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(54) **SYSTEM AND METHOD FOR AUTOMATED OPENING OR CLEARING A POWER TRUNK OR A POWER TAILGATE**

(57) Method for automatically opening and/or closing a power trunk or a power tailgate of a vehicle, comprising the steps of:

- detecting a user command by a user interface of a first transceiver to switch a system from a first operating state to a second operating state ,
- switching the system from a first operating state to a second operating state for automatically opening and/or closing the power trunk or the power tailgate of the vehicle,
- detecting a distance between the power trunk or the power tailgate and a second transceiver by means of a distance measuring unit comprising at least one sensor located at the vehicle,
- generating a first signal if a distance between the second transceiver and the power trunk or the power tailgate is lower than a threshold value, and
- generating a second signal by an access control device upon receiving the first signal and transmitting the second signal to an actuator for opening or closing the power trunk or the power tailgate.

Furthermore, the invention is directed to a system for automatically opening and/or closing a power trunk or a power tailgate of a vehicle, preferably by the above-mentioned method.

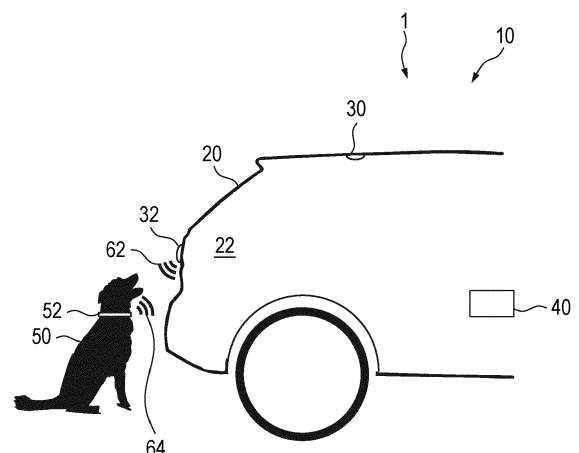


Fig. 2

Description

[0001] The present invention relates to a system for surveilling an area around a vehicle and automatically opening and/or closing a power trunk or a power tailgate of a vehicle for an authorized living being. The present invention also relates to a method for automatically opening and/or closing a power trunk or a power tailgate of a vehicle for an authorized living being.

[0002] Many systems are known for opening and/or closing a power trunk or a power tailgate of a vehicle. In a very simple example, a wireless key module comprises a button for opening the trunk. If this button is pressed by a user, a corresponding signal is sent by the wireless key module to the vehicle and the control system of the vehicle sends a signal to an actuator for opening the power trunk or a power tailgate. Further advanced systems comprise sensors for determining obstacles in the range of motion of the power trunk or a power tailgate. Thus, opening of the trunk can be prevented if a corresponding movement would likely result in damage of the vehicle or the objects in the range of motion. However, all these systems have the disadvantage that the user has to actively press the corresponding button on the key. This is disadvantageous if the hands of the user are not free, for example because the user is carrying goods to be put in the trunk.

[0003] From document US 2002/0183008 A1 a system is known, which automatically opens a door, if a compatible transceiver is detected in proximity. This document proposes a Bluetooth compatible transceiver. If the system detects that a compatible device is within range, then a preprogrammed function is always executed. Security systems or authorization systems are included in the system to ensure that any detected compatible device is authorized to exercise control over system. According to the authors of US 2002/0183008 A1, the disclosed system is especially suitable for opening a pet door when a pet (e.g. a dog) wearing the Bluetooth-equipped collar approaches the door. Another example mentioned in this document relates to a handicapped-person accessible door opener. The handicapped-person accessible door is automatically opened when a person carrying the Bluetooth-module approaches the door. Therefore, the Bluetooth-module may be affixed to a wheelchair. However, such a system always opens the respective door when the transceiver comes within range, even when opening of the door is not intended.

[0004] A system which eliminates the above-mentioned disadvantages is known from US 2015/0019046 A1. The system described in this document comprises a sensing device which senses an object approaching a vehicle from a rear side of the vehicle within a predetermined distance. If an object approaching object is detected, a smart key module recognizes a wireless key and authenticates whether or not the key is valid for the vehicle. Afterwards sensing device analyzes whether or not the detected object makes a predetermined motion and if the predetermined motion is detected, a power trunk/tailgate control device performs control such that the power trunk or the power tailgate is opened or closed.

[0005] A quite similar system is known from WO 2021/093934 A. The disclosed system for automatically operating a vehicle closure of a vehicle comprises a sensor for detecting the presence of a user in a so-called authorization region and in an activation region necessary. If the user performs a predetermined gesture and/or a predetermined sound in this area which is recognized by the vehicle, the controlling an operating mechanism of the vehicle closure will be activated. As sensors, a camera and/or a microphone for detecting a predetermined movement of the head or of the body as well as a predetermined phrase or predetermined sound of the user is proposed. It is noted that the user should not necessarily be a human being but can be an animal. For example, the vehicle may be configured to recognize the barking of a dog willing to jump inside the rear compartment of the vehicle.

[0006] It is therefore an objective of the invention to provide a reliable system for surveilling an area around a vehicle and automatically opening a closure of a trunk to provide access to the trunk for an authorized living being. Unintended opening of the trunk closure should be avoided. The surveillance system should be designed in a compliant and user-friendly way.

[0007] It is another objective of the invention to provide a user-friendly system and a method for granting access to a trunk of a vehicle for an authorized living being.

