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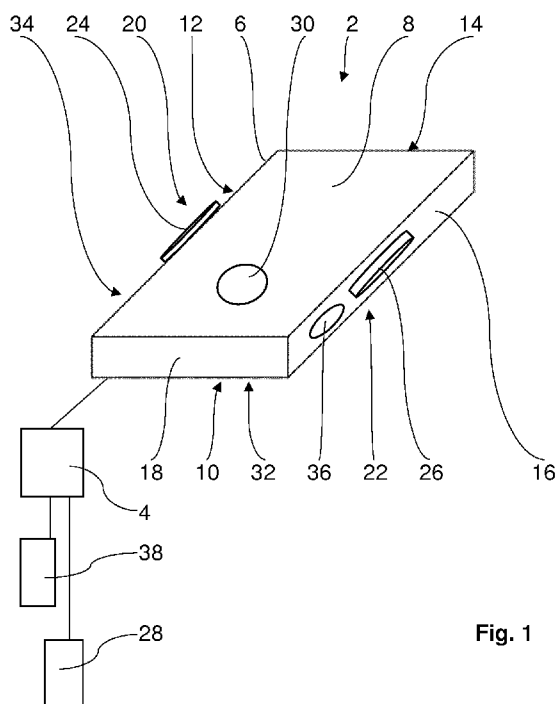


Fig. 1

(57) Abstract: The invention relates to a portable key device (2) for a door locking unit of a vehicle, comprising a control unit (4) housed by a housing (6) and designed and configured to lock and unlock said door locking unit, whereat a memory (38) is designed and configured for storing data for comparing a first output signal of a first input unit (20) and/or a second output signal of a second input unit (22) with said stored data in said control unit (4) for triggering a locking action or an unlocking action of said control unit (4) according to said comparison. In order to provide a portable key device (2) enabling a more intuitive handling of the portable key device (2) it is suggested, that the portable key device (2) comprises at least one position sensor (28) for detecting a spatial orientation of the portable key device (2) and touch sensors (30, 32, 34, 36), whereat said control unit (4) is designed and configured to lock or unlock said door locking unit according to a stored combination of output signals of said position sensor (28) and said touch sensors (30, 32, 34, 36) transferred to said control unit (4). Furthermore, the invention relates to a method for a portable key device (2).

PORTABLE KEY DEVICE WITH INTUITIVE USER INPUT

Description

The present invention relates to a portable key device according to the preamble of claim 1 and a method for a portable key device.

Such portable key devices and methods for such portable key devices are already known in different embodiments.

Known portable key devices for a door locking unit of a vehicle, comprising a control unit housed by a housing and designed and configured to lock and unlock said door locking unit, whereat said housing comprises a top side, a bottom side and at least one connecting side connecting said top side and said bottom side, a first input unit and a second input unit each connected to said control unit in a signal transmitting manner for triggering said control unit for locking or unlocking said door locking unit via radio link by means of a first output signal of said first input unit or a second output signal of said second input unit, and a memory designed and configured for storing data for comparing said first output signal and/or said second output signal with said stored data in said control unit for triggering a locking action or an unlocking action of said control unit according to said comparison.

It is an object of the invention to provide a portable key device and a method for a portable key device with enabling a more intuitive handling of the portable key device.

This object of the invention is solved by a portable key device for a door locking unit of a vehicle according to claim 1, wherein the portable key device comprises at least one position sensor housed by said housing for detecting a spatial orientation of the portable key device, a first, a second, a third and a fourth touch sensor, whereat said position sensor and each of said touch sensors are connected to said control unit in a signal transmitting manner and said first touch sensor is arranged at said top side, said

second touch sensor is arranged at said bottom side, said third touch sensor is arranged at said at least one connecting side and said fourth touch sensor is arranged at said at least one connecting side opposite to said third touch sensor, and whereat said memory is designed and configured for storing data for comparing said output signals of said position sensor and said touch sensors with said stored data in said control unit and said control unit is designed and configured to lock or unlock said door locking unit according to a comparison of said output signals of said position sensor and said touch sensors transferred to said control unit with said stored data.

Furthermore, this object of the invention is solved by a method for a portable key device according to claim 10, wherein said control unit locks or unlocks said door locking unit according to a comparison of said output signals of said position sensor and of said touch sensors, said first output signal and/or said second output signal transferred to said control unit with data stored in said memory.

