A phone-safe vehicle system comprising a vehicle with an engine and a vehicle immobilizer, a vehicle key system and a phone-safe unit (PSU) on-board the vehicle is provided. The PSU is configured to monitor the vehicle key system and to determine when a vehicle start signal is issued by the vehicle key system. The PSU is also configured to perform a short-distance search for mobile signal activity arising from active mobile terminals within the vehicle, when a vehicle start signal is detected. Furthermore, the PSU is configured to receive confirmation from an active mobile terminal that a phone safe mobile application (PSMA), which limits the functionality of the mobile terminal, is activated, and to issue an un-lock signal for the vehicle immobilizer, to thereby allow start of the vehicle, when the confirmation that the PSMA is activated has been received. There is also provided a method for controlling the operational state of a vehicle immobilizer.
TITLE

SYSTEM AND METHOD FOR CONTROLLING A VEHICLE IMMOBILIZER

TECHNICAL FIELD

The present invention relates to the field of detecting usage of wireless devices in a vehicle and controlling a vehicle immobilizer.

BACKGROUND

Mobile devices such as wireless devices, including, for example, cellular telephones, smart phones, laptop computers, notebook computers, tablet devices are ubiquitous in modern society. Use of such mobile devices while operating a vehicle, however, can be hazardous. The problem is exacerbated for inexperienced operators of the vehicle, such as youngsters just learning how to drive. Rates of vehicular accidents where mobile devices are involved are rising, especially with teenagers. Text messaging while operating a moving vehicle can be dangerous and has been linked with causing accidents. More generally, operating any keyboard while operating a vehicle can be dangerous.

Thus, the widespread adoption of mobile devices and common use of the devices while driving has raised concerns about the distraction of drivers. A driver speaking or text messaging on a mobile telephone may become mentally distracted from driving and lose control of the vehicle that he or she is driving. Thus, it is not uncommon to see an individual involved in an accident who was speaking or text messaging on a mobile device rather than paying attention to the road. Studies now suggest that individuals speaking on mobile telephones while driving a car may be as impaired as a person who drives while intoxicated. Not only is the driver mentally distracted, but eyes of the driver are diverted for dialing, looking to see who an incoming call is from.

It would be highly desirable to detect the presence of a mobile device such as a wireless device within a vehicle and control or disable the operation of the mobile device.
SUMMARY

It is an object of the present invention to provide a system and a method, which provide an improved solution to the problem of controlling the operation mode of a wireless mobile terminal within a vehicle.

The foregoing and other objects are achieved by the features of the independent claims. Further implementation forms are apparent from the dependent claims, the description and figures.

According to a first aspect, there is provided a phone-safe vehicle system comprising a vehicle with an engine and a vehicle immobilizer, a vehicle key system and a phone-safe unit (PSU) on-board the vehicle, wherein the phone-safe unit is configured to:

- monitor the vehicle key system to determine when a vehicle start signal is issued by the vehicle key system;
- perform upon detection of a vehicle start signal a signal search or short-distance signal search for mobile signal activity arising from active mobile terminals within said vehicle;
- receive confirmation from an active mobile terminal that a phone safe mobile application (PSMA), which limits the functionality of the mobile terminal, is activated; and
- issue, upon receiving said confirmation that the PSMA is activated, an un-lock signal for the vehicle immobilizer, to thereby allow start of the vehicle.

According to an embodiment of the invention then, when one or more active mobile terminals are detected during the signal search or short-distance signal search, the phone-safe unit is configured to issue the un-lock signal for the vehicle immobilizer only when a confirmation is received that a PSMA is activated for each of the detected mobile terminals.

It is within one or more embodiments of the invention that when no active mobile terminals are detected during the signal search or short-distance signal search, then the phone-safe unit is configured to issue an un-lock signal for the vehicle immobilizer without having received any confirmation of a PSMA being activated.
According to one or more embodiments of the invention the phone-safe unit is configured to:

determine if an active mobile terminal, for which confirmation is received that a PSMA is activated, is a verified user terminal; and

issue the un-lock signal for the vehicle immobilizer only when it is determined that the active mobile terminal for which the PSMA is activated is a verified user terminal. Here, when one or more active mobile terminals are detected during the short-distance signal search, the phone-safe unit may be configured to issue the un-lock signal for the vehicle immobilizer only

when a confirmation is received that a PSMA is activated for each of the detected mobile terminals, and

when it is determined that each of the active mobile terminals is a verified user terminal.