[0008] The afore-mentioned problems are eliminated by the subject-matter according to the independent claims. Advantageous embodiments and further developments form the subject matter of the sub-claims.

[0009] A method for automatically opening and/or closing a power trunk or a power tailgate of a vehicle, comprises the steps of:

- detecting a user command by a user interface of a first transceiver to switch a (surveillance) system from a first operating state to a second operating state ,
- switching the (surveillance) system from a first operating state to a second operating state for automatically opening and/or closing the power trunk or the power tailgate of the vehicle,
- detecting a distance between the power trunk or the power tailgate and a second transceiver by means of a distance measuring unit comprising at least one sensor located at the vehicle,
- generating a first signal if a distance between the second transceiver and the power trunk or the power tailgate is lower than a threshold value, and

- generating a second signal by an access control device upon receiving the first signal and transmitting the second signal to an actuator for opening or closing the power trunk or the power tailgate

[0010] This method allows a person having access to the first transceiver to switch the system in a second operating state in which access to the trunk can be granted to a living being carrying the second transceiver, when approaching the vehicle.

[0011] Preferably no access is granted to the trunk to a living being carrying the second transceiver when approaching the vehicle, if the system is in the first operating state. Thus, the person having access to the first transceiver controls whether or not the living being carrying the second transceiver gets access to the trunk. Accordingly, the first transceiver can be considered to be a master device and the second transceiver can be considered as a slave device.

[0012] Preferably the system switches from the second operating state to the first operating state, if a corresponding signal is generated by the first transceiver and/or a distance between the vehicle and the first transceiver exceeds a predetermined threshold distance or gets out of sight from the vehicle.

[0013] The above-mentioned embodiments of the system are each especially suitable if the second transceiver is carried by an animal, preferably a dog. Thus, the dog owner or dog handler can switch the system from the first operating state to the second operating state, for example when the vehicle gets in sight. If the animal then runs ahead to the vehicle, the trunk opens automatically and the animal can enter the trunk. If the animal enters the trunk it is in a safe place and the risk to be injured by another vehicles passing by is reduced.

[0014] Thus, the user experience around the car is enhanced for dog users. The dog handler saves time since the dog can enter the car / the trunk on its own. This makes the arrival at the vehicle after a dog walk easier and more secure for the dog and its owner.

[0015] Preferably, the first transceiver is selected from a group comprising a key, a FOB, a mobile phone, a touch sensitive display and a switch. Preferably the first transceiver is a mobile device which can be carried by the dog handler during a dog walk. However, a first transceiver can also be located stationary in the vehicle. By such a first transceiver the second operating state could be activated when approaching a parking position and the animal can open and leave the trunk without any further action of the dog handler.

[0016] Preferably a signal for switching the system from a first operating state to a second operating state is generated by the first transceiver and transmitted wireless to the access control device. For example, this signal could be generated by pressing a button or touch sensitive area on the first transceiver. Then, a corresponding signal is sent to the access control device, which is preferably (at least in parts) located in the vehicle. If the first transceiver is located in the vehicle transmission of the signal via a cable is also possible. In case a first transceiver is located in the vehicle, the system preferably comprises a further first transceiver, which could be located remote with respect to the vehicle and preferably taken with the dog handler.

[0017] In a preferred embodiment of the system, the second transceiver is intended and configured to be attached to an animal, preferably a dog. The second transceiver could be integrated in an animal collar or an animal harness. Alternatively, it could be attached to an animal, e.g. to an animal collar or an animal harness or as a ring, piercing or ear mark. In a further preferred embodiment, the second transceiver is implanted to the animal, for example as a chip located under the skin. All these embodiments have in common that the animal preferably cannot remove the second transceiver on its own. Thus, it is very unlikely that another animal can take up the second transceiver and gets unintended access to the trunk.

[0018] Preferably the system performs a security request and prevents switching from the first operating state to the second operating state if the result of the security request exceeds a defined danger threshold. The danger threshold could be exceeded if a high risk from a single source is detected or by combination of (lower) risks from different sources. An example for a high risk which exceeds the danger threshold and prevents the system to be switched from the first operating state to the second operating state is detection of motion of the vehicle. If the vehicle is moving, the trunk should not be opened. Accordingly, even if the dog owner gives the corresponding user command at the first transceiver, the system will not switch to the second operating state as long as the car has not reached its parking position and has stopped. Thus, the trunk remains closed even if the second transceiver is close to the sensor (namely inside the trunk).

[0019] Preferably, the result of the security request is based on data selected from a group comprising a distance between the power trunk or the power tailgate and the closest object or obstacle, a position of the vehicle, a speed of the vehicle, a mean speed of passing vehicles, distance of passing vehicles, presence of a bicycle lane, frequency of bikes passing the vehicle on a nearby bicycle lane, a frequency of vehicles passing the vehicle, a frequency at which the vehicle takes a detected vehicle position, a daytime, a date, a occupancy state of the trunk, a position of the first transceiver, a position of the first transceiver relative to the vehicle, a lighting condition, a weather condition and combinations thereof. If for example the vehicle is parked next to a road on which vehicles pass frequently at high speed, there could be a high risk for an animal leaving the car to step the road and to get injured. Thus, such a scenario would result in a high danger value, probably exceeding the danger threshold.

[0020] However, there is also a possibility that the danger threshold is exceeded not because of a high risk for the

animal but because a high risk caused by the animal. An example for such a scenario is a bicycle lane passing the parking position of the car. If the animal leaves the car and traverses the bicycle lane, it could happen that the animal collides with a bicycle and causes an accident. In such an accident probably the animal as well as a cyclist will be injured.

