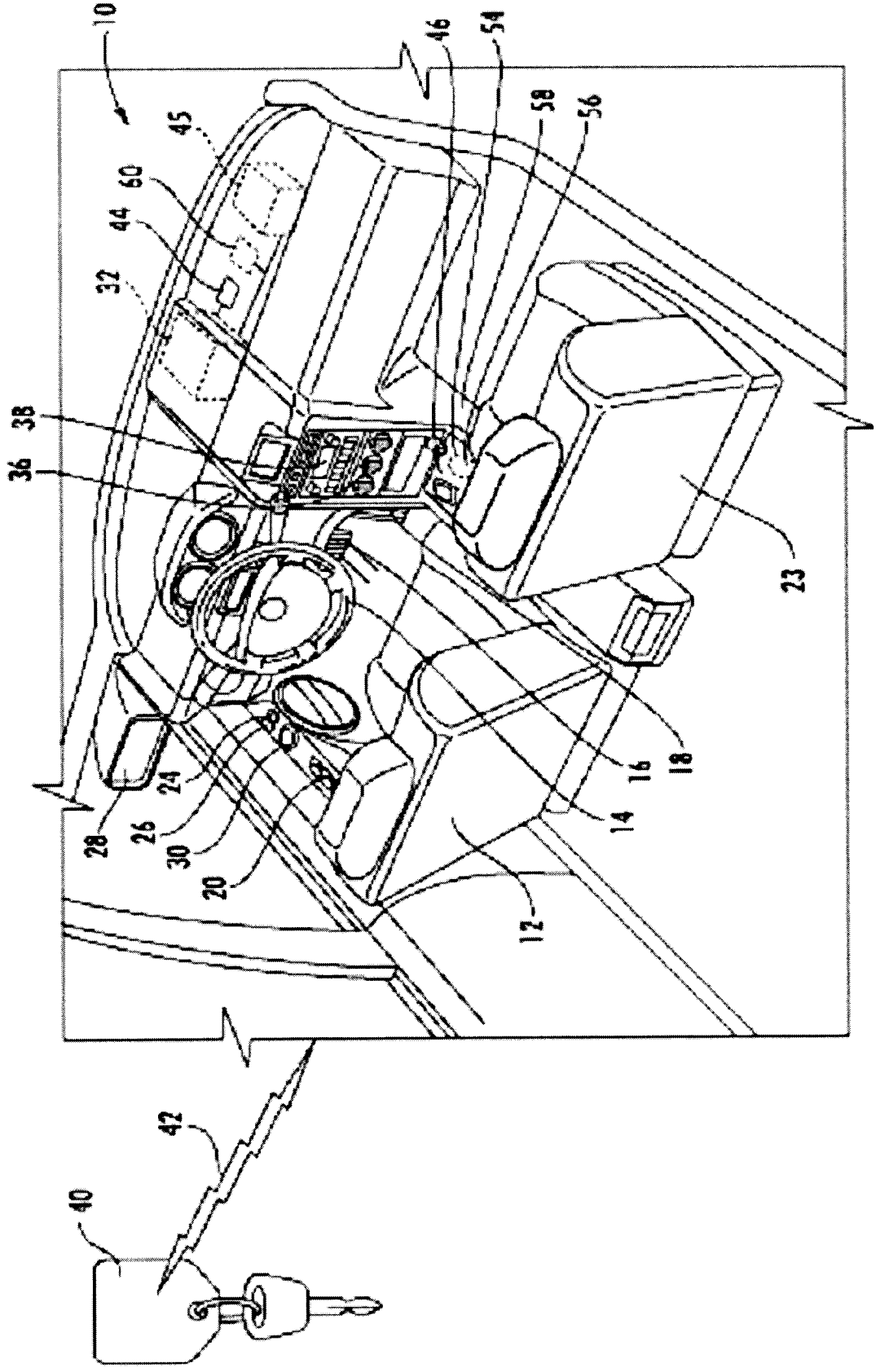
[Claim 16] The operation system according to any one of claims 9 to 15, wherein at least one user setting stored in the control module is electronically connected to adjustable features of the vehicle, which are settable by a user.

[Claim 17] The vehicle operation system according to claim 16, wherein the adjustable features comprise at least one of a driver seat (12), a passenger seat (23), an HVAC system, an entertainment system, a brake pedal (16), an accelerator pedal (18), and a mirror (28).

