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(54) **VEHICLE DOOR SYSTEM AND METHOD**

(57) The disclosure relates to a vehicle door system (1) comprising a door (2) and a vehicle body (3). The vehicle body (3) encloses a passenger compartment and defines a door opening, wherein the door (2) is moveable relative to the door opening between a closed position and a maximum open position. The vehicle door system (1) is adapted to limit the extent to which the door is allowed to open to at least one intermediate position between the closed position and the maximum open position. The vehicle door system (1) comprises a manually operated actuator (7) arranged for locking the door in any one of the at least one intermediate position between the closed position and the maximum open position. The disclosure also relates to a method for locking a door (2) in any position between a closed position and an open position relative a vehicle body (3).

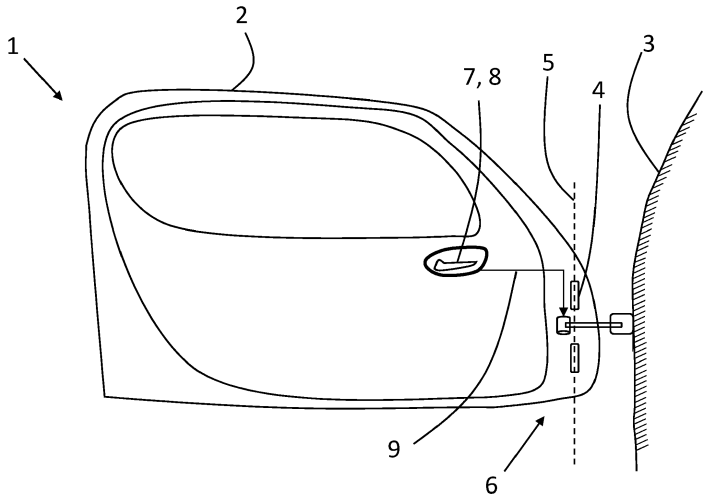

Fig. 1

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Description

TECHNICAL FIELD

[0001] The disclosure relates to a vehicle door system comprising a door and a vehicle body. The vehicle body encloses a passenger compartment and defines a door opening, wherein the door is moveable relative to the door opening between a closed position and a maximum open position. The vehicle door system is adapted to limit the extent to which the door is allowed to open to at least one intermediate position between the closed position and the maximum open position. The disclosure also relates to a method for locking a door in any position between a closed position and an open position relative a vehicle body.

BACKGROUND ART

[0002] Vehicle doors are known to have a mechanism that controls the opening of the vehicle door such that the opening is controlled. This is used to prevent the door from colliding with an object close to the vehicle if a vehicle user opening the door loses control of the door. One alternative comprises a mechanism that allows the vehicle door to stop in at least one predefined intermediate positions between a closed position and a maximum open position. A mechanical device fixes this intermediate position.

[0003] Another example of such a mechanism can be found in WO 2004/001170 A1 that discloses a door control system that includes a door check assembly, a hinge assembly, and a controller. The mechanism uses a magnetorheological fluid disposed within a cylinder and a passageway. Magnetic flux can be applied to the fluid in the passageway to dampen the movement of the door. A position sensor relays the position and velocity of the door. A proximity sensor senses closeness to obstacles and a controller restricts movement of the door if the door gets too close to an obstacle. This a complicated and expensive mechanism.

SUMMARY

[0004] An objective of the disclosure is to provide a vehicle door system and a method addressing the issues raised. The objective is achieved by the vehicle door system of claim 1 and the method of claim 14. Dependent claims provide advantageous example embodiments.

[0005] The disclosure relates to a vehicle door system comprising a door and a vehicle body. The vehicle body encloses a passenger compartment and defines a door opening, wherein the door is moveable relative to the door opening between a closed position and a maximum open position. The vehicle door system is adapted to limit the extent to which the door is allowed to open to at least one intermediate position between the closed position and the maximum open position. The vehicle door system comprises a manually operated actuator arranged for locking the door in any one of the at least one intermediate position between the closed position and the maximum open position.