[0021] There are also factors which can reduce the danger value. If for example the animal is used to a frequently used parking place and familiar to the location and its risks, this could result in a lower danger value. Also a daytime can result in lower or higher risks. If for example the vehicle is parked in parking place in an area which is not frequently passed by other vehicles at a certain daytime, the risk will be reduced at that time. However, at rush hours the risk will be considered to be high.

[0022] In a preferred embodiment, the method further comprises the step of detecting a change of a position of the second transceiver relative to the power trunk or the power tailgate. By this, it could be detected, whether the animal has leaved or entered the vehicle. After such a change of position relatively to the car, the power trunk or the power tailgate could be activated again and the trunk can be closed. This method is especially suitable, if a change of a position of the second transceiver from inside the trunk to outside the trunk or from outside the trunk to inside the trunk. In this case, it can be prevented that the animal again changes its position (detected by the position of the second transceiver) from inside the trunk to outside the trunk or from outside the trunk to inside the trunk. Usually such a further change of the animal's position relatively to the trunk is undesired.

[0023] Accordingly, a preferred variant of the method comprises the step of closing the power trunk or the power tailgate after detecting a change of a position of the second transceiver from inside the trunk to outside the trunk or from outside the trunk to inside the trunk. Thus, an undesired further change of the animal's position could be prevented.

[0024] In a preferred variant of the method the range of motion of the power trunk or the power tailgate is monitored. Thus, it can be detected whether objects are in the range of motion of the power trunk or the power tailgate. If an object and/or obstacle is detected in its range of motion, the movement of the power trunk or the power tailgate is preferably stopped. Thus, it can be avoided that the animal is hurt or injured by the power trunk or the power tailgate. If for example the animal's tail is in the range of motion of the power trunk or the power tailgate, its movement is stopped to allow the animal to remove its tail. Preferably the movement is stopped at a (nearly closed) position at which the animal cannot enter or leave the trunk but the animal can move its body part (e.g. its tail, leg or foot) out of the range of motion of the power trunk or the power tailgate.

[0025] The present invention is also directed to a (surveillance) system for automatically opening and/or closing a power trunk or a power tailgate of a vehicle. Preferably this system is intended and configured to perform a method as described above. The system comprises an access control device, a distance measuring unit comprising at least one sensor located at the vehicle, a first transceiver, a second transceiver and an actuator for opening and/or closing a power trunk or a power tailgate. The first transceiver comprises a user interface which is intended and configured to receive a command from a user to switch the system from a first operating state to a second operating state. In the second operating state, the distance measuring unit is configured to send a corresponding first signal to the access control device if a distance between the second transceiver and the power trunk or the power tailgate is lower than a threshold value. The access control device is connected to the actuator and intended and configured to send a second signal to the actuator upon receiving the first signal.

[0026] Preferably, the first transceiver is selected from a group comprising a key, a FOB, a mobile phone, a touch sensitive display and a switch. Preferably, the first transceiver is wirelessly connected with the vehicle. To allow wireless communication with the vehicle, the first transceiver preferably comprises a sender sending in the low frequency range, preferably of 125 kHz, 130 kHz or 20 kHz, or a sender sending in the UHF range, preferably 433 MHz, 868 MHz, 315 MHz or in a range of 2.402 GHz to 2.48 GHz and/or a RFID transponder. It has been found, that these frequencies are especially suitable since they provide a reasonable working range at low energy consumption. Furthermore, senders for these frequencies are frequently used for other devices and available from many suppliers at reasonable costs.

[0027] In a preferred embodiment, the second transceiver is integrated in an animal collar or an animal harness. Such an animal collar or an animal harness is preferably a dog collar or a dog harness. Since the animals are often usually accustomed to wearing a collar or a harness, there are no big changes for the animal, if the second transceiver is integrated in such a collar or harness.

[0028] Preferably the second transceiver has a volume of 100 ml or less, preferably 50 ml or less, more preferably 25 ml or less and/or a weight of 100 g or less, preferably 50 g or less, more preferably 25 g or less. Thus, a collar or a harness including such a second transceiver is not hindering the animal to a great extent, preferably it is not hindering the animal at all.

[0029] Preferably the second transceiver comprises a sender sending in the low frequency range, preferably of 125 kHz, 130 kHz or 20 kHz, or a sender sending in the UHF range, preferably 433 MHz, 868 MHz, 315 MHz or in a range of 2.402 GHz to 2.48 GHz and/or a RFID transponder. As mentioned with respect to the first transceiver, these senders are preferred because of their reasonable working range, their low energy consumption and availability. For the second transceiver, a RFID transponder is especially preferred, since such a transponder can be very small. It can receive needed energy in a wireless manner from an external energy supply. The energy is preferably provided as energy wave

(e.g. electromagnetic radiation) and received by an antenna of the RFID transponder. The energy wave or electromagnetic radiation is then converted in electric energy and used for generating and sending the signal.

[0030] Preferably, the distance measuring unit comprises at least two sensors. These two sensors are preferably spaced apart from each other by a known distance. Thus, the sensors are redundant and a signal from the second transceiver could be detected, even if one sensor is not working properly. Preferably, the direction and/or the distance from the second transceiver with respect to the sensors could be calculated based on a time difference between the arrival time of the signal at the two sensors.