It is preferred that the vehicle immobilizer, the vehicle key system and the phone-safe unit are configured to bring the vehicle immobilizer to an un-locked condition when the un-lock signal for the vehicle immobilizer is issued, and further to start the vehicle engine when the vehicle immobilizer is un-locked by issue of the un-lock signal.

It is within an embodiment of the invention that the system of the invention also includes one or more mobile terminals. Here, it is preferred that one or more or all of the mobile terminals of the system are configured to forward a confirmation signal to the phone-safe unit upon activation of a PSMA within the mobile terminal.

The invention covers embodiments wherein the phone-safe unit is configured to detect unique identifier information for an active mobile terminal for which confirmation is received that a PSMA is activated. The phone-safe unit may be configured to determine if an active mobile terminal is a verified terminal based on the detected unique identifier information. The phone-safe unit may also be configured to communicate with an active mobile terminal based on the detected unique identifier information. Furthermore, the phone-safe unit may be configured to:

establish communication with each active mobile terminal for which confirmation is received that a PSMA is activated;

determine if there are any detected active mobile terminals, for which communication is not established; and
issue the un-lock signal for the vehicle immobilizer only if communication is established to all detected active mobile terminals.

It is within an embodiment of the invention that the system of the invention further comprises a database holding data for mobile terminals being verified user terminals each having a PSMA installed, and wherein the phone-safe unit is configured to determine if an active terminal, for which confirmation is received that a PSMA is activated, is a verified user terminal based on the detected unique identifier information and data of the database. The phone-safe unit may hold the database. However, it is also within an embodiment of the invention that the system of the invention further comprises a service platform holding the database, and that the phone-safe unit is configured to communicate with the service platform through a wireless communication network to determine if a detected mobile terminal is a verified user terminal.

According to one or more embodiments of the invention, the phone-safe unit is configured to communicate with active mobile terminals via a wireless communication network.

It is within one or more embodiments of the invention that the phone-safe unit is configured to:

monitor the vehicle key system to determine when a vehicle stop signal is issued by the vehicle key system; and

communicate to each active mobile terminal, for which confirmation is received that a PSMA is activated, that the PSMA can be de-activated. Here, for systems of the invention comprising a mobile terminal, then an active mobile terminal is configured to de-activate the PSMA within said active mobile terminal upon receiving information from the phone-safe unit that the reduced functionality module can be de-activated.

According to an embodiment of the invention the phone-safe unit is configured to perform the signal search or short-distance signal search based on the power of a transmit signal from an active mobile terminal. Here, the power from the mobile terminal may have to succeed a predetermined threshold value, before the mobile terminal is detected as an active mobile terminal.
It is within an embodiment of the invention that the system comprises one or more mobile terminals holding a PSMA. Here, one or more of said mobile terminals holding a PSMA may be configured for near field communication with an external near field communication, NFC, tag or chip. It is also within an embodiment of the invention that the system further comprises a holder located inside the vehicle for holding a mobile terminal, wherein the holder holds a NFC tag configured to issue a change setting command to the mobile terminal when communicating with the mobile terminal, and wherein the mobile terminal holding a PSMA is configured to activate the PSMA upon receiving the change setting command from the NFC tag.

It is within one or more embodiments of the invention that a PSMA when activated on a mobile terminal limits the functionality of the mobile terminal. The PSMA may limit the functionality in order to allow incoming calls only, or to allow incoming calls only except for allowing outgoing alarm calls. The PSMA may be configured to hold a GPS application. Here, the GPS application may have a reduced functionality, which will only allow the GPS application to be used in a preset mode. In the preset mode the GPS may only be programmed when the vehicle is not driving, or driving at very low speed, such as below 15 km/h.