A main advantage of the portable key device and the method for a portable key device according to the invention is, that a more intuitive handling of the inventive portable key device is possible. There is no longer a need for looking at the portable key device trying to hit the right button for locking or unlocking a locking unit of a vehicle by using the inventive portable key device and the inventive method for a portable key device. Instead of that, the spatial orientation and the relative position of the inventive portable key device is detected while a user of the portable key device is handling it and is used for automatically finding out what kind of action said user keeps in mind while operating the inventive portable key device. Thus, locking or unlocking of doors of a vehicle by using the inventive portable key device is more user-friendly. Even at nighttime or under bad lighting conditions, locking or unlocking of the doors of a vehicle by using the inventive portable key device is possible without any further action. Therefore, a user can keep being focused on the overall situation in the vicinity and do not have to quit watching the traffic situation because of operating a portable key device in order to lock or unlock doors of a vehicle. The doors of the vehicle can be of any kind. Thus, a door of a vehicle could be a trunk or a hood of a vehicle, too.

Further advantageous developments of the inventive portable key device and the inventive method for a portable key device are apparent from the sub-claims as well as from the following description of exemplary embodiments of the portable key device and the method for a portable key device according to the invention by means of the attached Figures.

Basically, the design of the portable key device according to the invention can be of any suitable shape, material, dimension and arrangement. This is also true for said at least one connecting side of said housing. For example, said housing can be designed as a cuboid. That means, that the at least one connecting side is designed as in total four rectangular sides. In other embodiments, said at least one connecting side could be designed in order to follow an oval border of said top side and said bottom side. That way, said at least one connecting side is designed as only one single connecting side. Advantageously, said connecting side is designed as a narrow side. Hereby, the handling of said housing and therefore of the inventive portable key device is improved.

Another preferable development of the portable key device according to the invention is, that said first input unit and/or said second input unit are/is comprising a wheel, a slider or a button. Wheels, sliders and buttons are common input elements for users of vehicles. Thus, a user of the inventive portable key device according to this embodiment is used to the operation of the aforementioned input elements.

A particular preferable development of the portable key device according to the invention is, that said first input unit and/or said second input unit are/is comprising a non-mechanical sensor. Hereby, the design of said first and/or said second input unit and thus of the inventive portable key device according to this embodiment is simplified. Furthermore, said first and/or said second input unit is quite robust against detrimental environmental influences like dirt and humidity.

Another preferable development of the portable key device according to the invention is, that said position sensor is designed as a micro-electro-mechanical-system, abbreviated as MEMS. That means, that said position sensor can be realized with less space needed for its implantation in said housing of the inventive portable key device according to this embodiment.

A particular preferable development of the portable key device according to the invention is, that said position sensor is designed as a single 3-axes-acceleration-sensor. Thus, said at least one position sensor is realized with a minimum number of components.

A further preferable development of the inventive portable key device is, that said first touch sensor and/or said second touch sensor and/or said third touch sensor and/or said fourth touch sensor are/is designed as a non-mechanical sensor. Hereby, the design of said first touch sensor and/or said second touch sensor and/or said third touch sensor and/or said fourth touch sensor are/is simplified. Furthermore, said first touch sensor and/or said second touch sensor and/or said third touch sensor and/or said fourth touch sensor are/is quite robust against detrimental environmental influences like dirt and humidity.

A preferable development of the portable key device of the invention according to the aforementioned embodiment is, that said first touch sensor and/or said second touch sensor and/or said third touch sensor and/or said fourth touch sensor are/is designed as a capacitive sensor. Capacitive sensors are quite simple in design, highly sensitive and show less idleness.

Another preferable development of the portable key device according to the invention is, that said first input unit and said second input unit are designed and configured to trigger said control unit for a locking action or an unlocking action according to a single action of a user of the portable key device detected by said first input unit or said second input unit. Hereby, the operation of the inventive portable key device is further

simplified. A user of the inventive portable key device just has to do a single movement which can be detected by said first input unit or said second input unit in order to trigger a locking action or an unlocking action of said control unit of the portable key device. Thus, no complicated input action of a user is necessary for operating the portable key device according to this embodiment.

This is although true for a preferable development of the method according to the invention corresponding to the aforementioned embodiment of the inventive portable key device, wherein a single action of a user of the portable key device detected by said first input unit or said second input unit triggers said control unit for a locking action or an unlocking action.

The Figure is a schematic illustration of a portable key device for a vehicle according to the invention, wherein only the details necessary for the understanding of the invention are shown.

It is shown by the only Figure:

Fig. 1 an exemplary embodiment of the portable key device according to the invention in a perspective view.

Fig. 1 displays an exemplary embodiment of the portable key device according to the invention. The portable key device 2 for a door locking unit of a vehicle comprises a control unit 4 housed by a housing 6 and designed and configured to lock and unlock said door locking unit of said vehicle, whereat said housing 6 comprises a top side 8, a bottom side 10 and in total four connecting sides 12, 14, 16, 18 connecting said top side 8 and said bottom side 10. Said vehicle with said door locking unit is not displayed in Fig. 1. Said four connecting sides 12, 14, 16, 18 are each designed as a narrow side. Thus, said connecting sides 12, 14, 16, 18 are quite narrow compared to said top side 8 and said bottom side 10. See Fig. 1.