[0031] In a preferred embodiment, a relative position of the second transceiver with respect to the power trunk or the power tailgate is preferably calculated from the distance between the second transceiver and at least two of the sensors. The individual distance between one of the sensors and the second transceiver can be for example calculated based on a time delay between sending of a signal from a sender being located at a known position relative to a sensor and receiving a corresponding answer signal from the second transceiver at the sensor.

[0032] Preferably, the distance measuring unit comprises at least two sensors, wherein at least one sensor is located in the trunk and at least one sensor is located at an outer surface of the vehicle. This embodiment is advantageous for evaluating whether the animal is insider the trunk or outside the trunk.

[0033] In a preferred embodiment of the system it comprises a monitoring device, which is intended and configured to detect an obstacle moving in a range of motion of the power trunk or the power tailgate. Thus, it can be detected whether opening or closing of the trunk is possible without damaging surrounding objects like other cars, buildings, trees or traffic signs, without damaging the own car because of unintended contact with such a surrounding object or without hurting or injuring the animal if parts of its body (e.g. tail or foot) are arranged in the range of motion of the power trunk.

[0034] Preferably, the monitoring device comprises a sender for sending an alarm signal, if an obstacle is detected in the range of motion of the power trunk or the power tailgate. Such an alarm signal preferably includes an acoustic alarm signal. Such an acoustic alarm signal can be heard by the animal. Intelligent animals can understand, that this signal indicates a risk to get hurt. The animal will then move out of the range of motion of the power trunk or the power tailgate.

Preferably, the alarm signal includes a signal to stop the actuator moving the power trunk or the power tailgate. Such a signal is preferably an electrical signal and/or an electromagnetic wave.

[0035] Preferably, the system is set up, suitable and/or intended to carry out the above-described method as well as all method steps described in connection with the method individually or in combination with each other or individual method steps using the same. Conversely, the method for automatically opening and/or closing a power trunk or a power tailgate of a vehicle can be carried out using all the features described in the context of the system, either individually or in combination with each other.

[0036] The present invention is further directed to a vehicle, in particular motor vehicle, comprising a system described above for automatically opening and/or closing a power trunk or a power tailgate according to one embodiment and/or to a vehicle suitable for carrying out a method as described above.

[0037] The vehicle may in particular be a (motorized) road vehicle. The vehicle may, for example, be a passenger car (passenger car), a truck (truck) or a bus.

[0038] A vehicle may be a motor vehicle, which is in particular a semi-autonomous, autonomous (for example, autonomy level 3 or 4 or 5 (of the SAE J3016 standard)) or self-driving motor vehicle. In this context, autonomy level 5 refers to fully automatic driving vehicles. Similarly, the vehicle may be a driverless transportation system.

[0039] The present invention is further directed to a network system comprising at least one (and preferably a plurality) of the above described system(s). such a network system comprises an external storage device and/or an external server and/or backend. Preferably, the external storage device and/or the external server and/or the backend receives information from a plurality of (different) system and/or vehicles. The received information are preferably determined and/or generated by the individual systems of each vehicle. The network system is preferably suitable and intended to combine the data from the individual systems of each vehicle into an (even larger) database. Based on such a database information regarding locally or timely distribution of high risks for animals leaving or entering a trunk can be generated.

[0040] The present invention is further directed to a computer program or computer program product comprising program means, in particular a program code, which represents or codes at least individual and preferably several process steps (individually or in combination with each other) of the method according to the invention and preferably one of the described preferred embodiments and is adapted to be executed by a processor device.

[0041] The present invention is further directed to a data storage device on which at least one embodiment of the computer program according to the invention or a preferred embodiment of the computer program is stored.

[0042] The invention is further directed to a (machine-readable) signal (and/or an in particular machine-readable and/or computer-implemented data sequence) for controlling an actuator for automatically opening and/or closing a power trunk or a power tailgate of a vehicle based on a state and/or position of a first and second transceiver. Preferably, the signal and/or the data sequence is generated by the method described above. Preferably, the signal comprises the information and/or allows a receiver to derive that a (measured) distance between the second transceiver and the power trunk or the power tailgate is lower than a threshold value.

[0043] Furthermore, the invention is directed to a (machine-readable) signal (and/or an in particular machine-readable and/or computer-implemented data sequence) for switching a system for automatically opening and/or closing a power trunk or a power tailgate of a vehicle from a first state to a second state, in which a distance between a second transceiver and the power trunk or the power tailgate is monitored. Preferably, the signal and/or the data sequence is generated by the method described above. Preferably, the signal comprises the information and/or allows a receiver to derive that a (measured) distance between the second transceiver and the power trunk or the power tailgate is lower than a threshold value.

[0044] The present invention is also directed to an, processor-based, evaluation unit for automatically opening and/or closing a power trunk or a power tailgate of a vehicle. Preferably, the evaluation unit is set up, suitable and/or intended to process the data for the (surveillance) system described above and/or configured to process the data in order to perform the method as described above according to any of the embodiments described above. Conversely, the method for automatically opening and/or closing a power trunk or a power tailgate of a vehicle can be carried out using all the features described in the context of the evaluation unit and/or the (surveillance) system may comprise each feature described in the context of the evaluation unit, either individually or in combination with each other.

[0045] The evaluation unit is set up, suitable, and/or intended to receive user command data which are characteristic for a user command detected by a user interface of a first transceiver to switch a system (which preferably is the system described above) from a first operating state to a second operating state.

[0046] The evaluation unit is set up, suitable, and/or intended to switch the system from a first operating state to a second operating state for automatically opening and/or closing the power trunk or the power tailgate of the vehicle (in particular in dependence of the user command data).