According to the present invention there is also provided a method for controlling the operational state of a vehicle immobilizer for an engine of a vehicle with a vehicle key system, said method comprising:

monitoring the vehicle key system to determine when a vehicle start signal is issued by the vehicle key system;

performing upon detection of a vehicle start signal a signal search or short-distance signal search for mobile signal activity arising from active mobile terminals within said vehicle;

activating a phone safe mobile application (PSMA), which limits the functionality of a mobile terminal, of an active mobile terminal detected during said short-distance signal search; and

issuing upon activation of the PSMA of the detected mobile terminal an unlock signal for the vehicle immobilizer, to thereby allow start of the vehicle engine.

For the method of the invention it is preferred that when one or more active mobile terminals are detected during the signal search or short-distance signal search, then
the step of issuing the un-lock signal for the vehicle immobilizer is performed only when a PSMA is activated for each of the detected mobile terminals.

According to an embodiment of the method of the invention then, when no active mobile terminals are detected during the signal search or short-distance signal search, an un-lock signal for the vehicle immobilizer is issued without any activation of a reduced functionality module.

It is within one or more embodiments of the method of the invention that the step of activating a PSMA of a detected mobile terminal is followed by the step:

determine if the active mobile terminal for which the PSMA is activated is a verified user terminal, and wherein

the step of issuing the un-lock signal for the vehicle immobilizer is performed only when it is determined that the active mobile terminal for which the PSMA is activated is a verified user terminal.

According to an embodiment of the method of the invention then, when one or more active mobile terminals are detected during the short-distance signal search and a PSMA is activated for each of the detected mobile terminals, the step of issuing the un-lock signal for the vehicle immobilizer is performed only when it is determined that each of the active mobile terminals for which the PSMA is activated is a verified user.

It is within an embodiment of the method of the invention that the activation of a PSMA of an active local mobile terminal is performed by a user input.

According to an embodiment of the method of the invention, the vehicle immobilizer may be in a locked condition before the vehicle start signal is issued by the vehicle key system, and the vehicle immobilizer may be shifted to an un-locked condition when the un-lock signal for the vehicle immobilizer is issued.

It is also within an embodiment of the method of the invention that the method further comprises the step of starting the vehicle engine upon issue of the un-lock signal for the vehicle immobilizer.

According to one or more embodiments of the method of the invention, the method further comprises:
monitoring the vehicle key system to determine when a vehicle stop signal is
issued by the vehicle key system; and
communicate to each active mobile terminal for which a PSMA is activated,
that the PSMA can be de-activated.

According to a second aspect, there is provided a phone-safe system comprising:
a mobile terminal configured for near field communication with an external
near field communication, NFC, tag or chip; and
a holder for holding the mobile terminal;
wherein the holder holds a NFC tag configured to issue a change setting
command to the mobile terminal when communicating with the mobile terminal; and
wherein the mobile terminal holds a reduced functionality module and is
configured to activate the reduced functionality module upon receiving the change
setting command from the NFC tag.

It is within an embodiment of the second aspect of the invention that the holder for
holding the mobile is located within a vehicle.

It is also within an embodiment of the second aspect of the invention that the reduced
functionality module is a phone safe mobile application, PSMA.

It is within one or more embodiments of the second aspect of invention that a PSMA
when activated on a mobile terminal limits the functionality of the mobile terminal.
The PSMA may limit the functionality in order to allow incoming calls only, or to allow
incoming calls only except for allowing outgoing alarm calls. The PSMA may be
configured to hold a GPS application. Here, the GPS application may have a reduced
functionality, which will only allow the GPS application to be used in a preset mode.
In the preset mode the GPS may only be programmed when the vehicle is not
driving, or driving at very low speed, such as below 15 km/h.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram including components of a phone-safe vehicle system
according to an embodiment of the invention;
Fig. 2 is a block diagram including the components Fig.1 with a wireless mobile terminal within a phone-safe vehicle according to an embodiment of the invention;

Fig. 3 is a block diagram illustrating a phone-safe unit according to an embodiment of the invention;

Fig. 4 is an action flow diagram illustrating a method of controlling a vehicle immobilizer according to an embodiment of the invention;

Fig. 5 is a data flow diagram illustrating a method of controlling a vehicle immobilizer according to an embodiment of the invention;

Fig. 6 is a block diagram illustrating a phone-safe mobile application according to an embodiment of the invention; and

Fig. 7 is a block diagram illustrating installation of a phone-safe mobile application in a mobile terminal according to an embodiment of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE PRESENT INVENTION

In one embodiment, the present disclosure provides a system and method for detecting and restricting the use of mobile terminals or devices within a vehicle and controlling a vehicle immobilizer. Mobile terminals or devices, such as wireless devices, may include without limitation, for example, cellular telephones, smart phones, laptop computers, notebook computers, tablet devices, among other wireless mobile devices that a user can interact with while located in a vehicle. If an active mobile terminal is detected, the operation of the mobile device may be modified in order to let the vehicle start driving.