A first input unit 20 and a second input unit 22 of said portable key device 2 are each connected to said control unit 4 in a signal transmitting manner for triggering said control unit 4 for locking or unlocking said door locking unit via radio link by means of a first output signal of said first input unit 20 and/or a second output signal of said second input unit 22. Said first input unit 20 and said second input unit 22 are each comprising a wheel 24, 26 as well as a non-mechanical sensor detecting an operation of said corresponding wheel 24, 26 of said first input unit 20 and of said second input unit 22. Said non-mechanical sensors of said first input unit 20 and said second input unit 22 are not displayed.

Furthermore, said portable key device 2 comprises a single position sensor 28 housed by said housing 6 for detecting a spatial orientation of the portable key device 2, whereat said position sensor 28 is designed as a single 3-axes-acceleration-sensor, which is produced as a micro-electro-mechanical-system, abbreviated as MEMS.

Moreover, a first touch sensor 30 is arranged at said top side 8 of said housing 6, a second touch sensor 32 is arranged at said bottom side 10 of said housing 6, a third touch sensor 34 is arranged at said connecting side 12 of said housing 6 and a fourth touch sensor 36 is arranged at said connecting side 16 of said housing 6. Thus, said fourth touch sensor 36 is arranged opposite to said third touch sensor 34. Said first, second, third and fourth touch sensor 30, 32, 34, 36 each is designed as a non-mechanical sensor, too. Said first, second, third and fourth touch sensor 30, 32, 34, 36 each is designed as a capacitive sensor.

Said position sensor 28 and each of said touch sensors 30, 32, 34, 36 are connected to said control unit 4 in a signal transmitting manner, whereat a memory 38 is designed and configured for storing data for comparing said output signals of said position sensor 28 and said touch sensors 30, 32, 34, 36 with said stored data in said control unit 4, and for storing data for comparing said first output signal of said first input unit 20 and said second output signal of said second input unit 22 with said stored data in said control unit 4 and said control unit 4 is designed and configured to lock or

unlock said door locking unit according to a comparison of said output signals of said position sensor 28 and of said touch sensors 30, 32, 34, 36, said first output signal of said first input unit 20 and/or said second output signal of said second input unit 22 transferred to said control unit 4 with data stored in said memory 38.

Said memory 38 for storing said aforementioned data of output signals of said position sensor 28 and said first, second, third and fourth touch sensor 30, 32, 34, 36 for comparing said stored data with said output signals transferred to said control unit 4 and for storing said aforementioned data for comparing said first output signal and/or said second output signal with said stored data in said control unit 4 for triggering a locking action or an unlocking action of said control unit 4 according to said aforementioned comparisons is housed in said housing 6 of said portable key device 2, too.

In order to simplify the handling of the portable key device 2 according to this embodiment, said first input unit 20 and said second input unit 22 are designed and configured to trigger said control unit 4 for a locking action or an unlocking action according to a single action of a user of the portable key device 2 detected by said first input unit 20 or said second input unit 22. Said user is not displayed, too.

In the following, the function of the inventive portable key device as well as the inventive method for the inventive portable key device according to the embodiment are explained in detail by means of Fig. 1.

Said user of said portable key device 2 wants to unlock said door locking unit of said vehicle. For that reason, said user takes said portable key device 2 in his right hand, because said user is a right-handed person. Said right hand is not displayed. Said user takes said portable key device 2 that way, that said portable key device 2 is held in his right hand, whereat said bottom side 10 of said housing 6 of said portable key device 2 is in contact with the palm of said right hand of said user. That way, the thumb of said right hand is in contact with said wheel 26 of said second input unit 22, which is arranged on said connecting side 16 of said housing 6 of said portable key device 2.

Because of said aforementioned handling of said portable key device 2 by said user, the following occurs:

Said position sensor 28 detects, that the spatial orientation of said portable key device 2 is as displayed in Fig. 1. Furthermore, said second touch sensor 32 arranged at said bottom side 10, said third touch sensor 34 arranged at said connecting side 12 and said fourth touch sensor 36 arranged at said connecting side 16 of said housing 6 each detect a part of said right hand of said user while handling said portable key device 2. Last but not least, by turning said wheel 26 of said second input unit 22 in a direction of said connecting side 14 of said housing 6, said thumb of said right hand of said user is being detected by said second input unit 22 according to the aforementioned movement of said wheel 26.

All of said aforementioned detections of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 and said second input unit 22 each produce an output signal, namely a second output signal of said second input unit 22 and output signals from said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 which are transferred to said control unit 4 of said portable key device 2. Said aforementioned second output signal and said aforementioned output signals of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 are compared in said control unit 4 with data stored in said memory 38 in order to trigger a locking action or an unlocking action of said control unit 4 according to said comparison mentioned above. Because of said aforementioned second output signal and said aforementioned output signals of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 are corresponding to said handling of said portable key device 2 by said right-handed user, said control unit 4 triggers said door locking unit of said vehicle to unlock said doors of said vehicle. Thus, said user can enter said vehicle by opening one of said doors of said vehicle or can put something into a door of said vehicle designed as a trunk of said vehicle or can inspect something under a door of said vehicle designed as a hood of said vehicle. Of course, other doors of said vehicle like flaps are possible, too.

