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(54) A SYSTEM FOR THE UNLOCKING AND LOCKING OF A DOOR OF A TAXI, A DOOR LOCK LATCH ACTUATOR FOR A TAXI, AND A METHOD FOR MODIFYING THE DOOR LOCK LATCH ACTUATOR

(57) A method for converting a door lock latch actuator such that it is suitable for use with a taxi. The door lock latch actuator includes first and second movable linkage parts which are interlinked by an engagement element movable between a first and second state, the first and second state governing whether motion of the first movable linkage part results in movement of the second movable linkage part. The method includes the connection of an engagement actuator for causing the movement of the engagement element dependent on one or more predetermined criteria. Also disclosed is a system for locking and unlocking the door of a taxi.

Figure 1

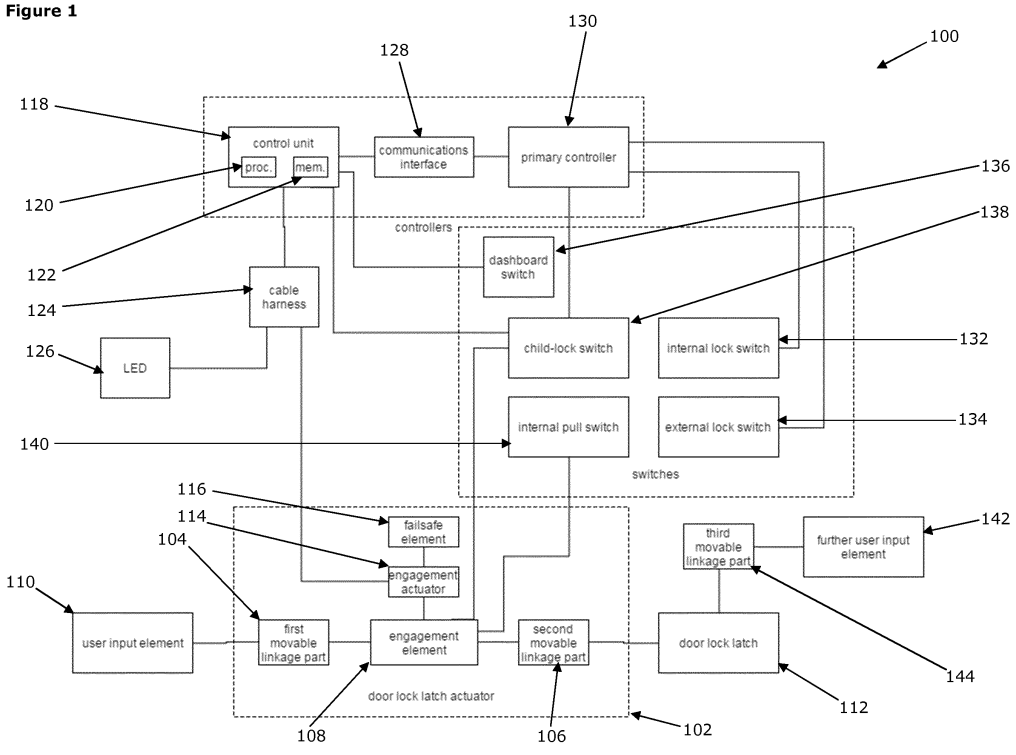

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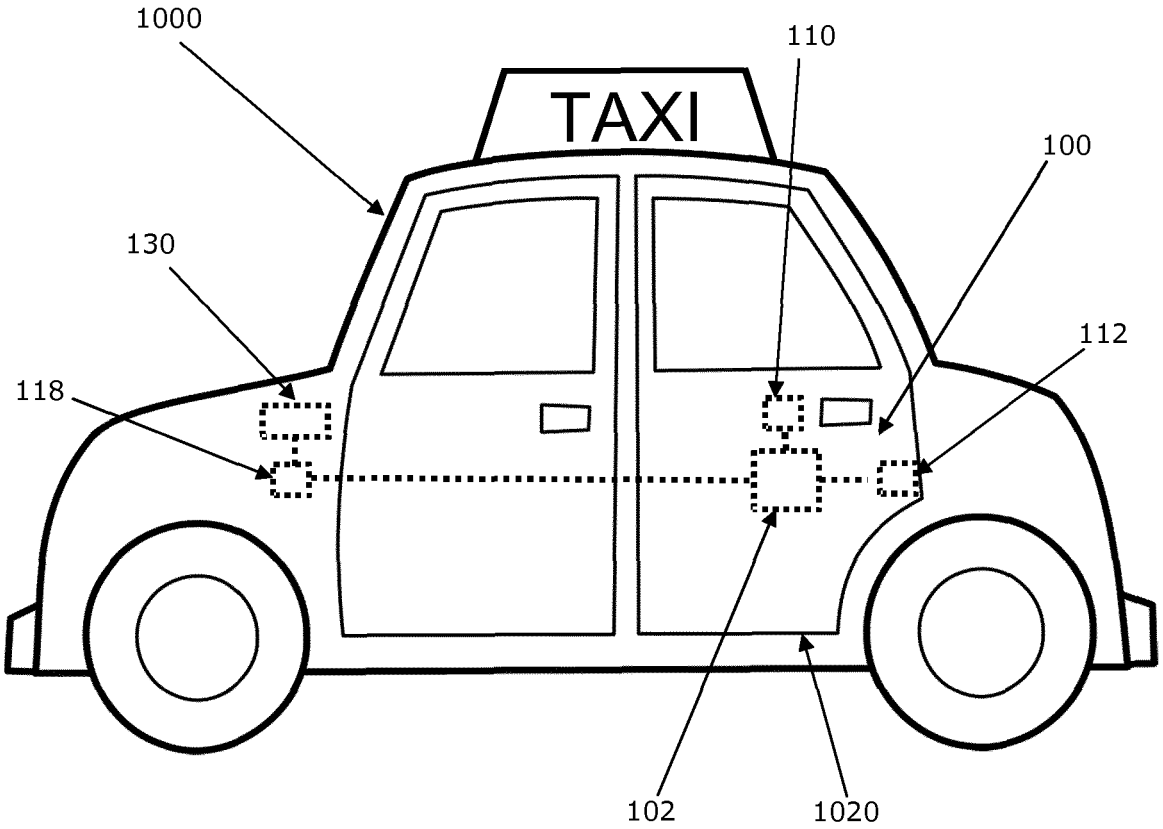
Figure 2



Description

[0001] The present invention relates to a system for the unlocking and locking of a door of a taxi, specifically unlocking and locking when based on predetermined criteria. The invention also relates to a door lock latch actuator for a taxi, and a method of modifying the same.