Figs. 1 and 2 are block diagrams including components of a phone-safe vehicle system 100 according to an embodiment of the invention. The system 100 comprises a vehicle 110 with an engine (not shown) and a vehicle immobilizer 111, a vehicle key system 112 and a phone-safe unit (PSU) 120 on-board the vehicle. The system 100 may also comprise a wireless mobile terminal 130, which holds general mobile applications 131 and a phone-safe mobile application (PSMA) 140, which limits the functionality of the mobile terminal when activated. The system may also comprise a
server system 160 with a service platform 170, which may hold a database. The PSU 120, the mobile terminal 130, and the service platform 170 can communicate through a wireless communication network 150. In Fig. 1 the mobile terminal is shown outside the vehicle 110, while in Fig. 2 the mobile terminal 130 is shown inside the vehicle 110.

The mobile terminal 130 may be configured for near field communication with an external near field communication, NFC, tag or chip, and the system 100 may further comprise a holder (not shown) located inside the vehicle 110 for holding the mobile terminal 130. The holder may hold a NFC tag configured to issue a change setting command to the mobile terminal 130 when communicating with the mobile terminal 130, and the mobile terminal holding a PSMA may be configured to activate the PSMA 140 upon receiving the change setting command from the NFC tag.

Fig. 3 is a block diagram illustrating a phone-safe unit (PSU) 120 according to an embodiment of the invention. The PSU 120 comprises a controller 121 for controlling the functions of the PSU 120, a signal search application (SSA) 124, which when activated is configured to perform a signal search for mobile signals arising from mobile terminals within the vehicle 110 hosting the PSA 120. The PSU 120 further comprises an immobilizer interface 122 for forwarding lock and un-lock signals to the immobilizer 111 of the vehicle 110, a key system interface 123 for detecting when a start and a stop signal is issued by the vehicle’s 110 key system 112, a signal search interface 125 for interfacing with the signal search application (SSA) 124, a data storage 127, which may hold a database, and a network interface 126 for wireless communication with a service platform 170 and mobile terminals 130. The signal search application (SSA) 124 may be configured to perform short-distance signal searches for mobile activity, which search may be restricted to the internal part of the vehicle. The PSU 120 may be a single unit, but the PSU 120 may also be composed of several separate units. Thus, the SSA 124 may be an integral part of the PSU 120, but is may also be a separate unit or part.

Fig. 4 is an action flow diagram illustrating a method of controlling a vehicle immobilizer according to an embodiment of the invention, for which the actions are as follows:
Step 401: Immobilizer 111 locked. Before the vehicle is started, the immobilizer 111 is locked.

Step 402: Vehicle start signal. The vehicle key system 112 is configured to forward a signal, such as a RFID signal, to the key system interface 123 of the PSU 120, when the vehicle 110 is to be started by activation of a start key or a key card or other start functionalities. The PSU 120 is configured to monitor the vehicle key system 112 and determines when a vehicle start signal is issued by the vehicle key system 112.

Step 403: Mobile signal search. When a vehicle start signal is detected at the PSU 120, the PSU 120 activates the signal search application (SSA) 124, which performs a signal search, or a short-distance signal search, for mobile signal activity arising from active mobile terminals 130 within the vehicle. If no mobile signals are detected during the signal search, then the process turns to step 406, in which the PSU 120 issues a un-lock signal for the vehicle immobilizer 111, whereby the immobilizer 111 is no more locked by the PSU 120, and the vehicle may be started. If one or more mobile signals are detected at step 403, the process turns to step 404.