After driving with said vehicle, said user wants to leave said vehicle again, thus wants to lock said door locking unit of said vehicle. Therefore, said user takes said portable key device 2 in his right hand again. Said user takes said portable key device 2 the way he did before, thus said portable key device 2 is held in his right hand, whereat said bottom side 10 of said housing 6 of said portable key device 2 is in contact with the palm of said right hand of said user. That way, the thumb of said right hand is in contact with said wheel 26 of said second input unit 22, which is arranged on said connecting side 16 of said housing 6 of said portable key device 2.

Because of said aforementioned handling of said portable key device 2 by said user, the following occurs:

Said position sensor 28 detects, that the spatial orientation of said portable key device 2 is as displayed in Fig. 1. Furthermore, said second touch sensor 32 arranged at said bottom side 10, said third touch sensor 34 arranged at said connecting side 12 and said fourth touch sensor 36 arranged at said connecting side 16 of said housing 6 each detect a part of said right hand of said user while handling said portable key device 2. Last but not least, by turning said wheel 26 of said second input unit 22 in a direction of said connecting side 18 of said housing 6, said thumb of said right hand of said user is being detected by said second input unit 22 according to the aforementioned movement of said wheel 26.

All of said aforementioned detections of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 and said second input unit 22 each produce an output signal, namely a second output signal of said second input unit 22 and output signals from said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 which are transferred to said control unit 4 of said portable key device 2. Said aforementioned second output signal and said aforementioned output signals of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 are again compared in said control unit 4 with data stored in said memory 38 in order to trigger a

locking action or an unlocking action of said control unit 4 according to said comparison mentioned above. Because of said aforementioned second output signal and said aforementioned output signals of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 are corresponding to said handling of said portable key device 2 by said right-handed user, said control unit 4 triggers said door locking unit of said vehicle to lock said doors of said vehicle again.

In another use case of said portable key device 2 said user of said portable key device 2 wants to unlock said door locking unit of said vehicle. For that reason, said user takes said portable key device 2 in his right hand again. That time, said user takes said portable key device 2 that way, that said portable key device 2 is held in his right hand, whereat said top side 8 of said housing 6 of said portable key device 2 is in contact with the palm of said right hand of said user. That way, the thumb of said right hand is in contact with said wheel 24 of said first input unit 20, which is arranged on said connecting side 12 of said housing 6 of said portable key device 2.

Because of said aforementioned handling of said portable key device 2 by said user, the following occurs:

Said position sensor 28 detects, that the spatial orientation of said portable key device 2 is as displayed in Fig. 1, but turned upside down. Thus, with respect to Fig. 1 said bottom side 10 is in place of top side 8 of Fig. 1 and top side 8 is in place of bottom side 10 of Fig. 1. Furthermore, said first touch sensor 30 arranged at said top side 8, said third touch sensor 34 arranged at said connecting side 12 and said fourth touch sensor 36 arranged at said connecting side 16 of said housing 6 each detect a part of said right hand of said user while handling said portable key device 2. Last but not least, by turning said wheel 24 of said first input unit 20 in a direction of said connecting side 14 of said housing 6, said thumb of said right hand of said user is being detected by said first input unit 20 according to the aforementioned movement of said wheel 24.

All of said aforementioned detections of said position sensor 28, said first, third and fourth touch sensor 30, 34, 36 and said first input unit 20 each produce an output signal, namely a first output signal of said first input unit 20 and output signals from said position sensor 28, said first, third and fourth touch sensor 30, 34, 36 which are transferred to said control unit 4 of said portable key device 2. Said aforementioned first output signal and said aforementioned output signals of said position sensor 28, said first, third and fourth touch sensor 30, 34, 36 are compared in said control unit 4 with data stored in said memory 38 in order to trigger a locking action or an unlocking action of said control unit 4 according to said comparison mentioned above. Because of said aforementioned first output signal and said aforementioned output signals of said position sensor 28, said first, third and fourth touch sensor 30, 34, 36 are corresponding to said handling of said portable key device 2 by said right-handed user, said control unit 4 triggers said door locking unit of said vehicle to unlock said doors of said vehicle. For example, said user can enter said vehicle as mentioned above.