[0047] The evaluation unit is set up, suitable, and/or intended to receive distance data being characteristic of a distance between the power trunk or the power tailgate and a second transceiver measured by means of a distance measuring unit comprising at least one sensor located at the vehicle.

[0048] Preferably, the evaluation unit is set up, suitable, and/or intended to determine at least one first signal parameter being characteristic for the case that a distance between the second transceiver and the power trunk or the power tailgate is lower than a threshold value.

[0049] Preferably, the evaluation unit is set up, suitable, and/or intended to trigger a first signal being generated in dependence of the first signal parameter and/or if a distance between the second transceiver and the power trunk or the power tailgate is lower than a threshold value.

[0050] Preferably, the evaluation unit is set up, suitable, and/or intended to trigger a second signal being generated by an access control device upon receiving the first signal and transmitting the second signal to an actuator for opening or closing the power trunk or the power tailgate.

[0051] Further advantages, objectives and features of the present invention will be described, by way of example only, in the following description with reference to the appended figure.

[0052] The figure shows:

Fig. 1 a schematic view of a vehicle with a system according to an embodiment of the invention and an animal inside the trunk.

Fig. 2 a schematic view of a vehicle with a system according to an embodiment of the invention and an animal outside the trunk.

Fig. 3a a schematic view of an embodiment of the first transceiver in a first state and

Fig. 3b a schematic view of an embodiment of the first transceiver in a state in which the system is switched to the second state.

[0053] Fig. 1 shows a schematic view of a vehicle 10 with a (surveillance) system 1 according to an embodiment of the invention and an animal 50 inside the trunk 22. The trunk 22 is closed by a power tailgate 20. The animal, in the shown embodiment a dog, is wearing a necklace 52. The necklace 52 configured to serve as a second transceiver. Therefore, it could be for example equipped with an RFID-tag. The necklace of second transceiver 52 is able to communicate with sensors 30, 32 of the vehicle.

[0054] The signal 64 send by the necklace 52 is received by the sensors 30, 32. From the signal 64 it is possible to determine the position of the necklace 52 relative to the sensors 30, 32. This determination could be performed by a distance measuring unit or calculating unit 40. For example the position of the necklace could be calculated from different arrival times of the signal 64 at the different sensors 30 and 32. The calculating unit 40 therefore is connected to the sensors 30, 32. This connection could be established by wires or wireless.

[0055] In the embodiment shown in Fig. 1 the signal 64 is detected by the sensor 30 first, because the necklace is

closer to the sensor 30 than to the sensor 32. Based on this information, the calculating unit 40 can determine that the animal 50 is inside the trunk. If the system is switched to the second state, and the risk for opening the power tailgate 20 is determined to be low, the power tailgate 20 will be actuated to leave the dog 50 out of the trunk 22.

[0056] Fig. 2 shows a schematic view of a vehicle 10 with a system 1 according to an embodiment of the invention and an animal 50 outside the trunk 22. Such a situation can occur, after the dog 50 was for a walk.

[0057] If the system 1 is switched to the second state, the signal send by the dog's necklace 52 is detected by the sensor 32 first and later by the sensor 30. Thus, the calculating unit 40 can determine that the animal 50 is outside the trunk. The power tailgate 20 will be actuated and the dog 50 is allowed to enter the trunk 22.

[0058] Fig. 3a is a schematic view of an embodiment of the first transceiver 70 in a first state. The first transceiver 70 comprises some buttons 72 - 76, by which individual functions of the vehicle could be actuated. These functions are preferably related to locking or unlocking some or all doors of the vehicle. When the button 79 is actuated, preferably a mechanical key is released from an internal compartment of the first transceiver 70. By such a mechanical key a door of the vehicle could be unlocked, even if the wireless connection between the first transceiver 70 and the car is not established, e.g. because the vehicle or the first transceiver 70 ran out of energy.

[0059] All buttons 72 - 78 could be considered to be part of an user interface, by which functions of the vehicle could be remote controlled. The button 78 is intended and configured to receive a user command for switching the system 1 between a first state and a second state (and *vis versa*).

[0060] Preferably a respective user command is detected by the user interface, e.g. button 78 and sent to the vehicle.

[0061] Fig. 3b shows a further schematic view of an embodiment of the first transceiver 70 in a state in which the system 1 is switched to the second state. All features are indicated with the same reference signs as in Fig. 3a.

[0062] In contrast to Fig. 3a, activation of the second state is indicated at the first transceiver 70. an active second state at the user interface is preferably indicated by illumination and/or coloration of button 78. Thus, the user can see at the first transceiver 70 whether the second state is activated or not.

[0063] The applicant reserves his right to claim all features disclosed in the application document as being an essential feature of the invention, as long as they are new, individually or in combination, in view of the prior art. Furthermore, it is noted that in the figures features are described, which can be advantageous individually. Someone skilled in the art will directly recognize that a specific feature being disclosed in a figure can be advantageous also without the adoption of further features from this figure. Furthermore, someone skilled in the art will recognize that advantages can evolve from a combination of diverse features being disclosed in one or various figures.