[0006] The vehicle door system provides the advantage of providing a simple, yet effective way for a vehicle user, i.e. a driver or passenger, to open the door and by a manually operated actuator lock it in an intermediate position between the closed position and the maximum open position. The system can be useful for everyday use in tight parking spaces, and is particularly useful when someone needs to lean into the car to adjust something (e.g. a baby seat, some grocery bags, etc.). This differs from the previously known systems that rely on some kind of automatic system, mechanical or other. The system according to the disclosure allows the vehicle user to himself or herself determine if the door should be locked in the intermediate position or not.

[0007] The manually operated actuator can activate locking through an electronic command or a mechanical linkage.

[0008] The vehicle door system may be adapted to limit the extent to which the door is allowed to open to at least two intermediate positions between the closed position and the maximum open position.

[0009] In order to have greater freedom in opening the door, the vehicle door system can be adapted to open to more than one intermediate position. For instance, the first intermediate position can be a position close to the closed position, where the opening is big enough for a vehicle user to pass through. The second intermediate position can be a position close to the maximum open position, such that the opening is more comfortable to pass through but can be used to stop the opening of the door before it hits an obstacle.

[0010] The vehicle door system may be adapted to limit the extent to which the door is allowed to open to an infinite number of intermediate positions between the closed position and the maximum open position.

[0011] In order to have even greater freedom in opening the door, the vehicle door system can be adapted to open to an infinite number of positions between the closed position and the maximum open position. This is useful in order to have complete freedom in determining the position in which the door is to be locked. Predetermined intermediate positions may in some situations prevent the door from being locked in a suitable position.

[0012] The manually operated actuator may be a door handle arranged to move between a first position and a second position, wherein in the first position, the manually operated actuator locks the door in any one of the at least one intermediate position between the closed position and the maximum open position.

[0013] In one aspect of the disclosure, the manually operated actuator is a door handle of the door of the vehicle. This provides the vehicle user with a simple way to control the actuator, as the door handle is in easy reach for the vehicle user when the door needs to be opened.

[0014] The manually operated actuator may be arranged in a door panel.

[0015] In a further aspect of the disclosure, the manually operated actuator is arranged in a door panel. In this case, the manually operated actuator may be a push button, a lever or similar arranged in the door panel.

[0016] The vehicle door system may comprise a latch for securing the door closed to the vehicle body, wherein the vehicle door system comprises a manually operated latch actuator for operating the latch, and wherein the manually operated actuator for locking the door in any one of the at least one intermediate position is integrated in the manually operated latch actuator.

[0017] One advantage with this is that there is no need for a separate manually operated actuator for locking the door. Instead, one actuator can be used for both opening the door from the closed position and locking the door in any one of the at least one intermediate position.

[0018] The vehicle door system may comprise a door check arrangement adapted to limit the extent to which the door is allowed to open, wherein the door check arrangement is arranged to be connected to the manually operated actuator.

[0019] Door check arrangements are commonly used in vehicles today, and can come in various designs. However, having the manually operated actuator connected to the door check arrangement provides the vehicle user freedom to choose when to lock the door in place in any one of the at least one intermediate position.

[0020] The door check arrangement may comprise a door check shaft interconnecting the vehicle body and the door, wherein the door check shaft is movable relative the door and/or the vehicle body, wherein the door check arrangement further comprises a locking mechanism arranged for locking the door in any one of the at least one intermediate position between the closed position and the maximum open position.

[0021] This provides a way to lock the door in a desired position and allows a designer to choose a suitable locking mechanism depending e.g. on the amount of space available in the door, the cost of the locking mechanism etc.

[0022] The door check arrangement may comprise stop pads arranged to lock the door check shaft.

[0023] This provides one alternative way to lock the door in position and provides an uncomplicated mechanical solution where stop pads are arranged to prevent the door check shaft from moving when the manually operated actuator is actuated.

[0024] The door check arrangement may comprise a fluid cylinder, wherein the door check shaft is attached to a piston arranged to run in the fluid cylinder, wherein a valve connects a first end of the fluid cylinder and a second end of the fluid cylinder, wherein in an open position, the valve allows fluid flow between the first end and the second end of the fluid cylinder such that the piston and door check shaft are free to move and, wherein in a closed position, the valve prevents fluid flow between the first end and the second end of the fluid cylinder such that the piston and door check shaft are prevented to move, wherein the manually operated actuator is arranged to operate the valve.