Again, after driving with said vehicle, said user wants to leave said vehicle, thus wants to lock said door locking unit of said vehicle. Therefore, said user takes said portable key device 2 in his right hand again. Said user takes said portable key device 2 the way he did before, thus said user takes said portable key device 2 that way, that said portable key device 2 is held in his right hand, whereat said top side 8 of said housing 6 of said portable key device 2 is in contact with the palm of said right hand of said user. That way, the thumb of said right hand is in contact with said wheel 24 of said first input unit 20, which is arranged on said connecting side 12 of said housing 6 of said portable key device 2.

Because of said aforementioned handling of said portable key device 2 by said user, the following occurs:

Said position sensor 28 detects, that the spatial orientation of said portable key device 2 is as displayed in Fig. 1, but turned upside down. Thus, with respect to Fig. 1 said bottom side 10 is in place of top side 8 of Fig. 1 and top side 8 is in place of bottom side 10 of Fig. 1. Furthermore, said first touch sensor 30 arranged at said top side 8,

said third touch sensor 34 arranged at said connecting side 12 and said fourth touch sensor 36 arranged at said connecting side 16 of said housing 6 each detect a part of said right hand of said user while handling said portable key device 2. Last but not least, by turning said wheel 24 of said first input unit 20 in a direction of said connecting side 18 of said housing 6, said thumb of said right hand of said user is being detected by said first input unit 20 according to the aforementioned movement of said wheel 24.

All of said aforementioned detections of said position sensor 28, said first, third and fourth touch sensor 30, 34, 36 and said first input unit 20 each produce an output signal, namely a first output signal of said first input unit 20 and output signals from said position sensor 28, said first, third and fourth touch sensor 30, 34, 36 which are transferred to said control unit 4 of said portable key device 2. Said aforementioned first output signal and said aforementioned output signals of said position sensor 28, said first, third and fourth touch sensor 30, 34, 36 are compared in said control unit 4 with data stored in said memory 38 in order to trigger a locking action or an unlocking action of said control unit 4 according to said comparison mentioned above. Because of said aforementioned first output signal and said aforementioned output signals of said position sensor 28, said first, third and fourth touch sensor 30, 34, 36 are corresponding to said handling of said portable key device 2 by said right-handed user, said control unit 4 triggers said door locking unit of said vehicle to lock said doors of said vehicle.

Of course, the invention is advantageous for left-handed users of said portable key device 2 explained above, too.

Said user of said portable key device 2 wants to unlock said door locking unit of said vehicle. For that reason, said user takes said portable key device 2 in his left hand, because said user is a left-handed person. Said left hand is not displayed. Said user takes said portable key device 2 that way, that said portable key device 2 is held in his left hand, whereat said bottom side 10 of said housing 6 of said portable key device 2 is in contact with the palm of said left hand of said user. That way, the thump of said

left hand is in contact with said wheel 24 of said first input unit 20, which is arranged on said connecting side 12 of said housing 6 of said portable key device 2.

Because of said aforementioned handling of said portable key device 2 by said user, the following occurs:

Said position sensor 28 detects, that the spatial orientation of said portable key device 2 is as displayed in Fig. 1. Furthermore, said second touch sensor 32 arranged at said bottom side 10, said third touch sensor 34 arranged at said connecting side 12 and said fourth touch sensor 36 arranged at said connecting side 16 of said housing 6 each detect a part of said left hand of said user while handling said portable key device 2. Last but not least, by turning said wheel 24 of said first input unit 20 in a direction of said connecting side 14 of said housing 6, said thumb of said left hand of said user is being detected by said first input unit 20 according to the aforementioned movement of said wheel 24.

All of said aforementioned detections of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 and said first input unit 20 each produce an output signal, namely a first output signal of said first input unit 20 and output signals from said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 which are transferred to said control unit 4 of said portable key device 2. Said aforementioned first output signal and said aforementioned output signals of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 are compared in said control unit 4 with data stored in said memory 38 in order to trigger a locking action or an unlocking action of said control unit 4 according to said comparison mentioned above. Because of said aforementioned first output signal and said aforementioned output signals of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 are corresponding to said handling of said portable key device 2 by said left-handed user, said control unit 4 triggers said door locking unit of said vehicle to unlock said doors of said vehicle. Thus, said user can enter said vehicle by opening one of said doors of said vehicle or can put something into a door of said vehicle designed as a trunk of said vehicle or can inspect something under a door of said vehicle

designed as a hood of said vehicle. Of course, other doors of said vehicle like flaps are possible, too.

After driving with said vehicle, said user wants to leave said vehicle again, thus wants to lock said door locking unit of said vehicle. Therefore, said user takes said portable key device 2 in his left hand again. Said user takes said portable key device 2 the way he did before, thus said portable key device 2 is held in his left hand, whereat said bottom side 10 of said housing 6 of said portable key device 2 is in contact with the palm of said left hand of said user. That way, the thumb of said left hand is in contact with said wheel 24 of said first input unit 20, which is arranged on said connecting side 12 of said housing 6 of said portable key device 2.