[0002] It is known to provide a locking system for a motor vehicle which is operable so as to prevent doors on a vehicle being opened from the inside. These systems are especially prevalent in taxis, where licencing conditions sometimes command that the doors be inoperable from the inside when the vehicle is in motion, and, in particular circumstances, also when stationary. By use of a specialised locking system, a taxi driver can be assured that passengers are not able to alight from the vehicle at an unsafe moment and also that they are abiding by the relevant licencing conditions. The present invention provides a locking system which is capable of abiding by these conditions.

[0003] In accordance with a first aspect of the invention, there is provided a system for the locking and unlocking of a door of a taxi, the system comprising a door lock latch actuator comprising a first movable linkage part having an input part which in use is connected to a remotely located user input element; a second movable linkage part which in use is connected to a door latch; an engagement element movable between a first state and a second state, in the first state movement of the user input element causes movement of the two movable linkage parts in turn to produce movement of the door latch and in the second state movement of the user input element causes the first moveable linkage part to move without producing a movement of the second linkage that would operate the door lock latch; and an engagement actuator for moving the engagement element between the first state and the second state in response to control signals received from a controller, the signals being set by the controller according to one or more predetermined criteria.

[0004] The system of the present invention therefore allows the user input element to be disconnected from the door lock latch, preventing the door from being opened from within the vehicle when at least one predetermined criterion has been fulfilled. Thus, the vehicle fitted with the system is rendered safer and equipped in accordance with any regulations governing such safety systems.

[0005] Preferably, the controller may be a control unit in communication with a primary controller. The control unit may be an electronic control unit which may be programmable and have memory. The primary controller may control the central locking and other vehicle functions.

[0006] The control unit and primary controller may communicate by way of a communications interface, preferably a PSM.

[0007] The second movable linkage part may in use be connected to the door latch by rods, bars, or cables, which may be relatively axially rigid. The second movable linkage part may push and/or pull the rods, bars, or cables to operate the door release.

[0008] Preferably, the system may further comprise a cable harness which passes the signals from the controller to the engagement actuator.

[0009] Preferably, the first movable linkage part, second movable linkage part, and engagement element may be located within a common housing. They may be supported by a common support. The engagement actuator may also be housed within, or mounted to, the housing or support.

[0010] It may be beneficial for the system to further comprise a failsafe element for returning the engagement element from the second state to the first state when a failure is detected. An example of a failure is a loss of power to the engagement actuator but a failure could also be any other detectable error of the system. The failsafe element may be a spring. The failsafe element enables compliance of the system with other regulations which aim to ensure that, in the event of a collision or other accident, passengers are able to escape from the taxi.

[0011] Preferably, the system may further comprise a visible or audible alert for alerting a user that the engagement element is in the second state. The visible or audible alert may be configured to alert the user when the engagement actuator has caused the engagement element to be in the second state. The visible or audible alert may be an LED in the passenger compartment of the vehicle.

[0012] The system may further comprise a cable harness which transmits the signals between the controller and the visible and/or audible alert, and/or the controller and the engagement actuator.

[0013] The user input element may be a door handle or door release button.

[0014] The system may further comprise sensors for providing data to the controller for assessing the predetermined criteria. Such sensors may include accelerometers, proximity sensors, optical sensors, magnetic sensors, inductive sensors, and/or position sensors, usable to provide speed or brake pedal position data, or any other data. Alternatively, data may be provided to the controller from a speedometer, brake pedal sensor, or other sensor of the vehicle.

[0015] Preferably, the system may further comprise a further user input element positionable on the exterior of the vehicle and in mechanical communication with the door lock latch, the transmission of movement between the further user input element and the door lock latch not being affected by whether the engagement element is in the first state or the second state. A third movable linkage part may mechanically link the further user input element and the door lock latch.

[0016] The controller may include a processor and a memory. The memory may store program instructions that relate to the predetermined criteria.

[0017] The system may be suitable for locking and unlocking (selectively securing) the door of a 2016 or newer model of the Mercedes® VS20 family.

[0018] In accordance with a second aspect of the invention, there is provided a taxi including a system in accordance with the first aspect of the invention.

[0019] The predetermined criteria may include the speed of the taxi being above a predetermined speed, for instance three miles per hour (1.34 ms^{-1}). The predetermined criteria may additionally or alternatively include when a brake pedal of the taxi is depressed when the taxi is stationary. Preferably, the engagement element may be automatically moved to the first state when the brake pedal is released.

[0020] The user input element and door lock latch actuator may be associated with a rear door of the taxi. This may be a sliding door. The door may be a powered door that is opened and/or closed by one or more motors. The control of the motors may be provided in response to signals from the primary controller or the control unit.

[0021] In accordance with a third aspect of the invention, there is provided a method of adapting a door lock latch actuator such that it is suitable for use with a taxi, the door lock latch actuator including a first movable linkage part connected to a user input element, a second movable linkage part connected to a door lock latch, and an engagement element movable between a first state and a second state, in the first state movement of the user input element causes movement of the two movable linkage parts in turn to produce movement of the door latch and in the second state movement of the user input element causes the first moveable linkage part to move without producing a movement of the second linkage that would operate the door latch, the method comprising the steps of: ; connecting an engagement actuator to the engagement element such that movement of the engagement actuator causes the engagement element to move between the first state and the second state; and connecting the engagement actuator to a controller for instructing the engagement actuator to move the engagement element to the second state based upon one or more predetermined criteria.