Step 404: Is phone safe mobile application, PSMA, 140 activated? When a person using a mobile terminal 130, such as a driver, enters the vehicle, this person can either have a mobile terminal without the PSMA 140 installed, or the PSMA 140 is installed at the terminal 130. If no PSMA 140 is installed, the mobile terminal can be non-active or active. If non-active there is no signal detected from this mobile terminal, and when no signals are detected at step 403, then this leads to step 406. If the mobile terminal having no PSMA 140 is active, then no confirmation can be received from this mobile terminal that a PSMA 140 is activated on the terminal, and the process turns to step 401, and maintains the immobilizer 111 in a locked condition.

If a PSMA 140 is installed, the mobile terminal 130 can be non-active or active. If non-active there is no signal detected from this mobile terminal, and when no signals are detected at step 403, then this leads to step 406. If the mobile terminal 130 having a PSMA 140 is active, then the PSMA 140 can be non-active or activated. If the PSMA 140 is non-active, no confirmation can be received from this mobile terminal that a PSMA 140 is activated on the terminal, and the process turns to step 401, and maintains the immobilizer 111 in a locked condition. If the PSMA 140 is
activated at the mobile terminal 130, then the PSMA 140 sets the mobile terminal 130 to transmit a confirmation signal to the PSU 120. The PSMA holds information of the corresponding PSU 120, and the confirmation signal may be transmitted by wireless transmission directly to the PSU 120 based on information obtained for the PSU 120, such as for example a call or phone number to be read by a user of the mobile terminal 130, or based on information stored in the PSMA 140. The confirmation signal may also or alternatively be transmitted to the service platform 170, which then re-transmits the signal to the PSU 120 by wireless transmission.

If only one active mobile terminal 130 is detected during the signal search at step 403, and if a confirmation signal is received at the PSU 120 that the PSMA is activated, then the process turns to step 405. If more than one active mobile terminal 130 is detected at step 403, then a PSMA active confirmation signal shall be received by the PSU 120 for each detected active terminal 130, before the process turns to step 405. If one or more active terminals 130 are not communicating a PSMA active confirmation signal to the PSU 120, then the process turns to step 401.

When the PSU 120 receives a PSMA active confirmation signal from a mobile terminal 130, then the PSU 120 at the same time may receive information for identifying the terminal 130 and communicating with the terminal 130. According to an embodiment of the invention the PSU 120 may communicate with each mobile terminal 130 for which a PSMA active confirmation signal has been received, in order to secure or determine that a PSMA active confirmation signal is received for each active mobile terminal 130 detected at step 403. If communication cannot be established to all detected terminals 130, then the process turns to step 401, and no un-lock signal is issued. If communication is established to all terminals 130, for which a PSMA active confirmation signal is received and these terminals correspond to the terminals detected at step 403, then the process turns to step 405.

It is noted that the present invention also covers an embodiment, which leaves out step 405, and turns directly to step 406, if a PSMA active confirmation signal has been received by the PSU 120 for each detected active terminal 130.

Step 405: Verification of mobile terminal 130. When a PSMA 140 is installed at a mobile terminal 130 in order to operate with a given PSU 120 installed at a vehicle 110, then information about the mobile terminal 130, on which the PSMA 140 is
installed, are stored in a database on the service platform 170, which platform 170 also holds data for the corresponding PSU 120. The database of the platform 170 may also hold information relating to the user of the mobile terminal. For a given PSU 120, corresponding database information may be communicated from the platform 170 to the PSU 120, which may then hold its own database.

When the PSU 120 receives a PSMA active confirmation signal from a mobile terminal 130, it receives information holding a unique identifier for this mobile terminal 130. The PSU 120 may then determine, based on data in the database and the received unique identifier information, if the mobile terminal 130 sending the PSMA confirmation signal, is a verified terminal. This determination can also or alternatively be performed by the service platform 170, where in the latter case the service platform forwards the verification result to the PSU 120. When the process has arrived at step 405 and all the terminals 130 with an active PSMA are determined to be verified mobile terminals 130, then the process proceeds to step 406, in which the PSU 120 issues a un-lock signal for the vehicle immobilizer 111, whereby the immobilizer 111 is no more locked by the PSU 120, and the vehicle may be started. If in step 405 one or more mobile terminals 130 are not verified, the process turns to step 401, and the immobilizer 111 is maintained in a locked condition.

