The present invention teaches a system for remotely initiating a function. The system comprises a first transceiver (20), which in a transmitting mode of operation, transmits an identification code stored in a memory (25). The first transceiver (20) initially has a first identification code stored in the memory (25). In a reprogramming mode of operation, the first transceiver (20) receives a new identification code, and stores the new identification code in the memory (25). Moreover, the system comprises a second transceiver (45), which in a receiving mode of operation, receives the transmitted stored identification code, tests the validity of the transmitted stored identification code, and initiates the function if the transmitted stored identification code is valid. In a reprogramming mode of operation, the second transceiver (45) transmits the new identification code, stores the new identification code in the memory (25) of the first transceiver (20) to reprogram the first transceiver (20).
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A SYSTEM AND METHOD FOR UPLOADING
AN IDENTIFICATION CODE

FIELD OF THE INVENTION

This invention relates to remote systems, generally, and more particularly a method and system for uploading an identification code.

BACKGROUND OF THE INVENTION

In the automotive industry, remote keyless entry ("RKE") systems have become standard equipment for new vehicles. Comprising a number of fob transmitters for communicating with a receiver positioned within the car, remote keyless entry systems enable users to control several vehicle functions remotely, such as the door locks and trunk, for example.

In providing remote control to vehicle functions, a problem arises as to restricting remote access to the automobile’s owners and authorized users. To prevent unauthorized access, an identification system is incorporated with an identification code or codes within both the fob transmitter and receiver. The receiver receives a transmitted signal having a command and an identification code and compares the received code with the identification code stored in its memory. If the receiver determines the received identification code matches the stored code, the command is initiated for execution.
As the demand for RKE systems has evolved in the marketplace, greater emphasis has been placed on increased security, reliability and flexibility. One area of focus has been on enabling the user in the field to reprogram the identification code(s) stored in memory. This RKE feature provides the user with an additional form of protection by allowing changes to the identification codes.

Traditionally, the memory for storing the identification code(s) has been located in the receiver within the vehicle. Thus, for reprogramming of RKE systems, the fob transmitter reprogrammed the receiver with a new identification code. This, however, enabled scenarios whereby an unauthorized user could reprogram the vehicle’s RKE system by either gaining access to the vehicle fob transmitter or bombarding the system with electronic signals to initiate the reprogramming mode.

Thus, a demand exists for a reprogramming RKE systems having an added level of security. A need further exists for an RKE system having a reprogramming feature that is initiated only in conjunction with access to the vehicle.

**SUMMARY OF THE INVENTION**

The primary advantage of the present invention is to overcome the limitations of the prior art.

In order to achieve the advantages of the present invention, a system for remotely initiating a function is disclosed. The system comprises a first transceiver, which
in a transmitting mode of operation, transmits an identification code stored in a memory. The first transceiver initially has a first identification code stored in the memory. In a reprogramming mode of operation, the first transceiver receives a new identification code, and stores the new identification code in the memory. Moreover, the system comprises a second transceiver, which in a receiving mode of operation, receives the transmitted stored identification code, tests the validity the transmitted stored identification code, and initiates the function if the transmitted stored identification code is valid. In a reprogramming mode of operation, the second transceiver transmits the new identification code, stores the new identification code in the memory of the first transceiver to reprogram the first transceiver.

These and other advantages and objects will become apparent to those skilled in the art from the following detailed description read in conjunction with the appended claims and the drawings attached hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be better understood from reading the following description of non-limitative embodiments, with reference to the attached drawings, wherein below:

Figures 1(a) and 1(b) depict a system block diagram and a word structure relevant to the system block diagram according to the present invention; and
Figure 2 illustrates a flow chart according to the present invention.

It should be emphasized that the drawings of the instant application are not to scale but are merely schematic representations and are not intended to portray the specific parameters or the structural details of the invention, which can be determined by one of skill in the art by examination of the information herein.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figure 1(a), the preferred embodiment of a reprogrammable remote control system 10 for remotely initiating a vehicle function is shown. System 10 comprises a remote fob transceiver 20 having both a transmitting mode and a receiving or reprogramming mode of operation. In the transmitting mode of operation, remote fob transceiver 20 transmits an identification code stored in a memory device 25 through antenna 35.