[0022] Modifying a locking mechanism in this way allows a cheaper and more efficient construction of the locking mechanism of the first aspect of the invention. Furthermore, it allows conversion of normal vehicles to taxis without the greater expense of entirely replacing the locking mechanisms.

[0023] The method may also include the step of, prior to connecting the engagement actuator, modifying the engagement element to allow the engagement actuator to be connected.

[0024] Preferably, the method will additionally comprise the step of programming the controller such that the predetermined criteria include one or both of: the speed of the taxi being above a predetermined minimum speed, the predetermined minimum speed preferably being three miles per hour (1.34 ms^{-1}); and a brake pedal of the taxi being depressed whilst the taxi is stationary.

[0025] Preferably, where the door lock latch actuator includes a control unit and the vehicle includes a primary controller, the method may further comprise the step of connecting the control unit to the primary controller.

[0026] In accordance with a fourth aspect of the invention there is provided a method of modifying a vehicle for use as a taxi, comprising applying the steps of the method according to the third aspect of the invention to the lock of the vehicle.

[0027] In accordance with a fifth aspect of the invention there is provided a kit of parts for use in modifying a vehicle for use as a taxi, the vehicle being of the kind comprising a door latch and a controller, the kit comprising: a replacement door lock latch actuator assembly according to the first aspect of the invention; a controller comprising a processor and memory; and a set of instructions stored in the memory.

[0028] According to a sixth aspect of the invention there is provided a door lock latch actuator comprising a first movable linkage part having an input part which in use is connected to a remotely located user input element; a second movable linkage part which in use is connected to a door latch; an engagement element movable between a first state and a second state, in the first state movement of the user input element causes movement of the two movable linkage parts in turn to produce movement of the door latch and in the second state movement of the user input element causes the first moveable linkage part to move without producing a movement of the second linkage that would operate the door lock latch; and an engagement actuator for moving the engagement element between the first state and the second state in response to control signals received from a controller, the signals being set by the controller according to one or more predetermined criteria.

[0029] There will now be described by way of example only one embodiment of the present invention with reference to and as illustrated in the accompanying drawings of which:

Figure 1 shows a box diagram of a system in accordance with the first aspect of the invention;

Figure 2 shows a simplified depiction of a taxi including the system of Figure 1;

Figure 3 is a flow-chart showing the steps involved in modifying a door locking system to produce a locking system for use in a taxi; and

Figures 4 to 6 depict a lock latch actuator in accordance with the sixth aspect of the invention in both component and assembled forms.

[0030] Referring firstly to Figure 1, there is shown a depiction of a system 100 for the locking and unlocking of a door of a taxi in accordance with the present inven-

tion. The system 100 includes a door lock latch actuator 102 having a first movable linkage part 104 and a second movable linkage part 106, which are selectively disengaged by an engagement element 108. Thus, the first movable linkage part 104 and second movable linkage part 106 are able to be mechanically isolated from each other by the movement of the engagement element 108.

[0031] The first movable linkage part 104 is connected to a user input element 110 which may be, for example, a door handle or push button. The user input element 110 is actuatable by a user to attempt to open a door of the vehicle to which the system 100 is connected. The second movable linkage part 106 is connected to a door lock latch 112 which mechanically releases the door of the vehicle such that it is able to be opened.

[0032] The connections between the first movable linkage part 104 and the user input element 110, and the second movable linkage part 106 and the door lock latch 112, may be implemented by way of one or more rods, bars, or cables which may then transfer the motion. The rods, bars, and/or cables may be relatively axially rigid in order that they may transmit both pushing and pulling motions between the respective components. Other motion transmission elements may also be used such as belts or wires, if desired.

[0033] When in a first state, the operation of the user input element 110 causes the movement of the first movable linkage part 104 which in turn causes the movement of the second movable linkage part 106 to an extent at which the door lock latch 112 is released and the door can be opened. When in a second state, the motion transmitted from the first movable linkage part 104 to the second movable linkage part 106, if any, is not sufficient to release the door lock latch 112.

[0034] As the user input element 110 is internal to the vehicle, the effect of putting the engagement element 108 in the second state such that the first movable linkage part 104 and the second movable linkage part 106 are mechanically separated is that the user is unable to operate the door lock latch from within the vehicle. Such a limitation on operation of a vehicle locking system 112 is desirable in order to prevent the disembarkation of passengers at an unsafe time, such as when the vehicle is travelling above a predetermined speed. As previously mentioned, this is especially useful when operating a taxi or other public service vehicle.

[0035] The engagement element 108 is driven by an electronic engagement actuator 114 which moves it between the first state and the second state. The engagement actuator 114 may be, for example, an electric motor, or more preferably a solenoid due to the swift movement generated by actuation of a solenoid being capable of quickly engaging or disengaging the engagement element 108. In the present embodiment, engagement of the engagement element 108 puts it in its first state which disconnects the first movable linkage part 104 and the second movable linkage part 106, whilst disengagement of the engagement element 108 puts it in its second state.

[0036] A failsafe element 116 may also be included which increases the safety of the system 100. Whilst it is desirable to be able to prevent the vehicle door being opened in some circumstances, it is also important that, in the event of an accident, for instance, the system 100 can allow the door to be opened, no matter whether the electronics of the system 100 are functioning correctly. The failsafe element 116 therefore functions to place the engagement element 114 in the first state in the event of a system failure or other event.

[0037] Where a solenoid is used as the engagement actuator 114, the failsafe element 116 may, for example, be a spring which forces the armature of the solenoid in a direction causing movement of the engagement element 108 into the first state. This could be a coil spring wrapped around the armature, or any other type. Alternatively, for instance where the engagement actuator 114 only positively acts on the engagement element 108 in a single direction, the failsafe element 116 could act directly on the engagement element 108 such that it is biased against the movement of the engagement actuator 114.