[0025] This provides a further alternative way to lock the door in position. As this alternative is based on fluid power, this door check arrangement can make sure that the door stays in place even if it exposed to large forces.

[0026] The door check arrangement may be arranged in the door.

[0027] According to one aspect, the door check arrangement is arranged in the door. Normally, the door check arrangement is arranged in the door. As this is a well-known way to arrange the door check arrangement, this provides an uncomplicated design.

[0028] The door check arrangement may be arranged in the vehicle body.

[0029] According to another aspect, the door check arrangement is arranged in the door or in the vehicle body. Depending on the design of the vehicle, it may be more beneficial to have the door check arrangement arranged in the vehicle body, freeing up space in the door and giving a designer more design choices for the vehicle.

[0030] The disclosure also relates to a vehicle comprising a vehicle door system according to the above disclosure.

[0031] The disclosure also relates to a method for locking a door in any position between a closed position and an open position relative a vehicle body. The vehicle body encloses a passenger compartment and defines a door opening, wherein the door is moveable relative to the door opening between a closed position and a maximum open position. The method comprises the steps:

- limiting the extent to which the door is allowed to open to at least one intermediate position between the closed position and the maximum open position in response to an actuation of a manually operated actuator arranged for locking the door in any one of the at least one intermediate position between the closed position and the maximum open position.

[0032] The method provides the same advantages as the vehicle door system.

[0033] The method may further comprise the step:

- limiting the extent to which the door is allowed to open to any one of at least two intermediate positions between the closed position and the maximum open position in response to an actuation of the manually operated actuator, or
- limiting the extent to which the door is allowed to open to any one of an infinite number of intermediate positions between the closed position and the maximum open position in response to an actuation of the manually operated actuator.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034]

Figure 1 schematically shows a vehicle door system according to a first example embodiment of the disclosure,

Figure 2 schematically shows a vehicle door system according to a second example embodiment of the disclosure,

Figure 3 schematically shows a vehicle door system according to a third example embodiment of the disclosure,

Figure 4 schematically shows a vehicle door system according to a fourth example embodiment of the disclosure,

Figure 5 schematically shows a vehicle door system according to a fifth example embodiment of the disclosure,

Figure 6 schematically shows a vehicle comprising a vehicle door system according to the disclosure,

Figures 7a-7c schematically show a vehicle comprising a vehicle door system with a door in different positions.

DETAILED DESCRIPTION

[0035] Figure 1 schematically shows a vehicle door system 1 according to a first example embodiment of the disclosure. The vehicle door system 1 comprises a door 2 and a vehicle body 3. The vehicle body 3 encloses a passenger compartment and defines a door opening. The door 2 is moveable relative to the door opening between a closed position and a maximum open position. For clarity, the door 2 is shown in an open position in order to be able to show the different parts of the vehicle door system 1. This position may not reflect an actual position the door 2 can be opened to.

[0036] The door 2 comprises a door pivoting arrangement 4 arranged to make the door 2 pivot around a rotation axis 5. Normally this is achieved by a bearing joint, but can be achieved by other types of joints, such as spring, slip joint, heavy duty and butt hinges. The door 2 further comprises a door check arrangement 6 attached to both the door 2 and the vehicle body 3 that is adapted to limit the extent to which the door 2 is allowed to open to at least one intermediate position between the closed position and the maximum open position.

[0037] In the example embodiment of figure 1, the vehicle door system 1 comprises a manually operated actuator 7 arranged for locking the door 2 in any one of the at least one intermediate position between the closed position and the maximum open position connected to the door check arrangement 6.

[0038] Alternatively, the vehicle door system 1 can be adapted to limit the extent to which the door 2 is allowed to open to at least two intermediate positions between the closed position and the maximum open position.

[0039] Alternatively, the vehicle door system 1 can be adapted to limit the extent to which the door 2 is allowed to open to an infinite number of intermediate positions between the closed position and the maximum open position.

[0040] In figure 1, a door handle 8 exemplifies the manually operated actuator 7. An actuator connection 9 schematically indicates that the manually operated actuator 7 is arranged for locking the door 2 in any one of the at least one intermediate position between the closed position and the maximum open position.