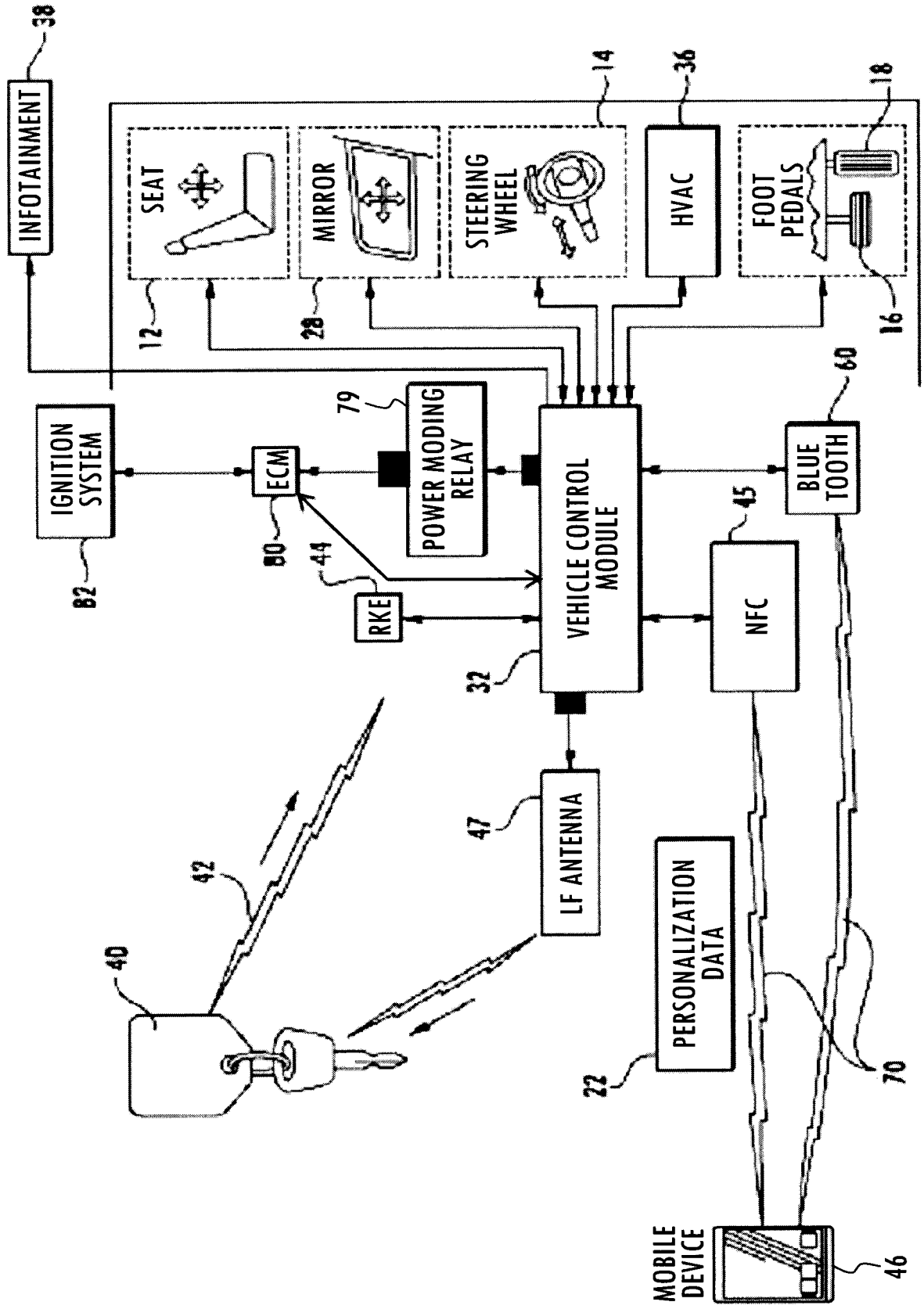
[Claim 18] The vehicle operation system according to claim 10, further comprising:
a passenger compartment in the vehicle;
a console in the passenger compartment of the vehicle; and
a near field communication pad (56) within the passenger compartment of the vehicle, wherein
the near field communication pad wirelessly charges a battery of the mobile device.

[Claim 19] A vehicle operation system comprising:
a vehicle (10);
an ignition system (82);
a passenger compartment in the vehicle;
a control module (32);
a first antenna (45, 60) for wirelessly receiving and transmitting data;
a near field communication pad (56) in the vehicle;
a second antenna (47) for wirelessly receiving and transmitting data with a key fob (40); and
a mobile device (46) including a third antenna (50, 52) wirelessly receiving and transmitting data and an internal memory device (48) storing data, wherein
the third antenna and the internal memory device are communicably coupled,
the first antenna, the second antenna, and the ignition system are communicably coupled to the control module,
the first antenna communicates with the third antenna, and
the mobile device communicates with the control module to start and stop the ignition system.