[0038] In order to achieve the automation required, a controller is provided, in the present embodiment a control unit 118, which controls the engagement actuator 114 and thus the condition of the engagement element 108. The control unit 118 includes a processor 120 and memory 122, the processor 120 being capable of providing control signals and the memory 122 being capable of storing program instructions. The control unit 118 can therefore cause the automatic movement of the engagement element 108 into the second state whenever one or more predetermined criteria are fulfilled. Such criteria could be that the vehicle be travelling above a predetermined speed, such as three miles per hour (mph) (1.34 ms^{-1}), that the vehicle is stationary and the brake pedal of the vehicle is depressed, or could be indicative of any other applicable characteristic of the vehicle or its surroundings.

[0039] The control unit 118 provides the engagement actuator 114 with signals via a cable harness 124 which transmits the signals electronically. Although described as a cable harness 124, it may also be possible to provide communication through wires which are not part of a cable harness 124. In order to comply with additional regulations, the cable harness 124 may simultaneously transmit an alert signal which operates a visible or audible alert which in the present embodiment is an LED 126 situated within the passenger compartment of the taxi. The LED 126 therefore lights up when the engagement element 108 is in the second state. In order to comply with other regulations, the LED 126 may more specifically be situated on a door pillar or adjacent surface.

[0040] By providing the system 100 in the manner of the present invention, the user input element 110 is advantageously separated from the system 100, resulting in lost motion. This means that the user input element 110 is able to operate freely but with limited or zero phys-

ical connection to the remainder of the system 100. For example, when the user input element 110 is a door handle, the door handle may be moved by the user, but does not have any effect on the door lock latch 112 and thus the motion is 'lost'. This disconnection prevents a user from applying additional force to the system 100, which could occur if they wrongly thought that the system 100 was jammed or otherwise broken rather than in the second state, as would be the case.

[0041] The control unit 118 may also be found within the door lock latch actuator 102 or could, as depicted, be external to the door lock latch actuator 102. The control unit 118 being external to the door lock latch actuator 102 allows the controller 118 to be a part of or in close proximity, optionally via a communications interface 128, or PSM, to a different controller such as a primary controller 130 which may provide door locking functionality other than taxi-specific functionality and which may also carry out other tasks during the running of the vehicle.

[0042] The primary controller 130 may receive feedback or transmit signals between itself and the control unit 130, 118 and also between the various switches within the locking system 100, such as an internal lock switch 132 which prevents the door lock latch 112 being released from the inside, and an external lock switch 134 which prevents the door lock latch 112 being released from the outside. A dashboard switch 136 which acts as a user input for the vehicle central locking, which generally activates the internal lock switch 132 and the external lock switch 134 communicates directly with the control unit 118, but could instead communicate with the primary controller 130. In the present embodiment, the internal lock switch 132 and the external lock switch 134 are enabled to work through a different mechanism from the door lock latch actuator 102, and therefore no detailed description is provided of these features.

[0043] Where internal and external lock switches 132, 134 are used for locking, these may remain in communication with the primary controller 130, which may then implement locking by operation of the engagement element 108 without use of the engagement actuator 114, via other means, which are not shown, for clarity. These means could involve a motor which acts directly on the engagement element.

[0044] The use of the separate control unit 118 and primary controller 130 enables easier conversion of a system 100 installed in a vehicle to be converted in accordance with the method of the invention. By providing these units separately, the conversion process can advantageously take control of the locking function without requiring any adaptation of the primary controller 130 itself, which may be subject to modification restrictions.

[0045] In the depicted embodiment, the control unit 118 communicates with the primary controller 130 via the communications interface 128. The communications interface 128 and/or control unit 118 may ignore, adapt, or otherwise modify the signals received form the primary controller 130 in order to provide the desired signals for the operation of the system. For example, the control unit 118 may ignore all locking signals issued by the primary controller 130 in order that the system 100 only respond to those issued by the control unit 118, or it may modify signals that are unwanted.

[0046] Alternative methods of locking the door, such as by an internal pull switch 140, may be coupled directly to the engagement element 108 in order to provide locking such that physical, rather than electronic, locking may be enabled. In this case, feedback to the primary controller or control unit 130, 118 may also be implemented, if desired, for monitoring purposes.

[0047] In the present embodiment, a further user input element 142 is provided which is connected to the door lock latch 112 in a separate mechanism to that which includes the engagement element 108. Thus, the door lock latch 112 may be operated by the further user input element 142 even when the engagement element 108 is in a second state. A third movable linkage part 144 may be provided which links the further user input element 142 to the door lock latch 112. The further user input element 142 may be, for example, a door handle or door release button on the exterior of the vehicle in order that the door lock latch 112 can be released from the exterior of the vehicle even when the user input element 110 on the interior of the vehicle is inoperative.

[0048] Figure 2 shows an example of how the system 100 of the first aspect of the invention may be incorporated into a taxi 1000. As can be seen, the door lock latch actuator 102 is situated within the rear passenger door 1020, and is connected to the user input element 110, which is an interior door handle, and also to the control unit 118, which is situated in the front of the taxi 1000.

[0049] The controller 118 may be connected to, or include within itself, one or more sensors which may control the activation of the system 100, alone or in combination. For example, the controller 118 may include an accelerometer which measures the speed of the taxi 1000 or may instead by coupled to the speedometer of the taxi 1000 in order to measure the speed. The speed of the taxi 1000 may then be used to move the engagement element 114 into the second state within the door lock latch actuator 102.

[0050] Commonly, the minimum speed at which the user input element should be mechanically disconnected from the door lock latch is three miles per hour (1.34 ms^{-1}), but this predetermined minimum speed could instead be between three and five miles per hour (1.34 to 2.24 ms^{-1}) or less than three miles per hour or more than 5 miles per hour.