For the mobile signal search, step 403, an active mobile signal to be detected can be a GSM, LTE, 3G, 4G, Bluetooth or Wi-Fi signal. An active mobile signal may be detected based on the power of a signal transmitted from a mobile terminal 130. Here, a signal may be considered to represent a mobile terminal 130 when the signal power exceeds a predefined threshold value obtained by SSA 124.

The wireless communication between the PSU 120 and a mobile terminal 130, between the mobile terminal 130 and the service platform 170, and between the PSU 120 and the service platform 170, may in at least some implementations be performed by use of machine-to-machine (M2M) data exchange.

Fig. 5 is a data flow diagram illustrating a method of controlling a vehicle immobilizer according to an embodiment of the invention. The data flows illustrated in Fig. 5 correspond to the actions described in connection with Fig. 4.
At 501 a vehicle start signal is issued by the vehicle key system 112, and detected by the PSU 120. At 502 the PSU controller 121 then activates the signal search application 124. At 503 the signal search application 124 receives and detects mobile signal(s) from one or more active mobile terminals 130, and at 504 the signal search application forwards the signal search result to the PSU controller 121. At 505 an active mobile terminal 130 having a PSMA 140 installed has activated the PSMA 140 and a PSMA active confirmation signal is forwarded from the mobile terminal 130 to the PSU 120. At 506 the PSU controller 121 forwards a verification request to the service platform 170, which request holds unique identifier information for the mobile terminal 130 forwarding the PSMA active confirmation signal. At 507, after verification of the mobile terminal 130 at the service platform 170, the service platform 170 forwards the verification result to the PSU 120. At 508, in case the verification is positive, the PSU 120 communicates to the mobile terminal 130 that the PSU 120 has received the PSMA confirmation signal and that the terminal 130 has been verified. At 509, in case verification is positive, the PSU 120 then issues a un-lock signal for releasing the immobilizer 111 and the vehicle can be started. At 510 a vehicle stop signal is issued by the vehicle key system 112 and received by the immobilizer, whereby the immobilizer is brought into the locked condition. At 511 the vehicle stop signal issued by the vehicle key system 112 is forwarded to the PSU 120, and at 512 the PSU 120 forwards a signal to the mobile terminal 130 that the PSMA can now be de-activated.

It is noted that the communication performed at 508 is optional. It is also noted that the verification of the mobile terminal 130 may be performed within the PSU 120 when the PSU 120 holds the database information, and thus data flows 506 and 507 may be within the PSU 120. As already mentioned the present invention covers embodiments which leave out the verification process, which would then leave out the data flows 506 and 507.

Fig. 6 is a block diagram illustrating a phone-safe mobile application, PSMA, 140 according to an embodiment of the invention. The PSMA is an application which when activated limits the functionality of the mobile terminal 130, hosting the PSMA 140. It is preferred that the PSMA 140 controls the mobile terminal 130 so that only incoming calls are allowed. This reduced functionality can be combined with the use of a hands-free technology, such as Bluetooth®, 141. Being configured to only allow incoming calls, the PSMA may however be configured to allow outgoing alarm calls,
whereby an alarm central application 143 may be part of the PSMA 140 showing a 
single button at the terminal 130, which may be activated to call an alarm central. 
The PSMA 140 may also be configured to hold a GPS application 142, where the 
GPS application 142 may have a reduced functionality, which will only allow the GPS 
application 142 to be used in a preset mode. In the preset mode the GPS application 
142 may only be programmed when the vehicle is not driving, or driving at very low 
speed, such as below 15 km/h.

When the mobile terminal 130 is configured for near field communication with an 
external near field communication, NFC, tag or chip, and a mobile terminal holder is 
located inside the vehicle 110, where the holder holds a NFC tag configured to issue 
a change setting command to the mobile terminal 130 to thereby activate the PSMA 
140, then the GPS application 142 may automatically be activated when the PSMA 
140 is activated, which can be by setting the mobile terminal 130 into the holder.

Fig. 7 is a block diagram illustrating installation of a phone-safe mobile application, 
PSMA 140 in a mobile terminal 130 according to an embodiment of the invention. 
Each PSMA 140, which is installed at a mobile terminal 130, needs to be registered 
in a database from where it can be verified. The database can be at the service 
platform 170 of the server system 160. The PSMA 140 can be downloaded via the 
server system 160 and the service platform 170, and when a user of a mobile 
terminal downloads the PSMA 140, the PSMA 140 may control the mobile terminal 
130 in order to make the user perform registration of the terminal 130 and the user at 
the database in the service platform 170.