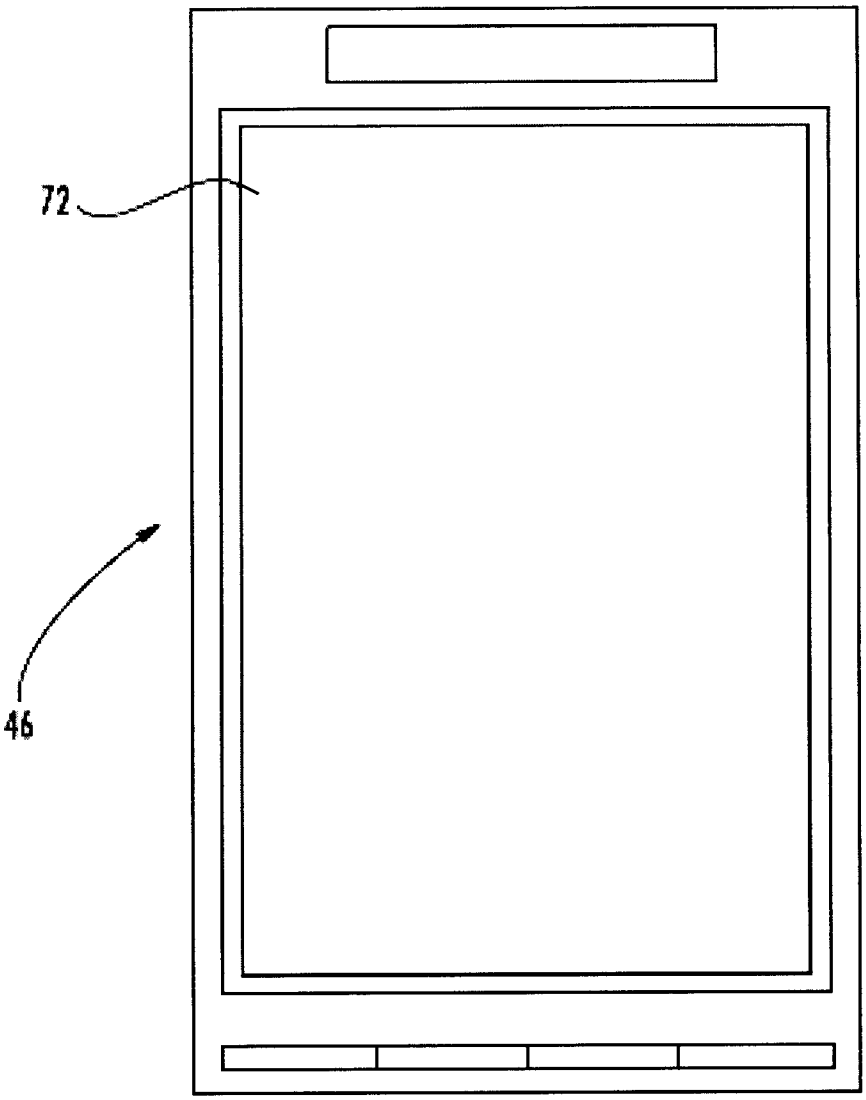
[Fig. 1]



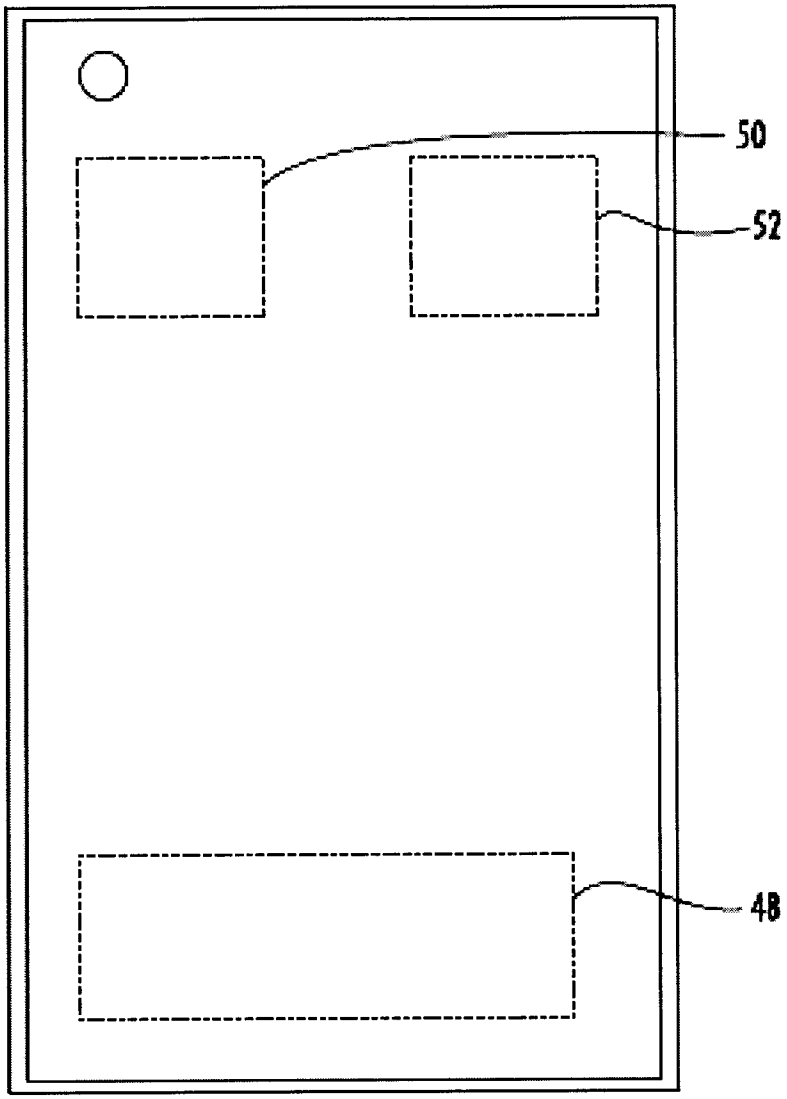
[Fig. 2]