[0051] In addition, a common criterion for the system 100 is that the user input element 110 should be disengaged from the door lock latch 112 when the taxi 1000 is stationary and a brake pedal of the taxi 1000 is depressed by the driver. Therefore, a further sensor may be disposed such that it may sense the depression of the brake pedal either directly or indirectly. Other criteria and, where necessary, additional sensors may also be uti-

lised, depending on the particular requirements of the system 100. In place of additional sensors, the controller 118 may be made to be in communication with the primary controller 130 of the taxi, from which the necessary data may be received or derived.

[0052] Although the described system 100 may be manufactured so as to include all of the above features, it may also be desirable to adapt an existing or donor system such that it may be used in the prescribed manner. A method of adaptation is shown in Figure 3.

[0053] In order to be adapted, the donor system should already include at least a first movable linkage part, a second movable linkage part, and an engagement element S1. Such systems may be commonly found on vehicles including a child-lock function. The child-lock function acts to prevent the user input element on the interior of the door from resulting in the door lock latch being allowed to open in the same manner as the functioning of the present invention. However, and importantly, child-locks do not engage automatically and must be engaged or disengaged manually, either through use of a manual engagement actuator such as a lever, which is commonly found on the edge of the door and therefore is unusable whilst the vehicle is in motion, or more rarely is controllable via a switch accessible to the driver. A particularly suitable donor system is that used within the Mercedes-Benz ® VS20 model range on the rear passenger doors.

[0054] Assuming that the engagement element of the donor system is manually operated, it may be necessary to modify the engagement element S2 such that it is connectable to an engagement actuator such as the previously discussed solenoid. Modification could include mounting a plate to the engagement element, for instance, which allows easy attachment of the engagement actuator. Additionally or alternatively, the engagement element may simply be reconfigured to remove the manually operable child-lock control such that it does not interfere with the workings of the system when made suitable for use in a taxi.

[0055] The engagement actuator may then be attached to the engagement element S3 and mounted such that when actuated the engagement element is moved. If there is space inside the door lock latch actuator of the donor system, then the engagement actuator may be mounted inside, but otherwise it may be necessary to affix the engagement actuator to the outside of the door lock latch actuator, or to an additional plate which itself may be affixed to the door lock latch actuator. Thus, the door lock latch actuator may be kept relatively small and self-contained, within the door structure, when installed.

[0056] Finally, the engagement actuator must be connected up to a controller S4 which may also be installed within or in close proximity to the locking module or may instead be positioned within the front of the vehicle, for instance, which may be advantageous for sensor placement or access to the electronic control unit (ECU) of the vehicle. The connection between the controller and engagement actuator may be wired or wireless. The controller may also be programmed with the predetermined criteria S5 discussed as above, if necessary.

[0057] Figure 4 shows a known door lock latch actuator with the parts requiring adaptation for the present invention removed. As such, the workings are able to be seen in more detail. Such details will be known to the person skilled in the art and thus unnecessary description is omitted. Figures 5 and 6 show some components of the known door lock latch actuator which are adapted, with additional components of the present invention which are used to supplement the known door lock latch actuator to create the system of the present invention. Common references are used, for clarity, and additional description is omitted.

[0058] In the depicted embodiment, the first movable linkage part, second movable linkage part, engagement element, engagement actuator, and failsafe element are all housed within, or mounted upon, a housing or support. This means that the stated components are self-contained within the housing, making the door lock latch actuator discrete and easily manufactured or replaced.

Claims

1. A method of adapting a door lock latch actuator such that it is suitable for use with a taxi, the door lock latch actuator including a first movable linkage part connected to a user input element, a second movable linkage part connected to a door lock latch, and an engagement element movable between a first state and a second state, in the first state movement of the user input element causes movement of the two movable linkage parts in turn to produce movement of the door latch and in the second state movement of the user input element causes the first moveable linkage part to move without producing a movement of the second linkage that would operate the door latch, the method comprising the steps of:

   connecting an engagement actuator to the engagement element such that movement of the engagement actuator causes the engagement element to move between the first state and the second state; and
   connecting the engagement actuator to a controller for instructing the actuator to move the engagement element to the second state based upon one or more predetermined criteria.

2. A method according to claim 1 wherein, prior to connecting the actuator, modifying the engagement element to allow the actuator to be connected.

3. A method according to claim 1 or claim 2, further comprising the step of programming the controller such that the predetermined criteria include one or both of: the speed of the taxi being above a prede-

termined minimum speed, the predetermined minimum speed preferably being three miles per hour; and a brake pedal of the taxi being depressed whilst the taxi is stationary.

4. A method of modifying a vehicle for use as a taxi, comprising applying the steps of any of claims 1 to 3 to the lock of the vehicle.

5. A method of modifying a vehicle according to claim 4, wherein the door lock latch actuator includes a control unit and the vehicle includes a primary controller, the method further comprising the step of connecting the control unit to the primary controller.

6. A system for the locking and unlocking of a door of a taxi, the system comprising a door lock latch actuator comprising:

a first movable linkage part which in use is connected to a remotely located user input element;
a second movable linkage part which in use is connected to a door lock latch;
an engagement element movable between a first state and a second state, in the first state movement of the user input element causes movement of the two movable linkage parts in turn to produce movement of the door latch and in the second state movement of the user input element causes the first moveable linkage part to move without producing a movement of the second linkage that would operate the door latch; and
an engagement actuator for moving the engagement element between the first state and the second state in response to control signals received from a controller, the signals being set by the controller according to one or more predetermined criteria.

7. A system according to claim 6, wherein the controller is a control unit in communication with a primary controller.

8. A system according to claim 6 or claim 7, further comprising a cable harness which passes the signals from the controller to the engagement actuator.

9. A system according to any of claims 6 to 8, further comprising a housing or support to which are mounted the first movable linkage part, second movable linkage part, and engagement element.

10. A system according to claim 9, wherein the engagement actuator is also mounted to the housing or support.

11. A system according to any of claims 6 to 10, further comprising a failsafe element for returning the engagement element from the second state to the first state when a failure is detected.