When a PSU 120 is installed or is to be installed in a vehicle 110, a number of mobile 
terminals 130 may be connected to this PSU 120, which mobile terminals 130 may 
then be users of a PSMA 140 when being in the vehicle 110. The PSU may hold call 
information of each of the terminals 130 connected to the PSU 120, and the PSU 
may send a message to each of these mobile terminals 130 that a PSMA 140 can be 
downloaded to the terminal 130. Also here, when a PSMA 140 is downloaded to a 
mobile terminal 130, the PSMA 140 may control the mobile terminal 130 in order to 
make the user perform registration of the terminal 130 and the user at the database 
in the service platform 170. The service platform 170 may then inform the PSU 120 
which of the connected mobile terminals 130 has registered as PSMA users, and the
PSU 120 may hold a database 127, which stores information of connected terminals 130 being registered as PSMA users.

It is noted that mobile terminals 130 having a PSMA 140 installed, but which are not connected to the PSU 120 of a vehicle 110, can also be used within said vehicle 110. Here, the PSU 120 may need to communicate with the database of the service platform 170 in order to verify a mobile terminal 130 as a registered PSMA user.

Although the present invention has been described with reference to specific features and embodiments thereof, it is evident that various modifications and embodiments can be made thereto without departing from the spirit and scope of the invention. The specification and drawings are, accordingly, to be regarded as an illustration of the invention as defined by the appended claims, and are contemplated to cover any and all modifications, variations, combinations or equivalents that fall within the scope of the present invention.

The term "comprising" as used in the appended claims does not exclude other elements or steps. The term "a" or "an" as used in the appended claims does not exclude a plurality.

Any method described herein and in the claims may be supplemented by any features of the apparatuses and systems described herein and in the claims in terms of method features.
PATENTKRAV

1. Phone-safe-bilsystem, der omfatter en bil med en motor og en bilstartspærreanordning, et bilnøglesystem og en phone-safe-unit (PSU), der er monteret i bilen, hvor phone-safe-unitten er konfigureret til at:
   overvåge bilnøglesystemet for at bestemme, når et bilstarts signal udsendes af bilnøglesystemet;
   udføre, efter detektering af et bilstarts signal, en kortdistancesignalsøgning for mobil signal aktivitet, der stammer fra active mobilterminaler inde i bilen;
   modtage bekænfelse fra en aktiv mobilterminal om, at en phone safe mobile- applikation (PSMA), der begrænser mobil terminalens funktionalitet, er aktiveret;
   bestemme, om den aktive mobilterminal, for hvilken bekænfelse er modtaget om, at en PSMA er aktiveret, er en godkendt brugerterminal med en unik identitet, der kendes af phone-safe-unitten; og
   kun udsende en oplåsningssignal for bilens startspærreanordning, når det er bestemt, at den aktive bilterminal, for hvilken PSMA'en er aktiveret, er en godkendt brugerterminal.

2. System ifølge krav 1, hvor, når flere active mobilterminaler er detekteret under kortdistancesignalsøgningen, phone-safe-unitten er konfigureret til kun at udsende oplåsningssignalet for bilens startspærreanordning
   når der er modtaget en bekænfelse om, at en PSMA er aktiveret for hver af de detekterede mobilterminaler, og
   når det er bestemt, at hver aktiv mobilterminal, for hvilken PSMA'en er aktiveret, er en godkendt brugerterminal.

3. System ifølge krav 1 eller 2, hvor, når ingen active mobilterminaler er detekteret under kortdistancesignalsøgningen, phone-safe-unitten er konfigureret til at udsende et oplåsningssignal for bilens startspærreanordning uden at have modtaget nogen bekænfelse om, at en PSMA er aktiveret.