List of reference symbols

[0064]

1	System
10	Vehicle, car
20	Power trunk, power tailgate
22	Trunk
30	Sensor
32	Sensor
40	Distance measuring unit, calculating unit
50	Animal, dog
52	Necklace, second transceiver
60, 62, 64	Signal
70	First transceiver
72, 74, 76, 78, 79	User interface, button
80	Signal

Claims

1. Method for automatically opening and/or closing a power trunk or a power tailgate of a vehicle, comprising the steps of:

- detecting a user command by a user interface of a first transceiver to switch a system from a first operating state to a second operating state ,
- switching the system from a first operating state to a second operating state for automatically opening and/or closing the power trunk or the power tailgate of the vehicle,
- detecting a distance between the power trunk or the power tailgate and a second transceiver by means of a

distance measuring unit comprising at least one sensor located at the vehicle,
 - generating a first signal if a distance between the second transceiver and the power trunk or the power tailgate is lower than a threshold value, and
 - generating a second signal by an access control device upon receiving the first signal and transmitting the second signal to an actuator for opening or closing the power trunk or the power tailgate.

2. Method according to claim 1, wherein the first transceiver is selected from a group comprising a key, a FOB, a mobile phone, a touch sensitive display and a switch, wherein preferably a signal for switching the system from a first operating state to a second operating state is generated by the first transceiver and transmitted wireless to the access control device.
3. Method according to one of the preceding claims, wherein the second transceiver is intended and configured to be attached to an animal, preferably a dog.
4. Method according to one of the preceding claims, wherein the system performs a security request and prevents switching from the first operating state to the second operating state if the result of the security request exceeds a defined danger threshold.
5. Method according to claim 4, wherein the result of the security request is based on data selected from a group comprising a distance between the power trunk or the power tailgate and the closest object or obstacle, a position of the vehicle, a speed of the vehicle, a mean speed of passing vehicles, distance of passing vehicles, a frequency of vehicles passing the vehicle, presence of a bicycle lane, frequency of bikes passing the vehicle on a nearby bicycle lane, a frequency at which the vehicle takes a detected vehicle position, a daytime, a date, a occupancy state of the trunk, a position of the first transceiver, a position of the first transceiver relative to the vehicle, a lighting condition, a weather condition and combinations thereof.
6. Method according to one of the preceding claims, further comprising the step of detecting a change of a position of the second transceiver relative to the power trunk or the power tailgate, especially detecting a change of a position of the second transceiver from inside the trunk to outside the trunk or from outside the trunk to inside the trunk.
7. Method according to claim 6, further comprising the step of closing the power trunk or the power tailgate after detecting a change of a position of the second transceiver from inside the trunk to outside the trunk or from outside the trunk to inside the trunk.
8. Method according to claim 6 or 7, further comprising the step of monitoring the range of motion of the power trunk or the power tailgate and stopping its movement if an obstacle enters its range of motion.
9. A system for automatically opening and/or closing a power trunk or a power tailgate of a vehicle, preferably by a method according to one of the preceding claims, comprising an access control device, a distance measuring unit comprising at least one sensor located at the vehicle, a first transceiver, a second transceiver and an actuator for opening and/or closing a power trunk or a power tailgate, wherein the first transceiver comprises a user interface which is intended and configured to receive a command from a user to switch the system from a first operating state to a second operating state, wherein in the second operating state the distance measuring unit is configured to send a corresponding first signal to the access control device if a distance between the second transceiver and the power trunk or the power tailgate is lower than a threshold value, and wherein the access control device is connected to the actuator and intended and configured to send a second signal to the actuator upon receiving the first signal.
10. The System according to claim 9, wherein the first transceiver is selected from a group comprising a key, a FOB, a mobile phone, a touch sensitive display and a switch, wherein the first transceiver preferably comprises a sender sending in the low frequency range, preferably of 125 kHz, 130 kHz or 20 kHz, or a sender sending in the UHF range, preferably 433 MHz, 868 MHz, 315 MHz or in a range of 2.402 GHz to 2.48 GHz and/or a RFID transponder.
11. The system according to claim 9 or 10, wherein the second transceiver integrated in an animal collar or an animal harness, preferably a dog collar or a dog harness.
12. The system according to one of claims 9 - 11, wherein the second transceiver comprises a sender sending in the low frequency range, preferably of 125 kHz, 130 kHz or 20 kHz, or a sender sending in the UHF range, preferably 433 MHz, 868 MHz, 315 MHz or in a range of 2.402 GHz to 2.48 GHz and/or a RFID transponder.

13. The system according to one of claims 9 -12, wherein the distance measuring unit comprises at least two sensors, wherein the sensors are preferably spaced apart from each other by a known distance and a relative position of the second transceiver with respect to the power trunk or the power tailgate is preferably calculated from the distance between the second transceiver and at least two of the sensors.
14. The system according to one of claims 9 -13, wherein the distance measuring unit comprises at least two sensors, wherein at least one sensor is located in the trunk and at least one sensor is located at an outer surface of the vehicle.
15. The system according to one of claims 9 -14, further comprising a monitoring device, which is intended and configured to detect an obstacle moving in a range of motion of the power trunk or the power tailgate, wherein the monitoring device comprises a sender for sending an alarm signal to an if an obstacle is moved in the range of motion of the power trunk or the power tailgate in order to stop the actuator moving the power trunk or the power tailgate.

Amended claims in accordance with Rule 137(2) EPC.