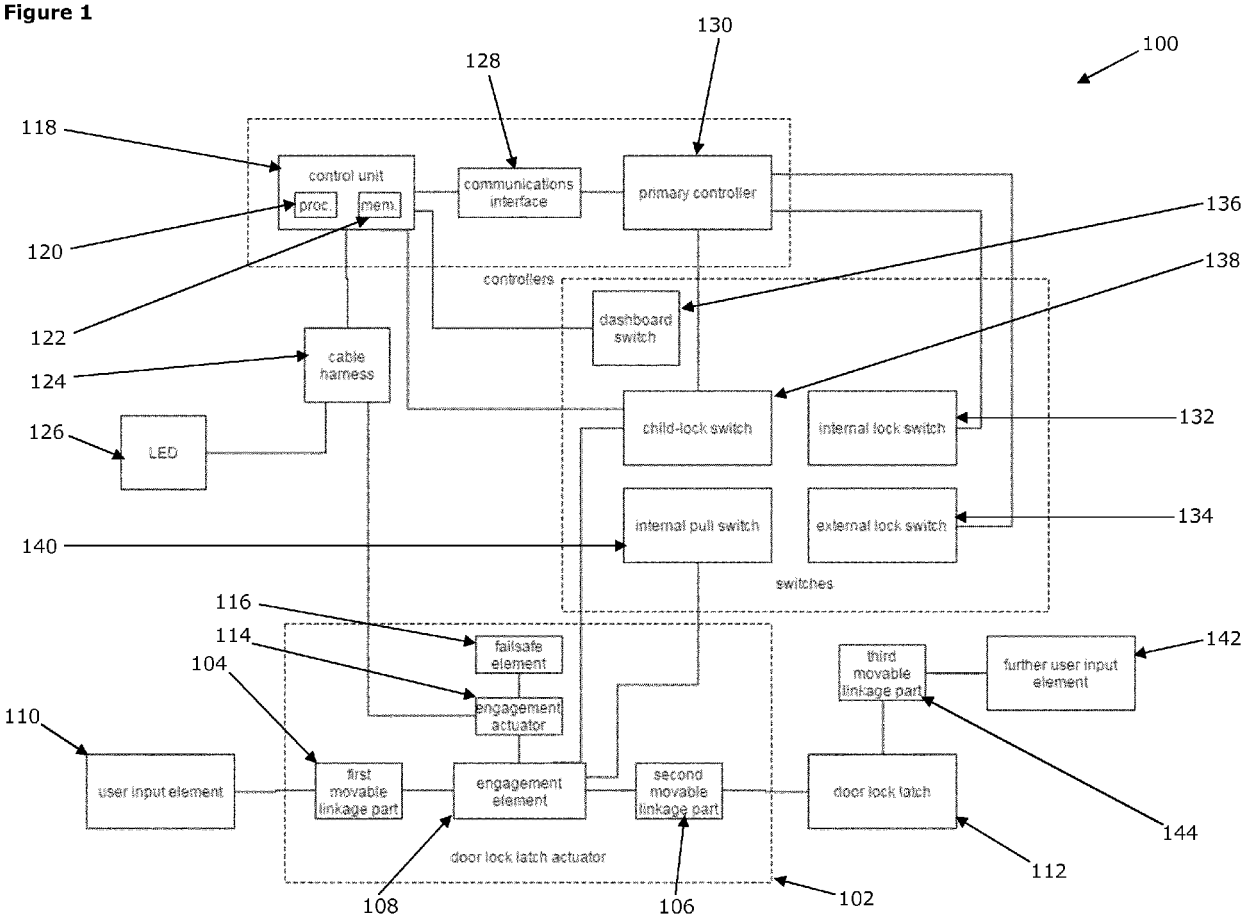
12. A system according to any of claims 6 to 11, further comprising one or more sensors which provide data to the controller for assessing the predetermined criteria.

13. A system according to claim 12, wherein the sensors include a speedometer of the vehicle and/or a brake pedal sensor of the vehicle.

14. A system according to any of claims 6 to 13, further comprising a further user input element positionable on the exterior of the vehicle and in mechanical communication with the door lock latch, the transmission of movement between the further user input element and the door lock latch not being affected by whether the engagement element is in the first state or the second state.

15. A system according to claim 14, further comprising a third movable linkage part which mechanically links the further user input element and the door lock latch.

Figure 1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130
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control unit
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mem.
communications interface
primary controller
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122
controllers
136
138
dashboard switch
cable harness
124
126
LED
child-lock switch
internal lock switch
132
internal pull switch
external lock switch
134
140
switches
116
114
104
failsafe element
engagement actuator
third movable linkage part
further user input element
142
110
user input element
first movable linkage part
engagement element
second movable linkage part
door lock latch
144
112
door lock latch actuator
108
106
102