38
INFOTAINMENT
14
36
18
SEAT
MIRROR
STEERING WHEEL
HVAC
FOOT PEDALS
12
28
16
60
79
IGNITION SYSTEM
ECM
POWER MODING RELAY
VEHICLE CONTROL MODULE
BLUE TOOTH
82
80
44
RKE
45
NFC
32
47
LF ANTENNA
42
40
PERSONALIZATION DATA
22
70
MOBILE DEVICE
46

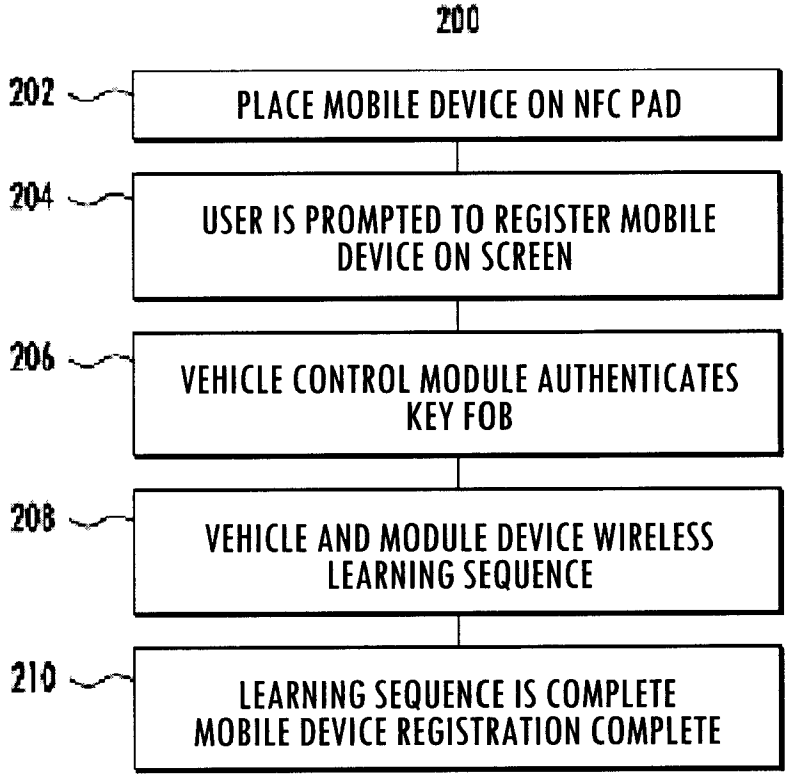
[Fig. 3A]



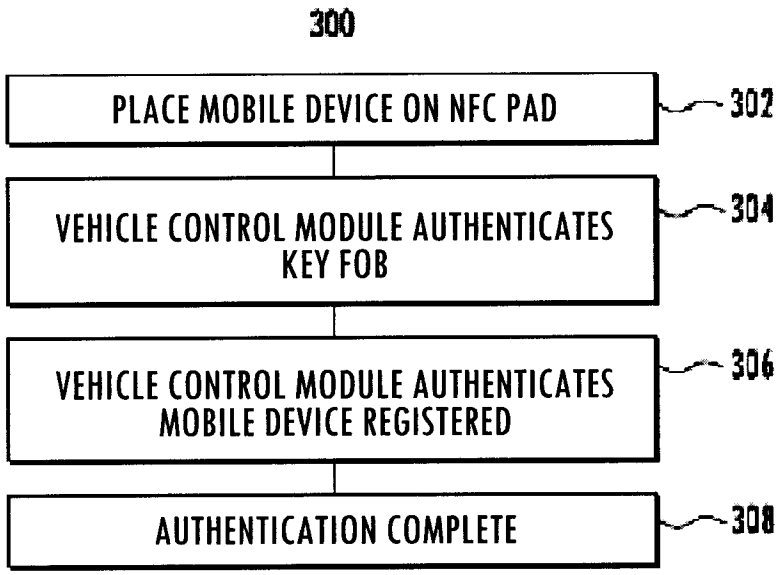
[Fig. 3B]