Remote control system 10 also comprises a vehicle based transceiver 45 positioned within a vehicle 40. Vehicle based transceiver 45 comprises both a receiving mode and a transmitting or reprogramming mode of operation. While in the receiving mode of operation, vehicle based transceiver 45 receives the transmitted identification code transmitted by remote fob transceiver 20 also operating in a receiving mode. Subsequently, a processor 50 within vehicle based transceiver 45 tests the validity of the transmitted identification code as received. If the transmitted
identification code is deemed valid, processor 50 initiates the selected vehicle function.

Remote fob transceiver 20, as well as vehicle based transceiver 45, also operate in a reprogramming mode of operation. In the event a user wishes to securely change the identification code employed within system 10 for remote function actuation, both remote fob transceiver 20 and vehicle based transceiver 45 may be switched into a reprogramming mode of operation. Once in reprogramming mode, vehicle based transceiver 45 is enabled to create a new identification code. In the preferred embodiment, the new identification code is created by a random number generator. The newly created identification code is then transmitted to remote fob transceiver 20. Upon receiving the new identification code, remote fob transceiver 20 stores the new code in memory 25 to establish the new identification code as the basis for all subsequent remote functional actuation.

The operating modes of both remote fob transceiver 20 and vehicle based transceiver 45 may be switched by a switching device. In a first embodiment of the present invention, the switching device is enabled by a preset keying sequence. However, in the preferred embodiment, the switching device comprises a first switch 30 on remote fob transceiver 20 and a second switch 60 on vehicle based transceiver 45.

In one embodiment of the preferred switching device, first switch 30 switches remote fob transceiver 20 between a transmitting mode and a reprogramming mode, while second
switch 60 switches vehicle based transceiver 45 between a receiving mode and a reprogramming mode, if both first and second switches, 30 and 60, respectively, are simultaneously actuated. Unintentional or accidental mode changes may be inhibited nevertheless by preferably requiring the simultaneous actuation of both first and second switches 30 and 60. In the preferred embodiment, if both first and second switches are simultaneously enabled, to insure that remote fob transceiver 20 and vehicle based transceiver 45 are both in the same mode of operation as well as prevent unauthorized mode changes, a mode change signal is transmitted from remote fob transceiver 20 to vehicle based transceiver 45 to initiate a mode change in vehicle based transceiver 45, while a mode change signal is transmitted from vehicle based transceiver 45 to remote fob transceiver 20 to initiate a mode change in remote fob transceiver 20.

It should be noted that to effectively realize the present invention, remote fob transceiver 20 is preferably coupled with vehicle based transceiver 45 by means of a radio frequency link. However, it should be noted that alternatively remote fob transceiver 20 and vehicle based transceiver 45 may be coupled by other means known in the art including for example an infra-red link, a microwave link and an inductive coupling link.

Referring to Figure 1(b), the preferred format of a word 70 comprising the code transmitted to initiate a function is depicted. Word 70 preferably comprises at least three components. First, word 70 comprises a fixed identification code 75 which does not change during
reprogramming. Fixed identification code 75 in one embodiment corresponds with the vehicle identification number ("VIN"). Word 70 also comprises a flexible identification code 80. During a reprogramming mode of operation, an old flexible identification code 80 replaced by a newly created code. Finally, the last component is a function code 85 corresponding with the function sought to be remotely initiated. It should be apparent to one of ordinary skill in the art that by utilizing the format of word 70 as depicted in Figure 1(b), the present method and system allows for a very large number of remote fob transceivers to be used in conjunction with a vehicle based transceiver dependant solely on the bit width of the flexible identification code 80.

Referring to Figure 2, a flow chart of a method of reprogramming a remote fob transceiver by means of a vehicle based transceiver according to a second embodiment of the present invention is illustrated. Upon initiating the algorithm (START 100), the method determines whether both the remote fob transceiver and the vehicle based transceiver are in the reprogram mode (TEST 110).

If it is determined by TEST 110 that the remote fob transceiver and the vehicle based transceiver are not in the reprogram mode such that remote fob transceiver is in a transmit mode while vehicle based transceiver is in a receive mode of operation, the method enables the transmission from of an identification code stored in the memory of the remote fob transceiver (TRANSMIT ID CODE 120). Upon transmitting the ID code stored in memory, the vehicle based transceiver subsequently receives the ID code (RECEIVE
ID CODE 130). The validity of the received ID code is subsequently verified (VALIDITY OF ID CODE TESTED 140). In the event the ID code is deemed not valid, the algorithm terminates operation (STOP 160). However, if the ID code is deemed valid, the method enables the remote actuation of a specified function (EXECUTE FUNCTION 150) and the program terminates operation (STOP 160).