Figure 2

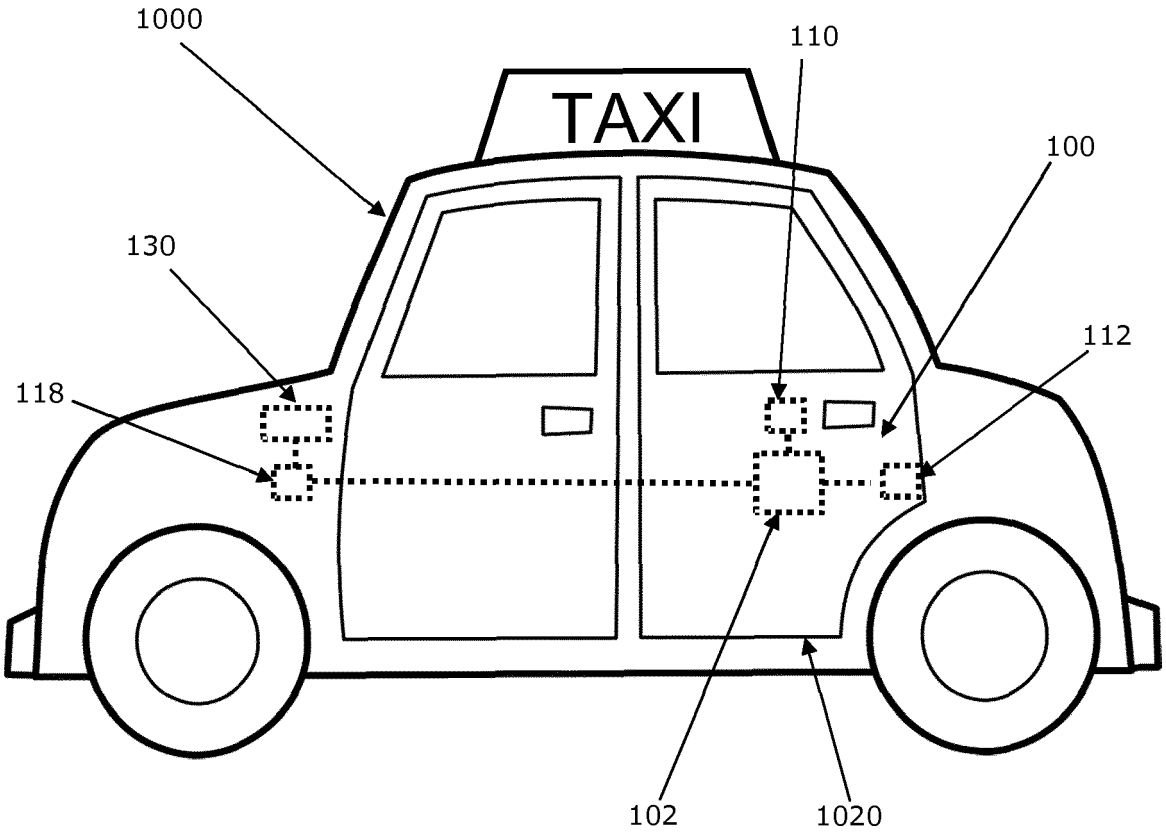


Figure 3

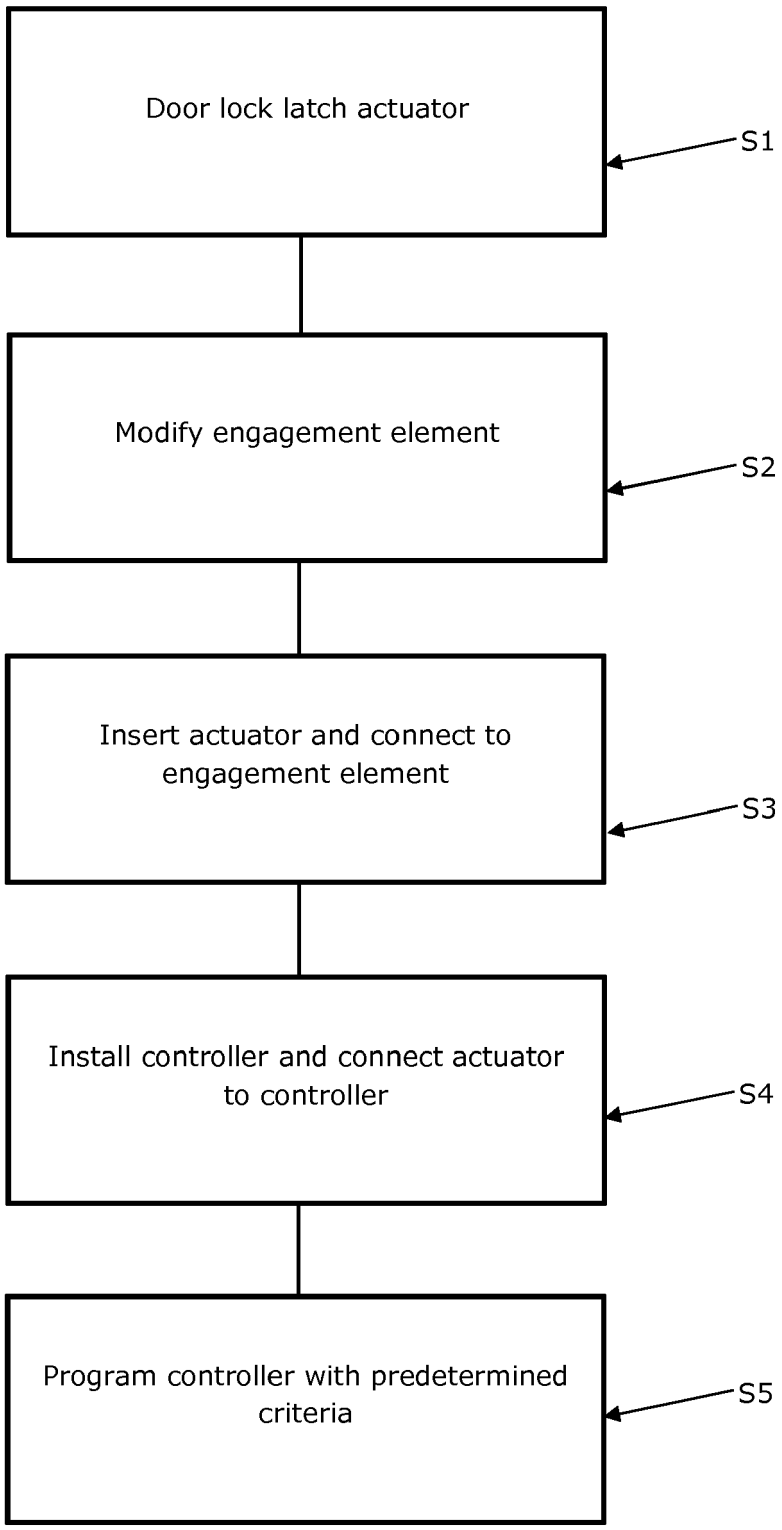

Door lock latch actuator
S1
Modify engagement element
S2
Insert actuator and connect to engagement element
S3
Install controller and connect actuator to controller
S4
Program controller with predetermined criteria
S5