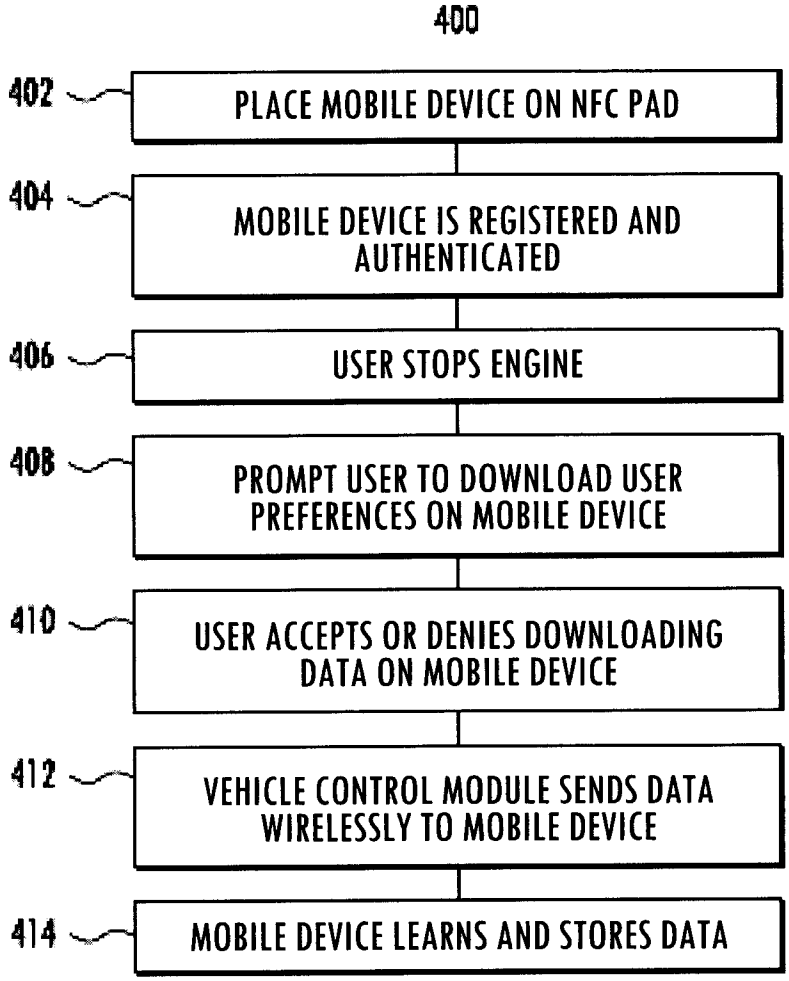
[Fig. 4]


200
202
PLACE MOBILE DEVICE ON NFC PAD
204
USER IS PROMPTED TO REGISTER MOBILE DEVICE ON SCREEN
206
VEHICLE CONTROL MODULE AUTHENTICATES KEY FOB
208
VEHICLE AND MODULE DEVICE WIRELESS LEARNING SEQUENCE
210
LEARNING SEQUENCE IS COMPLETE MOBILE DEVICE REGISTRATION COMPLETE