Because of said aforementioned handling of said portable key device 2 by said user, the following occurs:

Said position sensor 28 detects, that the spatial orientation of said portable key device 2 is as displayed in Fig. 1. Furthermore, said second touch sensor 32 arranged at said bottom side 10, said third touch sensor 34 arranged at said connecting side 12 and said fourth touch sensor 36 arranged at said connecting side 16 of said housing 6 each detect a part of said left hand of said user while handling said portable key device 2. Last but not least, by turning said wheel 24 of said first input unit 20 in a direction of said connecting side 18 of said housing 6, said thumb of said left hand of said user is being detected by said first input unit 20 according to the aforementioned movement of said wheel 24.

All of said aforementioned detections of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 and said first input unit 20 each produce an output signal, namely a first output signal of said first input unit 20 and output signals from said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 which are transferred to said control unit 4 of said portable key device 2. Said aforementioned first output signal and said aforementioned output signals of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 are again compared in

said control unit 4 with data stored in said memory 38 in order to trigger a locking action or an unlocking action of said control unit 4 according to said comparison mentioned above. Because of said aforementioned first output signal and said aforementioned output signals of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 are corresponding to said handling of said portable key device 2 by said left-handed user, said control unit 4 triggers said door locking unit of said vehicle to lock said doors of said vehicle again.

Analog to the other use case of said portable key device 2 according to the embodiment displayed in Fig. 1 by a right-handed user explained in detail above, another use case of said portable key device 2 by a left-handed user is possible, too. Thus, by storing data for all possible handlings and operations of said portable key device 2 in said memory 38 for comparison with said first output signal and/or said second output signal and output signals of said position sensor 28 and of said touch sensors 30, 32, 34, 36 transferred to said control unit 4, said portable key device 2 can be used advantageously for a lot of different scenarios.

Of course, said portable key device 2 is also advantageous functioning in other possible handlings of a user, whether said user is a left-handed person or a right-handed person. For example, said above mentioned right-handed user wants to unlock said doors and handles said portable key device 2 again that way, that said bottom side 10 of said portable key device 2 is in contact with said palm of said right hand of said user. That time, said connection side 18 is in place of said connection side 14 as displayed in Fig. 1 and said connection side 14 is in place of said connection side 18 as displayed in Fig. 1. That way, the thumb of said right hand is in contact with said wheel 24 of said first input unit 20, which is arranged on said connecting side 12 of said housing 6 of said portable key device 2.

Because of said aforementioned handling of said portable key device 2 by said user, the following occurs:

Said position sensor 28 detects, that the spatial orientation of said portable key device 2 is as mentioned above. Furthermore, said second touch sensor 32 arranged at said bottom side 10, said third touch sensor 34 at said connecting side 12 and said fourth touch sensor 36 arranged at said connecting side 16 of said housing 6 each detect a part of said right hand of said user while handling said portable key device 2. Last but not least, by turning said wheel 24 of said first input unit 20 in a direction of said connecting side 18 of said housing 6, said thumb of said right hand of said user is being detected by said first input unit 20 according to the aforementioned movement of said wheel 24.

All of said aforementioned detections of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 and said first input unit 20 each produce an output signal, namely a first output signal of said first input unit 20 and output signals from said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 which are transferred to said control unit 4 of said portable key device 2. Said aforementioned first output signal and said aforementioned output signals of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 are compared in said control unit 4 with data stored in said memory 38 in order to trigger a locking action or an unlocking action of said control unit 4 according to said comparison mentioned above. Because of said aforementioned first output signal and said aforementioned output signals of said position sensor 28, said second, third and fourth touch sensor 32, 34, 36 are corresponding to said handling of said portable key device 2 by said right-handed user, said control unit 4 triggers said door locking unit of said vehicle to unlock said doors of said vehicle.

As explained in detail above, said data stored in said memory 38 of said portable key device 2 according to the exemplary embodiment of Fig. 1 is configured to unlock said doors of said vehicle by means of an unlocking action of said control unit 4, if said wheel 24 of said first input unit 20 or said wheel 26 of said second input unit 22 is turned in direction of the upper right corner of Fig. 1 and to lock said doors of said vehicle by means of a locking action of said control unit 4, if said wheel 24 of said first input unit 20 or said wheel 26 of said second input unit 22 is turned in direction of the

lower left corner of Fig. 1. This is true for all possible handlings of said portable key device 2 according to the embodiment explained, because of said position sensor 28 and said first, second, third and fourth touch sensor 30, 32, 34, 36 arranged at said housing 6 of said portable key device 2 and the stored data related to all possible combinations of output signals.

The invention is not limited to the exemplary embodiments of the inventive portable key device and of the inventive method for the inventive portable key device discussed before.