Figure 4

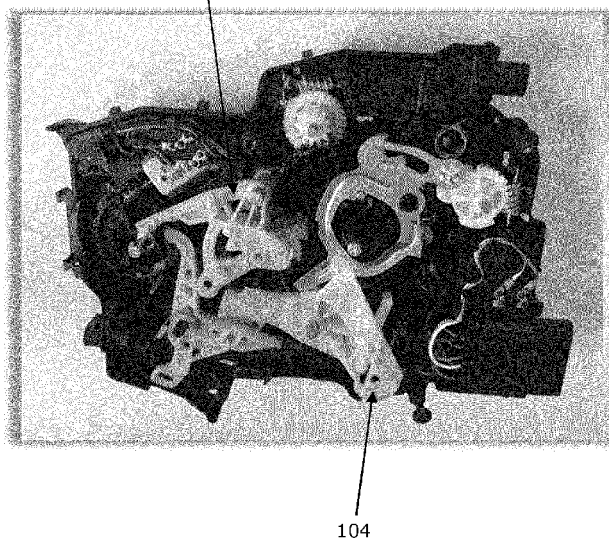


Figure 5

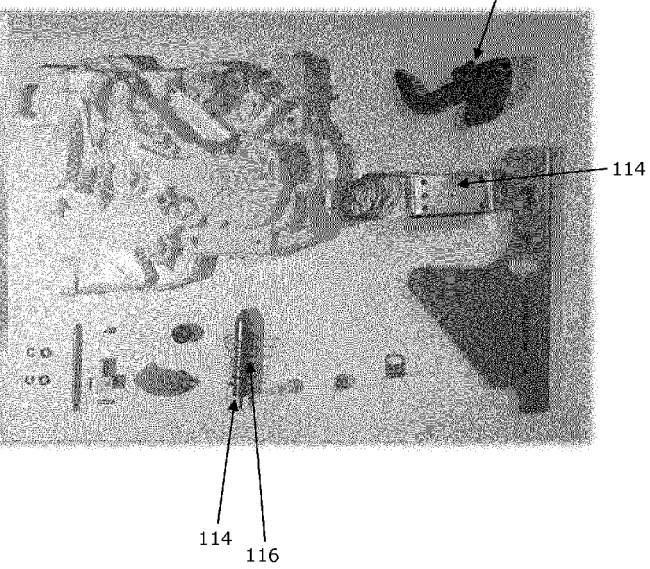
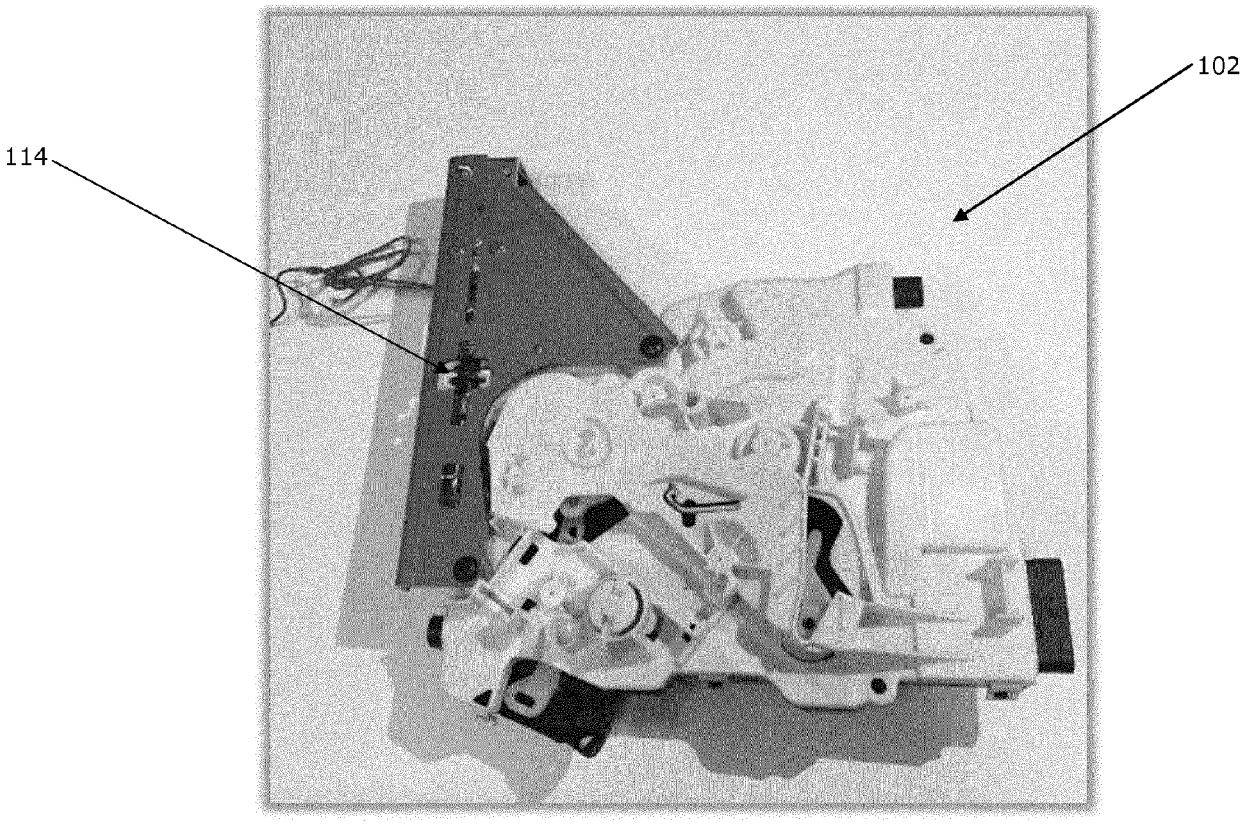


Figure 6



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Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 August 2017	Antonov, Ventseslav

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