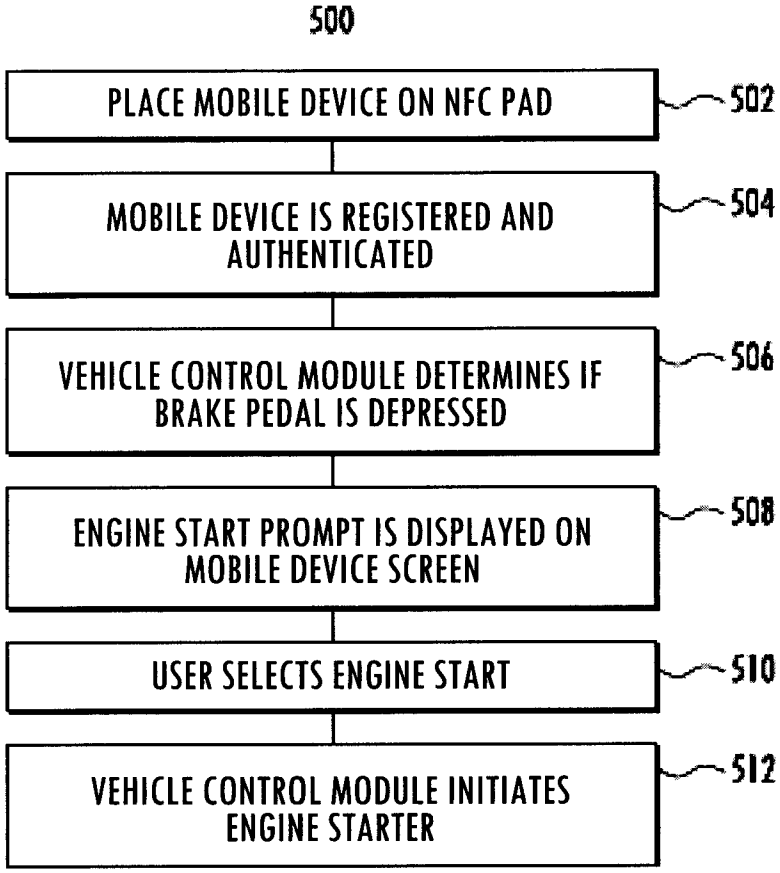
[Fig. 5]


300
PLACE MOBILE DEVICE ON NFC PAD
302
VEHICLE CONTROL MODULE AUTHENTICATES KEY FOB
304
VEHICLE CONTROL MODULE AUTHENTICATES MOBILE DEVICE REGISTERED
306
AUTHENTICATION COMPLETE
308

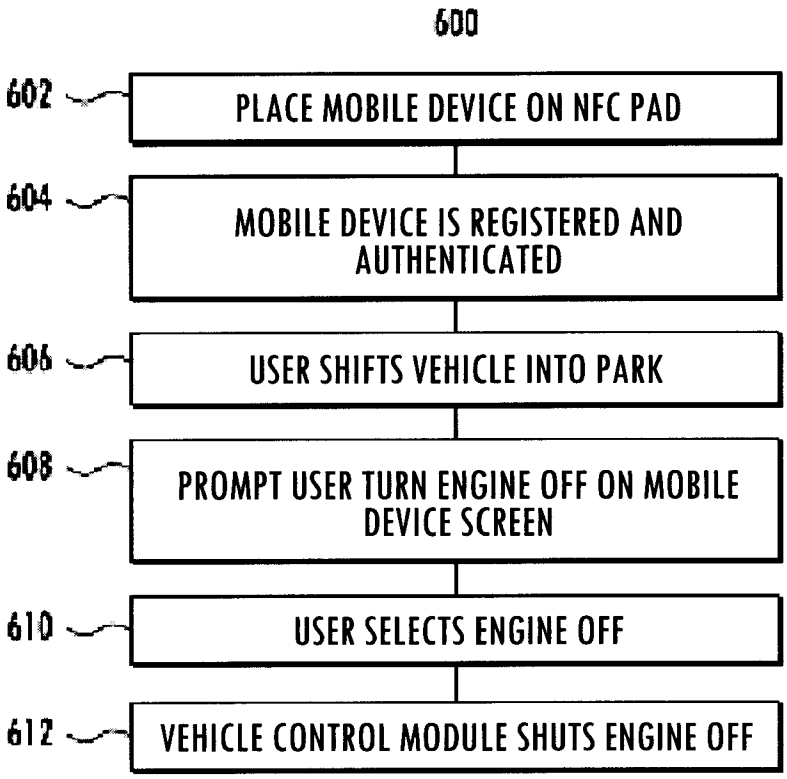
[Fig. 6]


400
402
PLACE MOBILE DEVICE ON NFC PAD
404
MOBILE DEVICE IS REGISTERED AND AUTHENTICATED
406
USER STOPS ENGINE
408
PROMPT USER TO DOWNLOAD USER PREFERENCES ON MOBILE DEVICE
410
USER ACCEPTS OR DENIES DOWNLOADING DATA ON MOBILE DEVICE
412
VEHICLE CONTROL MODULE SENDS DATA WIRELESSLY TO MOBILE DEVICE
414
MOBILE DEVICE LEARNS AND STORES DATA