4. System ifølge et hvilket som helst af kravene 1 til 3, hvor phone-safe-unitten er konfigureret til at detektere unikke identifikatorinformationer for en aktiv mobilterminal, for hvilken der er modtaget bekænfelse om, at en PSMA er aktiveret, og hvor phonesafe-unitten er konfigureret til at bestemme, om en aktiv mobilterminal er en godkendt terminal baseret på de detekterede unikke identifikatorinformationer.
5. System ifølge krav 4, hvor systemet endvidere omfatter en database med data for mobilterminaler, der er godkendte brugerterminaler, der hver har en PSMA installeret, og hvor phone-safe-unititen er konfigureret til at bestemme, om en aktiv terminal, for hvilken bekræftelse er modtaget om, at en PSMA er aktiveret, er en godkendt brugerterminal baseret på de detekterede unikke identifikatorinformationer og data fra databasen.

6. System ifølge et hvilket som helst af kravene 1 til 5, hvor phone-safe-unititen er konfigureret til at:
   overvåge bilnøglesystemet for at bestemme, når et bilstopsignal udsendes af bilnøglesystemet; og
   kommunikere til hver aktiv mobilterminal, for hvilken der er modtaget bekræftelse om, at en PSMA er aktiveret, at PSMA’en kan deaktiveres.

7. Fremgangsmåde til styring af driftstillstanden for en bilstartspærreanordning til en motor i en bil med et bilnøglesystem og en phone-safe-unit (PSU), der er monteret i bilen, hvilken fremgangsmåde omfatter:
   overvågning af bilnøglesystemet for at bestemme, når et bilstartsignal udsendes af bilnøglesystemet;
   udførelse, efter detektering af et bilstartsignal, af en kortdistancesignalsøgning for mobilsignalaktivitet, der stammer fra aktive mobilterminaler inde i bilen;
   aktivering af en phone safe mobile-applikation (PSMA), der begrænser en mobilterminals funktionalitet, af en aktiv mobilterminal, der er detekteret under kortdistancesignalsøgningen;
   bestemmelse af, om den aktive bilterminal, for hvilken PSMA’en er aktiveret, er en godkendt brugerterminal med en unik identifikator, der kendes af phone-safe-unititen; og
   kun udsendelse af et oplåsningssignal for bilens startspærreanordning, når det er bestemt, at den aktive bilterminal, for hvilken PSMA’en er aktiveret, er en godkendt brugerterminal.

8. Fremgangsmåde ifølge krav 7, hvor flere aktive mobilterminaler er detekteret under kortdistancesignalsøgningen, og hvor trinnet med udsendelse af oplåsningssignalet for bilens startspærreanordning kun udføres, når en PSMA er aktiveret for hver af de detekterede mobilterminaler; og
når det er bestemt, at hver aktiv mobilterminal, for hvilken PSMA'en er aktiveret, er en godkendt brugertilinal.

9. Fremgangsmåde ifølge krav 7 eller 8, hvor, når ingen aktive mobilterminaler er detekteret under kortdistancesignalsøgningen, der derefter udsendes et oplysningssignal for bilens startspærreanordning uden nogen aktivering af et reduceret funktionalitetsmodul.
Fig. 2

Network

Mobile Terminal

PhoneSafe Unit, PSU

Key System, KEY

Immobilizer, IMB

Vehicle

Service Platform with Database

Server System

100

110

111

112

120

130

150
SEARCH REPORT - PATENT

1. Certain claims were found unsearchable (See Box No. I).

2. Unity of invention is lacking prior to search (See Box No. II).

A. CLASSIFICATION OF SUBJECT MATTER
H 04 M 1/66 (2006.01); B 60 W 50/08 (2012.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC and CPC: H04 and B62.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
DK, NO, SE, FI: IPC-classes as above.

Electronic database consulted during the search (name of database and, where practicable, search terms used)
EPODOC, WPI, FULLTEXT: ENGLISH.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant for claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 8478237 B1 (STENTTA) 2013.07.02; See col. 1, l. 66 - col. 2, l. 65; and col 4, l. 28 - 62.</td>
<td>1,2,7,8,9</td>
</tr>
<tr>
<td>A</td>
<td>US 2010/0216509 A1 (RIEMER et al.) 2010.08.26; See pages 1 - 2 of the description.</td>
<td>1-10</td>
</tr>
<tr>
<td>A</td>
<td>US 2011/0021213 A1 (CARR) 2011.01.27; See [0022 - 23].</td>
<td>1-10</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C.

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