On the other hand, should it be determined during TEST 110 that both the remote fob transceiver and the vehicle based transceiver are in the reprogram mode, in one embodiment of the present invention, the identification code stored in the memory of the remote fob transceiver is transmitted (TRANSMIT ID CODE 170). Upon transmitting the ID code stored in memory, the vehicle based transceiver subsequently receives the ID code (RECEIVE ID CODE 180). The validity of the received ID code is thereafter verified (VALIDITY OF ID CODE TESTED 190). In the event the ID code is deemed not valid, the algorithm terminates operation (STOP 160). However, if the ID code is deemed valid, and the steps for initiating reprogramming mode of operation are completed as detailed hereinabove, the algorithm begins the process of reprogramming the system.

Once in the reprogramming mode, a new ID code is created, preferably randomly, which is in turn transmitted by the vehicle based transceiver (TRANSMIT NEW ID CODE 200). The remote fob transceiver then receives the new ID code as transmitted by the vehicle based transceiver (RECEIVE New ID CODE 210). The received new ID code is subsequently stored in the memory of the remote fob transceiver (STORE NEW ID CODE 220). Thereafter, in one embodiment of the
present invention, a step confirming the new ID code may be employed to insure the functionality of the reprogramming operation (CONFIRM 230). This confirmation step (CONFIRM 230) may be realized by various feedback means including a chirp, flickering of lights, or honking of the horn for example. Upon completing the confirmation step, the program terminates operation (STOP 160).

In view of the above disclosure, several conclusions should be apparent to one of ordinary skill in the art. First, in the step of storing the received new ID code in the memory of the remote fob transceiver (STORE NEW ID CODE 180), two realizations may be formulated. In one approach, the memory is first cleared and the new ID code is then written into memory. In an alternate technique, the initial ID code is written over by the newly received new ID code. Moreover, it should be apparent that the present reprogrammable remote control system may also be employed in a passive one or two way realization. Here, once the remote fob transceiver is in range, the vehicle based transceiver can transmits ID codes to enable function actuation or initiate a reprogramming operation.

While the particular invention has been described with reference to illustrative embodiments, this description is not meant to be construed in a limiting sense. It is understood that although the present invention has been described in a preferred embodiment, various modifications of the illustrative embodiments, as well as additional embodiments of the invention, will be apparent to persons skilled in the art upon reference to this description without departing from the spirit of the invention, as
recited in the claims appended hereto. Thus, for example, it should be apparent to one of ordinary skill in the art that while the present invention is intended for remote keyless entry systems, the present invention nonetheless may be applied with other remote control systems including, for example, a remote garage door opener system or a remote security access control system. The invention detailed herein is, hence, applicable to other secured enclosed spaces or secured switching mechanisms requiring security for deterring theft. It is therefore contemplated that the appended claims will cover any such modifications or embodiments as fall within the true scope of the invention.
WHAT IS CLAIMED IS:

1. A system for remotely initiating a function, the system comprising:

   a first transceiver,

   in a transmitting mode of operation,

   for transmitting an identification code stored in a memory, said first transceiver initially having a first identification code stored in said memory; and

   in a reprogramming mode of operation,

   for receiving a new identification code, and for storing said new identification code in said memory to reprogram said first transceiver; and

   a second transceiver,

   in a receiving mode of operation,

   for receiving said transmitted stored identification code, testing the validity of said transmitted stored identification code, and for initiating the function if said transmitted stored identification code is valid; and
in a reprogramming mode of operation,

for creating said new identification code,
and for transmitting said new identification code.

2. The invention of claim 1, further comprising:

a switching device for switching said first transceiver between said transmitting mode and said reprogramming mode, and for switching said second transceiver between said receiving mode and said reprogramming mode.

3. The invention of claim 2, wherein said switching device is enabled by a preset keying sequence.

4. The invention of claim 2, further comprising:

a first switch on said first transceiver and a second switch on said second transceiver, said switching device switching said first transceiver between said transmitting mode and said reprogramming mode and switching said second transceiver between said receiving mode and said reprogramming mode if said first and second switches are enabled.
5. The invention of claim 1, wherein said first transceiver and said second transceiver are coupled by at least one of a microwave link, a radio frequency link, an infra-red link and a inductive coupling link.