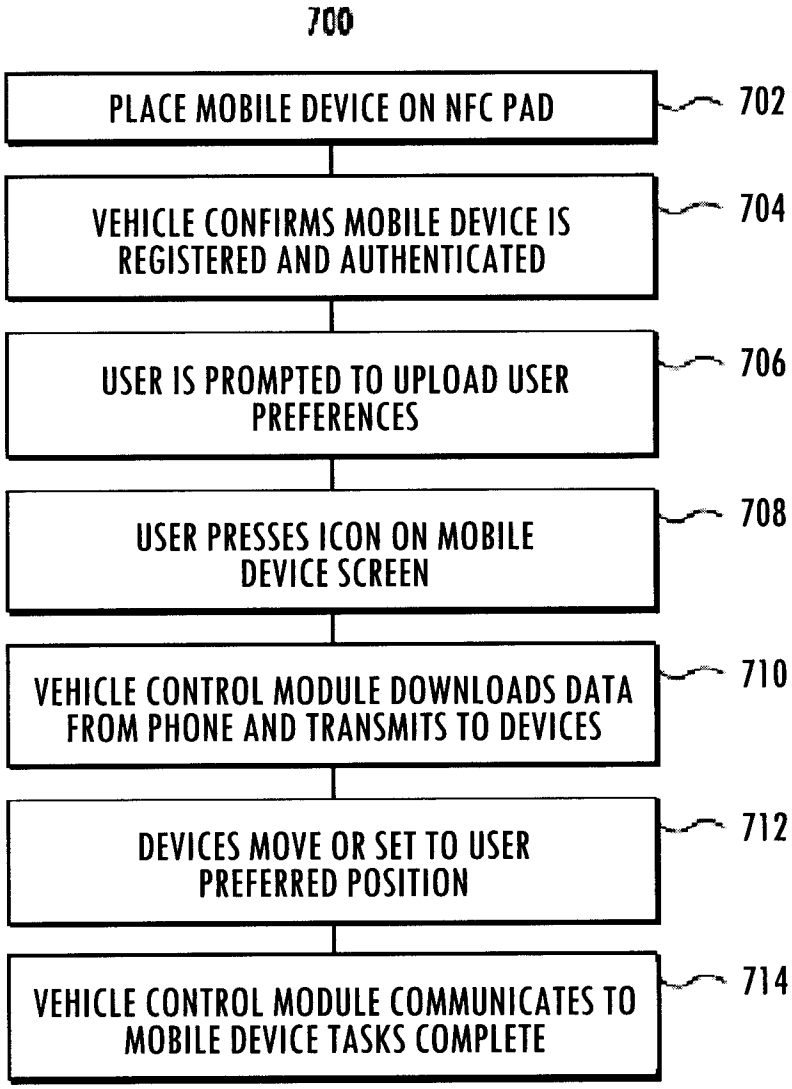
[Fig. 7]


500
PLACE MOBILE DEVICE ON NFC PAD
502
MOBILE DEVICE IS REGISTERED AND AUTHENTICATED
504
VEHICLE CONTROL MODULE DETERMINES IF BRAKE PEDAL IS DEPRESSED
506
ENGINE START PROMPT IS DISPLAYED ON MOBILE DEVICE SCREEN
508
USER SELECTS ENGINE START
510
VEHICLE CONTROL MODULE INITIATES ENGINE STARTER
512