As already mentioned above, the term doors is not limited to doors giving entrance to a user of the vehicle, but covers all types of doors, flaps, hoods and trunks, too. The first input unit and/or the second input unit could also comprise a mechanical sensor instead of a non-mechanical sensor. Furthermore, the position sensor does not have to be designed as a MEMS. The overall shape of the housing is not limited to a cuboid, but can be of any suitable shape. Thus, instead of multiple connecting sides only a single connecting side is possible, too. For example, this can be the case for the top side and the bottom side each having an oval border. Instead of only one single position sensor designed as a 3-axes-acceleration-sensor any useful and suitable type and number of the at least one position sensor is possible. Similar is true for the touch sensors, which can be of any useful and suitable type, material, dimension, arrangement and number.

List of reference numbers

- 2 Portable key device
- 4 Control unit
- 6 Housing
- 8 Top side of housing 6
- 10 Bottom side of housing 6
- 12 Connecting side of housing 6
- 14 Connecting side of housing 6
- 16 Connecting side of housing 6
- 18 Connecting side of housing 6
- 20 First input unit
- 22 Second input unit
- 24 Wheel of first input unit 20
- 26 Wheel of second input unit 22
- 28 Position sensor
- 30 First touch sensor
- 32 Second touch sensor
- 34 Third touch sensor
- 36 Fourth touch sensor
- 38 Memory

Claims

1. A portable key device (2) for a door locking unit of a vehicle, comprising a control unit (4) housed by a housing (6) and designed and configured to lock and unlock said door locking unit, whereat said housing (6) comprises a top side (8), a bottom side (10) and at least one connecting side (12, 14, 16, 18) connecting said top side (8) and said bottom side (10), a first input unit (20) and a second input unit (22) each connected to said control unit (4) in a signal transmitting manner for triggering said control unit (4) for locking or unlocking said door locking unit via radio link by means of a first output signal of said first input unit (20) and/or a second output signal of said second input unit (22), and a memory (38) designed and configured for storing data for comparing said first output signal and/or said second output signal with said stored data in said control unit (4) for triggering a locking action or an unlocking action of said control unit (4) according to said comparison, wherein,
the portable key device (2) comprises at least one position sensor (28) housed by said housing (6) for detecting a spatial orientation of the portable key device (2), a first, a second, a third and a fourth touch sensor (30, 32, 34, 36), whereat said position sensor (28) and each of said touch sensors (30, 32, 34, 36) are connected to said control unit (4) in a signal transmitting manner and said first touch sensor (30) is arranged at said top side (8), said second touch sensor (32) is arranged at said bottom side (10), said third touch sensor (34) is arranged at said at least one connecting side (12) and said fourth touch sensor (36) is arranged at said at least one connecting side (16) opposite to said third touch sensor (34), and whereat said memory (38) is designed and configured for storing data for comparing said output signals of said position sensor (28) and said touch sensors (30, 32, 34, 36) with said stored data in said control unit (4) and said control unit (4) is designed and configured to lock or unlock said door locking unit according to a comparison

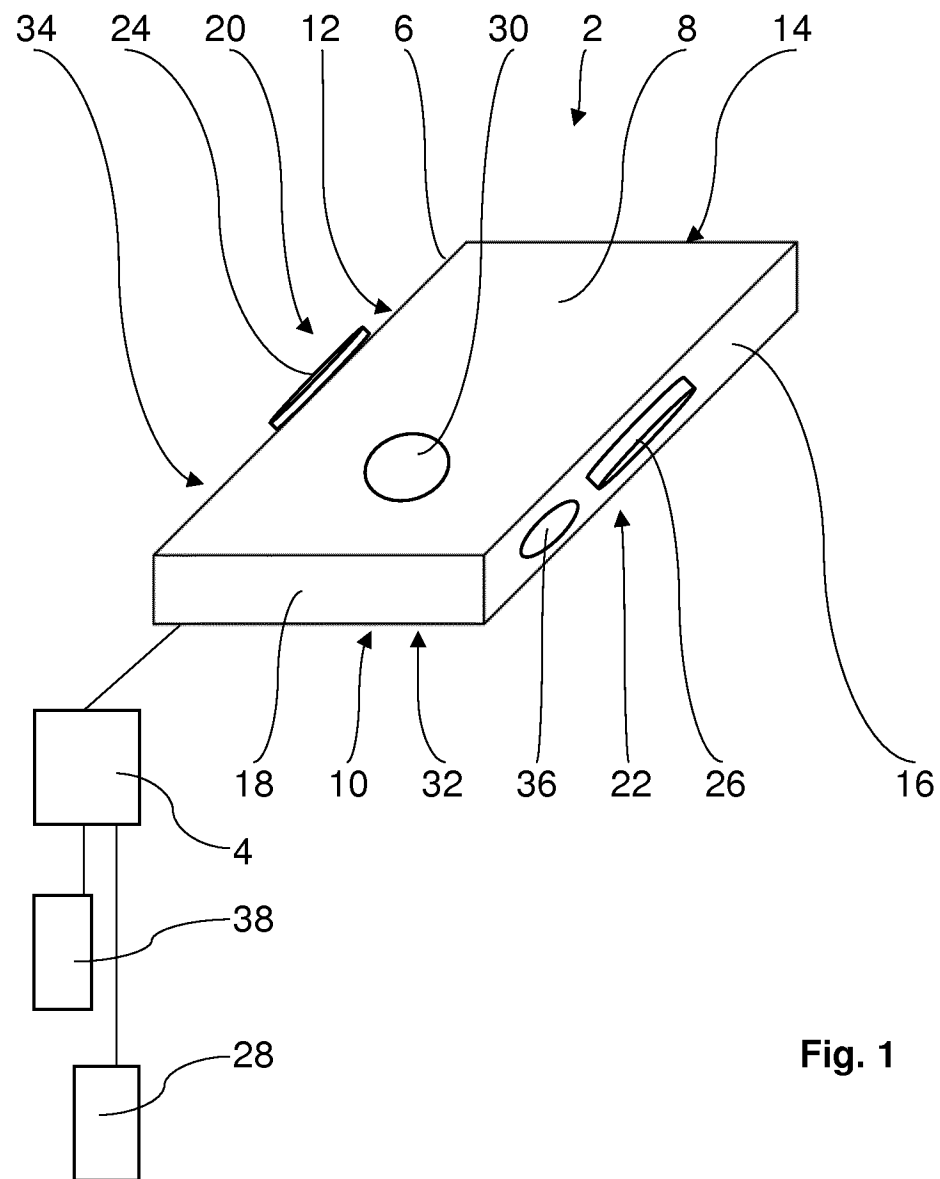
of said output signals of said position sensor (28) and said touch sensors (30, 32, 34, 36) transferred to said control unit (4) with said stored data.