1. Method for automatically opening and/or closing a power trunk or a power tailgate (20) of a vehicle (10), comprising the steps of:
 - detecting a user command by a user interface (78) of a first transceiver (70) to switch a system (1) from a first operating state to a second operating state ,
 - switching the system (1) from a first operating state to a second operating state for automatically opening and/or closing the power trunk or the power tailgate (20) of the vehicle,
 - detecting a distance between the power trunk or the power tailgate (20) and a second transceiver (52) by means of a distance measuring unit (40) comprising at least one sensor (30, 32) located at the vehicle (10),
 - generating a first signal if a distance between the second transceiver (52) and the power trunk or the power tailgate (20) is lower than a threshold value, and
 - generating a second signal by an access control device upon receiving the first signal and transmitting the second signal to an actuator for opening or closing the power trunk or the power tailgate (20).
2. Method according to claim 1, wherein the first transceiver (70) is selected from a group comprising a key, a FOB, a mobile phone, a touch sensitive display and a switch, wherein preferably a signal for switching the system from a first operating state to a second operating state is generated by the first transceiver (70) and transmitted wireless to the access control device.
3. Method according to one of the preceding claims, wherein the second transceiver (52) is intended and configured to be attached to an animal (50), preferably a dog.
4. Method according to one of the preceding claims, wherein the system performs a security request and prevents switching from the first operating state to the second operating state if the result of the security request exceeds a defined danger threshold.
5. Method according to claim 4, wherein the result of the security request is based on data selected from a group comprising a distance between the power trunk or the power tailgate (20) and the closest object or obstacle, a position of the vehicle (10) , a speed of the vehicle (10), a mean speed of passing vehicles, distance of passing vehicles, a frequency of vehicles passing the vehicle (10), presence of a bicycle lane, frequency of bikes passing the vehicle (10) on a nearby bicycle lane, a frequency at which the vehicle (10) takes a detected vehicle position, a daytime, a date, a occupancy state of the trunk, a position of the first transceiver (70), a position of the first transceiver (70) relative to the vehicle (10), a lighting condition, a weather condition and combinations thereof.
6. Method according to one of the preceding claims, further comprising the step of detecting a change of a position of the second transceiver (52) relative to the power trunk or the power tailgate(20), especially detecting a change of a position of the second transceiver (52) from inside the trunk (22) to outside the trunk (22) or from outside the trunk (22) to inside the trunk (22).
7. Method according to claim 6, further comprising the step of closing the power trunk or the power tailgate (20) after detecting a change of a position of the second transceiver (52) from inside the trunk (22) to outside the trunk (22) or from outside the trunk (22) to inside the trunk (22).

8. Method according to claim 6 or 7, further comprising the step of monitoring the range of motion of the power trunk or the power tailgate (20) and stopping its movement if an obstacle enters its range of motion.
- 5 9. A system (1) for automatically opening and/or closing a power trunk or a power tailgate (20) of a vehicle (10), preferably by a method according to one of the preceding claims, comprising an access control device, a distance measuring unit (40) comprising at least one sensor (30, 32) located at the vehicle (10), a first transceiver (70), a second transceiver (52) and an actuator for opening and/or closing a power trunk or a power tailgate (20), wherein the first transceiver (70) comprises a user interface (78) which is intended and configured to receive a command from a user to switch the system (1) from a first operating state to a second operating state, wherein in the second
10 operating state the distance measuring unit (40) is configured to send a corresponding first signal to the access control device if a distance between the second transceiver (52) and the power trunk or the power tailgate (20) is lower than a threshold value, and wherein the access control device is connected to the actuator and intended and configured to send a second signal to the actuator upon receiving the first signal.
- 15 10. The System (1) according to claim 9, wherein the first transceiver (70) is selected from a group comprising a key, a FOB, a mobile phone, a touch sensitive display and a switch, wherein the first transceiver (70) preferably comprises a sender sending in the low frequency range, preferably of 125 kHz, 130 kHz or 20 kHz, or a sender sending in the UHF range, preferably 433 MHz, 868 MHz, 315 MHz or in a range of 2.402 GHz to 2.48 GHz and/or a RFID transponder.
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11. The system (1) according to claim 9 or 10, wherein the second transceiver (52) integrated in an animal collar or an animal harness, preferably a dog collar or a dog harness.
- 25 12. The system (1) according to one of claims 9 -11, wherein the second transceiver (52) comprises a sender sending in the low frequency range, preferably of 125 kHz, 130 kHz or 20 kHz, or a sender sending in the UHF range, preferably 433 MHz, 868 MHz, 315 MHz or in a range of 2.402 GHz to 2.48 GHz and/or a RFID transponder.
- 30 13. The system (1) according to one of claims 9 -12, wherein the distance measuring unit (40) comprises at least two sensors (30, 32), wherein the sensors (30, 32) are preferably spaced apart from each other by a known distance and a relative position of the second transceiver (52) with respect to the power trunk or the power tailgate (20) is preferably calculated from the distance between the second transceiver (52) and at least two of the sensors (30, 32).
- 35 14. The system (1) according to one of claims 9 -13, wherein the distance measuring unit (40) comprises at least two sensors (30, 32), wherein at least one sensor (30, 32) is located in the trunk (22) and at least one sensor (30, 32) is located at an outer surface of the vehicle (10).
- 40 15. The system (1) according to one of claims 9 -14, further comprising a monitoring device, which is intended and configured to detect an obstacle moving in a range of motion of the power trunk or the power tailgate (20), wherein the monitoring device comprises a sender for sending an alarm signal to an if an obstacle is moved in the range of motion of the power trunk or the power tailgate (20) in order to stop the actuator moving the power trunk or the power tailgate (20).