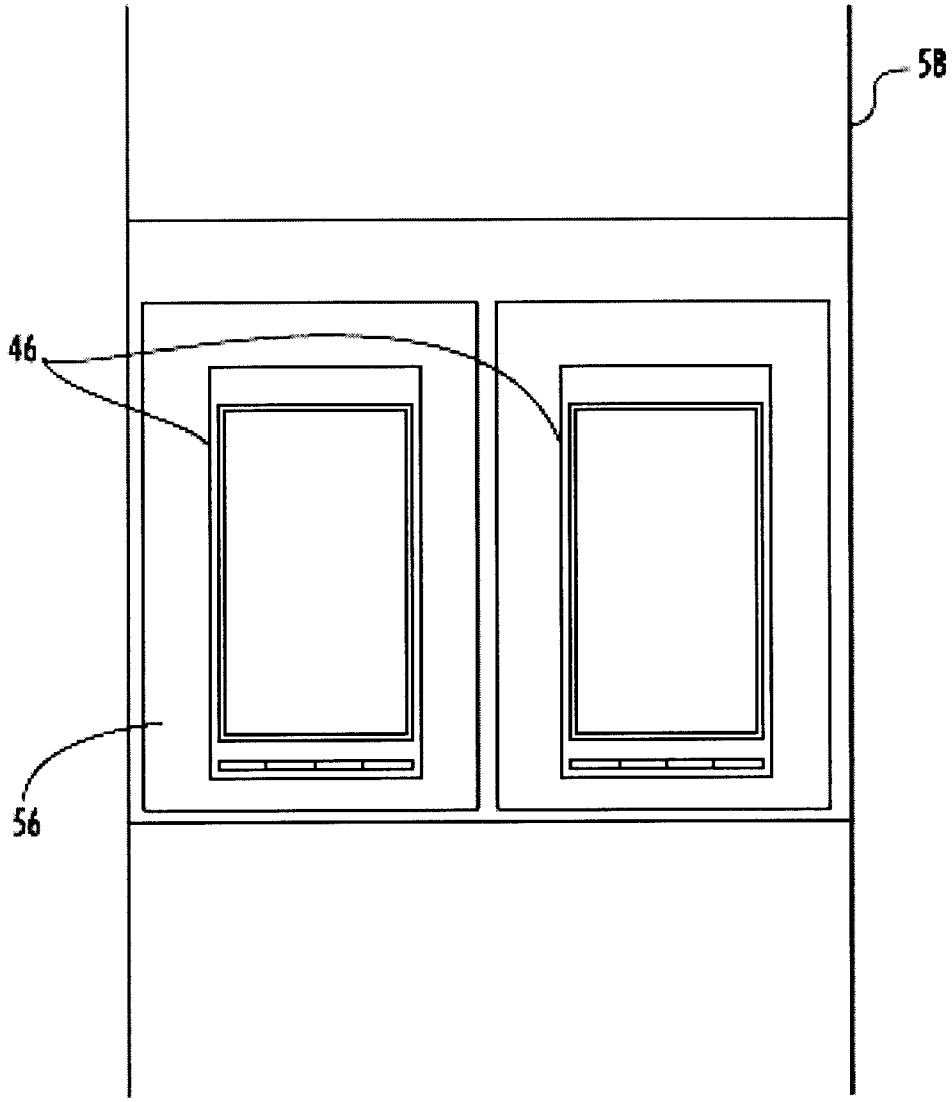
[Fig. 8]


600
602
PLACE MOBILE DEVICE ON NFC PAD
604
MOBILE DEVICE IS REGISTERED AND AUTHENTICATED
606
USER SHIFTS VEHICLE INTO PARK
608
PROMPT USER TURN ENGINE OFF ON MOBILE DEVICE SCREEN
610
USER SELECTS ENGINE OFF
612
VEHICLE CONTROL MODULE SHUTS ENGINE OFF

[Fig. 9]


700
PLACE MOBILE DEVICE ON NFC PAD
702
VEHICLE CONFIRMS MOBILE DEVICE IS REGISTERED AND AUTHENTICATED
704
USER IS PROMPTED TO UPLOAD USER PREFERENCES
706
USER PRESSES ICON ON MOBILE DEVICE SCREEN
708
VEHICLE CONTROL MODULE DOWNLOADS DATA FROM PHONE AND TRANSMITS TO DEVICES
710
DEVICES MOVE OR SET TO USER PREFERRED POSITION
712
VEHICLE CONTROL MODULE COMMUNICATES TO MOBILE DEVICE TASKS COMPLETE
714

[Fig. 10]



INTERNATIONAL SEARCH REPORT

International application No
PCT/JP2013/006035

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04M1/725
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04M G08C G07C B60R G01C

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/222939 A1 (NAMBURU SETU MADHAVI [US] ET AL) 2 September 2010 (2010-09-02)	1-3, 6-12,14, 16,17,19
Y	paragraph [0001] paragraph [0003] paragraph [0029] - paragraph [0031] paragraph [0034] - paragraph [0035] paragraph [0037] paragraph [0040] - paragraph [0050] paragraph [0053] paragraph [0056] - paragraph [0067] figures 1,2B,4-7,8A	4,5,13, 15,18

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
7 February 2014	20/02/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Banerjea, Robin

1

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INTERNATIONAL SEARCH REPORT

International application No
PCT/JP2013/006035

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	EP 1 884 415 A1 (SAMSUNG ELECTRONICS CO LTD [KR]) 6 February 2008 (2008-02-06)	4,13
A	paragraph [0002] paragraph [0008] - paragraph [0013] paragraph [0016] - paragraph [0022] paragraph [0025] - paragraph [0029] paragraph [0032] - paragraph [0044] figures 1-7	1,3,6-8, 10,14, 16,17

Y	US 2008/272889 A1 (SYMONS PETER ROBERT [GB]) 6 November 2008 (2008-11-06) abstract paragraph [0018] paragraph [0026] - paragraph [0028] paragraph [0086] - paragraph [0091] figures 1,6	5,18

Y	US 2006/061458 A1 (SIMON GREGORY [US] ET AL) 23 March 2006 (2006-03-23) paragraph [0009] paragraph [0021] page 31	15

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1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/JP2013/006035

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