2. Portable key device (2) according to claim 1,
wherein,
said connecting side (12, 14, 16, 18) is designed as a narrow side.
3. Portable key device (2) according to claim 1 or 2,
wherein,
said first input unit (20) and/or said second input unit (22) are/is comprising a wheel (24, 26), a slider or a button.
4. Portable key device (2) according to one of the claims 1 to 3,
wherein,
said first input unit (20) and/or said second input unit (22) are/is comprising a non-mechanical sensor.
5. Portable key device (2) according to one of the claims 1 to 4,
wherein,
said position sensor (28) is designed as a micro-electro-mechanical-system.
6. Portable key device (2) according to one of the claims 1 to 5,
wherein,
said position sensor (28) is designed as a single 3-axes-acceleration-sensor.
7. Portable key device (2) according to one of the claims 1 to 6,
wherein,
said first touch sensor (30) and/or said second touch sensor (32) and/or said third touch sensor (34) and/or said fourth touch sensor (36) are/is designed as a non-mechanical sensor.
8. Portable key device (2) according to claim 7,

wherein,

said first touch sensor (30) and/or said second touch sensor (32) and/or said third touch sensor (34) and/or said fourth touch sensor (36) are/is designed as a capacitive sensor.

9. Portable key device (2) according to one of the claims 1 to 8,
wherein,
said first input unit (20) and said second input unit (22) are designed and configured to trigger said control unit (4) for a locking action or an unlocking action according to a single action of a user of the portable key device (2) detected by said first input unit (20) or said second input unit (22).
10. Method for a portable key device (2) according to one of the claims 1 to 9,
wherein,
said control unit (4) locks or unlocks said door locking unit according to a comparison of said output signals of said position sensor (28) and of said touch sensors (30, 32, 34, 36), said first output signal and/or said second output signal transferred to said control unit (4) with data stored in said memory (38).
11. Method according to claim 10,
wherein,
a single action of a user of the portable key device (2) detected by said first input unit (20) or said second input unit (22) triggers said control unit (4) for a locking action or an unlocking action.



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/055096

A. CLASSIFICATION OF SUBJECT MATTER
INV. G07C9/00
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G07C G06K G06F B60R 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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2010/134423 A1 (BRISEBOIS ARTHUR [US] ET AL) 3 June 2010 (2010-06-03) paragraphs [0005], [0006], [0035], [0036], [0029], [0031], [0056], [0070], [0078], [0085] - [0089]; figures 2,3,8,9,10,18	1-11
Y	US 2017/012658 A1 (OTSUBO YOSHINORI [JP] ET AL) 12 January 2017 (2017-01-12) paragraphs [0001], [0021], [0050]; figure 3	1-11
X	US 2017/108919 A1 (TOKUYAMA YUKI [JP] ET AL) 20 April 2017 (2017-04-20) paragraphs [0036], [0042], [0075]; figures 2-4, 6-8 ----- -/--	1,10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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

"E" earlier application or patent but published on or after the international filing date

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

"T" 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

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"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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