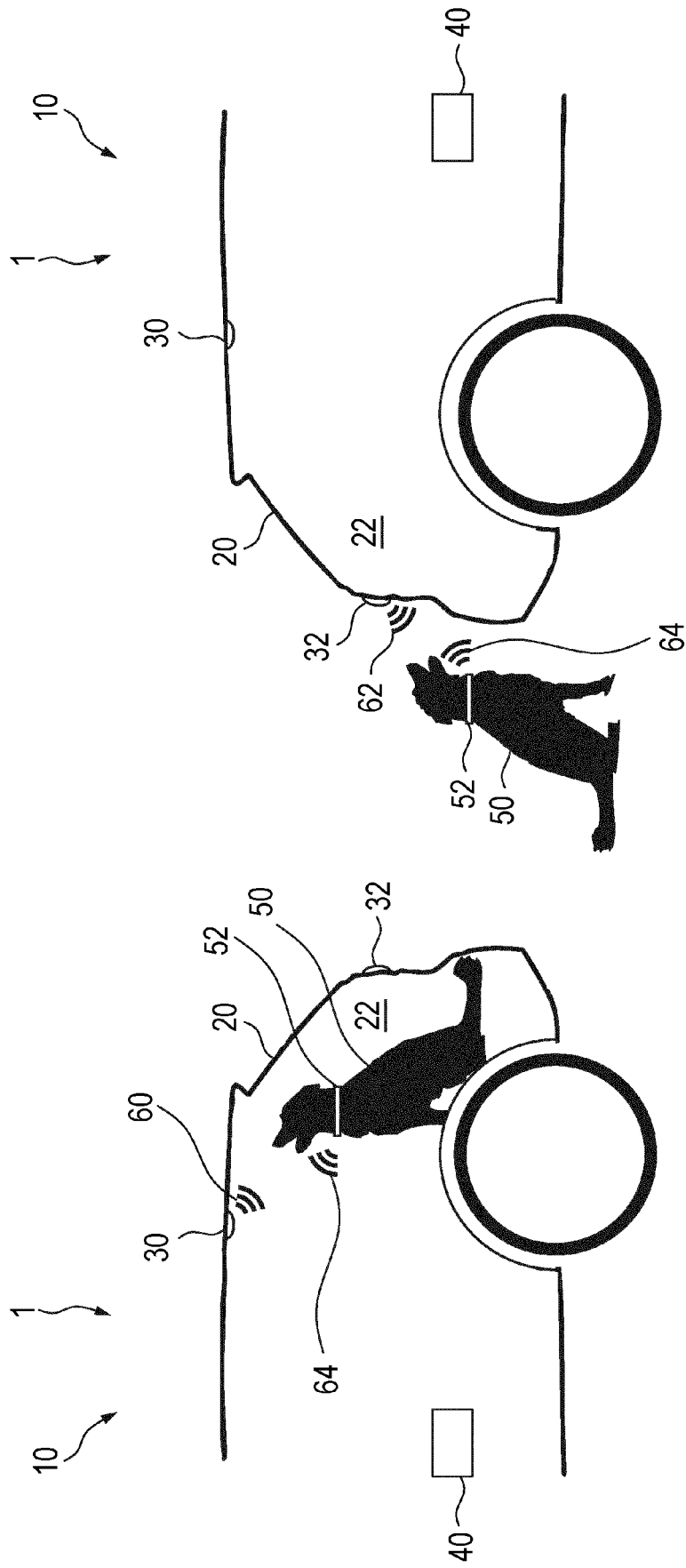


Fig. 2

Fig. 1

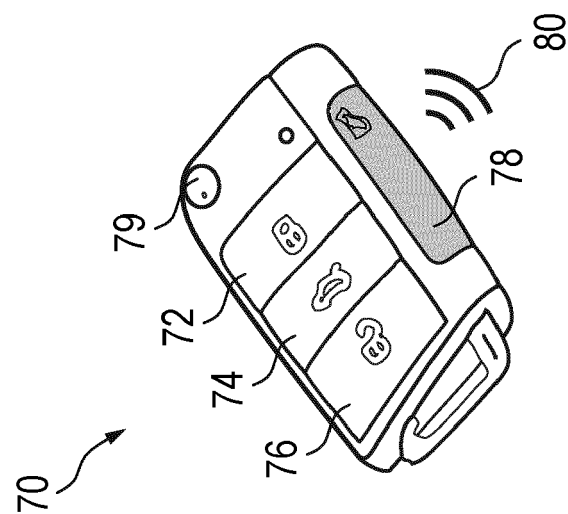


Fig. 3b

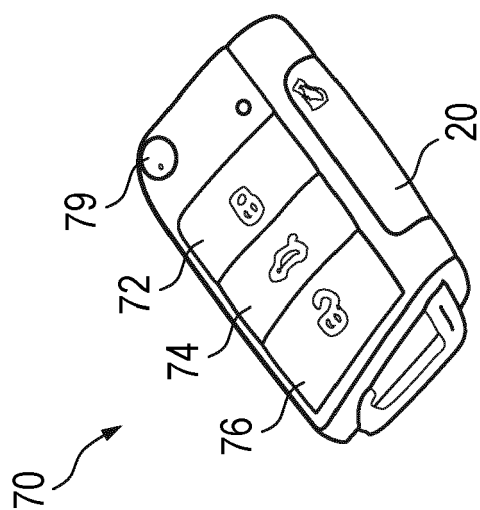


Fig. 3a



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Place of search		Date of completion of the search	Examiner
The Hague		10 February 2023	Prieto, Daniel
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons	
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