6. The invention of claim 1, wherein said first transceiver is positioned within a remote control device.

7. The invention of claim 1, wherein said second transceiver is positioned within a fixed base station.

8. The invention of claim 1, wherein said new identification code is created by a random number generator.

9. A reprogrammable remote control system for remotely initiating a function of a vehicle, the reprogrammable remote control system comprising:

   a remote fob transceiver,

   in a transmitting mode of operation,

   for transmitting an identification code stored in a memory, said remote fob transceiver initially having a first identification code stored in said memory; and
in a reprogramming mode of operation,

for receiving a new identification code, and for storing said new identification code in said memory to reprogram said remote fob transceiver;

a vehicle based transceiver,

in a receiving mode of operation,

for receiving said transmitted stored identification code, testing the validity of said transmitted stored identification code, and for initiating the function if said transmitted stored identification code is valid; and

in a reprogramming mode of operation,

for creating said new identification code, and for transmitting said new identification code; and

a switching device for switching said remote fob transceiver between said transmitting mode and said reprogramming mode, and for switching said vehicle based transceiver between said receiving mode and said reprogramming mode.
10. The invention of claim 9, wherein said switching device is enabled by a preset keying sequence.

11. The invention of claim 9, wherein said switching device comprises:

   a first switch for switching said remote fob transceiver between said transmitting mode and said reprogramming mode if said first switch and a second switch is enabled; and

   said second switch for switching said vehicle based transceiver between said receiving mode and said reprogramming mode if said first and second switches are enabled.

12. The invention of claim 9, wherein said remote fob transceiver and said vehicle based transceiver are coupled by at least one of a microwave link, a radio frequency link, an infra-red link and a inductive coupling link.

13. The invention of claim 9, wherein said new identification code is created by a random number generator.

14. A method of reprogramming a remote fob transceiver with an identification code stored in a vehicle based transceiver, the remote fob transceiver remotely initiating a function of a vehicle, the method comprising the steps of:
transmitting to the vehicle based transceiver an
identification code stored in a memory initially having
a first identification code;

receiving said transmitted stored identification code;

testing the validity of said transmitted and received
stored identification code;

initiating the function if said transmitted and
received stored identification code is valid; and

reprogramming the remote fob transceiver comprising the
steps of:

transmitting a new identification code to the
remote fob transceiver;

receiving said new identification code from the
vehicle based transceiver; and

storing said new identification code in said
memory for subsequent transmission to initiate the
function if said new identification code is deemed
valid.

15. The method of claim 14, further comprising the step of:

switching the vehicle based transceiver into a
reprogramming mode to reprogram the vehicle based
transceiver; and
switching the remote fob transceiver into a reprogramming mode to reprogram the remote fob transceiver.

16. The method of claim 14, further comprising the step of:

coupling the remote fob transceiver and the vehicle based transceiver by at least one of a microwave link, a radio frequency link, an infra-red link and a inductive coupling link.

17. The invention of claim 14, wherein said new identification code is created by a random number generator.
FIG. 2

100 START

110 ARE 1st AND 2nd TRANSCEIVERS IN A REPROGRAM MODE OF OPERATION?

120 1st TRANSCEIVER IS IN TRANSMIT MODE AND 2nd TRANSCEIVER IS IN RECEIVE MODE

130 TRANSMIT ID CODE FROM MEMORY IN 1st TRANSCEIVER

140 RECEIVE THE TRANSMITTED ID CODE

150 IS RECEIVED ID CODE VALID?

160 STOP

170 Y

180 2nd TRANSCEIVER RECEIVES THE TRANSMITTED ID CODE

190 IS THE ID CODE VALID?

200 Y

210 TRANSMIT NEW RANDOM ID CODE TO 1st TRANSCEIVER

220 RECEIVE THE NEW RANDOM ID CODE WITHIN 1st TRANSCEIVER

230 STORE NEW RANDOM ID CODE WITHIN 1st TRANSCEIVER MEMORY

240 CONFIRM FUNCTIONALITY OF NEW RANDOM ID CODE

250 STOP
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 E05B49/00

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 6 E05B

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 practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of box C.

X Patent family members are listed in annex.

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"Y" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"A" document member of the same patent family

Date of the actual completion of the international search
8 February 1999

Date of mailing of the international search report
15/02/1999

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Fax (+31-70) 340-3016

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Herbelet, J.C.
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