[0041] The actuator connection 9 can for instance be a mechanical, electromechanical or wireless.

[0042] Figure 2 schematically shows a vehicle door system 1 according to a second example embodiment of the disclosure. In this example embodiment, the door 2 comprises a door check arrangement 6 comprising a door check shaft 10 arranged to run through a prismatic joint 11 arranged in the door 2. The door check shaft 10 interconnects the vehicle body 3 and the door 2 and is connected to a door bearing joint 12 and a vehicle body bearing joint 13 such that the door check shaft 10 can rotate at these joints with the opening or closing movement of the door 2. The door check shaft 10 also moves in an axial direction as the door 2 opens and closes as indicated by the arrow above the door check shaft 10.

[0043] A locking mechanism 14 is connected to a first manually operated actuator 7a as indicated by the actuator connections 9. In this example embodiment, the locking mechanism 14 comprises a number of stop pads 15 that are mounted such that when the manually operated actuator 7 is actuated, the stop pads 15 clamp the door check shaft 10, preventing it from moving and thereby locking the door 2 in any one of the at least one intermediate position between the closed position and the maximum open position.

[0044] In the example embodiment, the door check shaft 10 is straight and mounted essentially halfway between a lower side and an upper side of the door 2. It is also possible for the door check shaft 10 to be curved and be mounted at the lower side of the door 2.

[0045] In figure 2, the first manually operated actuator 7a is arranged on the inside of the door 2 and is exemplified by an inner door handle 8a. A second manually operated actuator 7b is arranged on the outside of the door 2 in order for a vehicle user to be able to lock/unlock the door 2 also from the outside. In figure 2, this is exemplified by an outer door handle 8b. This allows for a simpler actuation of locking the door 2 in or unlocking the door 2 from the intermediate position when the vehicle user has exited the vehicle and wants to prevent the door 2 from moving or wants to move the door 2.

[0046] Actuation of the door handle 8, 8a, 8b can be arranged such that the door handle 8, 8a, 8b is movable between a first position and a second position. In the first position, the door handle 8, 8a, 8b locks the door 2 in any one of the at least one intermediate position between the closed position and the maximum open position. In one aspect, the first position of the door handle 8, 8a, 8b is a position other than a non-operational position of the door handle 8, e.g. a position reached by moving the door handle 8, 8a, 8b in a vertical direction as indicated by the dashed line in the insert of figure 2. In another aspect, the first position of the door handle 8 is the non-operational position, i.e. the position in which the door handle 8, 8a, 8b does not activate opening of the door 2. A second position is the operational position, i.e. the position in which the door handle 8, 8a, 8b activates opening of the door 2.

[0047] The door 2 can be allowed to move between any one of the at least one locked intermediate positions and the closed position, i.e. when locking the door 2, the door 2 is only locked in the opening direction and not in the closing direction.

[0048] Figure 3 schematically shows a vehicle door system 1 according to a third example embodiment of the disclosure. In figure 3, the manually operated actuator 7 is exemplified by an actuator that can be actuated by a vehicle user by pressing, touching or a similar interaction. The first and second manually operated actuators 7a, 7b in this example can be a push button 16, a touch-activated button 16 or a proximity sensor 16. The first manually operated actuator 7a is arranged in a door panel 17 in order to be easily accessible to a vehicle user. The position of the second manually operated actuator 7b is intended to show an example position. Other positions for the push button or the touch-activated button 16 may be possible. Otherwise, the vehicle door arrangement is the same as in figure 2.

[0049] It is also possible to complement the first and second manually operated actuators 7a, 7b in figure 2 with further manually operated actuators according to the example embodiment of figure 3. Alternatively, the first manually operated actuator 7a can be the inner door handle 8a and the second manually operated actuator 7b can be a push button 16 or a touch activated button 16 arranged on the outside of the door 2 or on a surface easily reachable when the door 2 is open, such as a position on the door frame.

[0050] Actuation of the push button 16 or a touch-activated button 16 can be arranged such that the push button 16 or touch activated button 16 is set in a first state and a second state. In the first state, the push button 16 or touch activated button 16 locks the door 2 in any one of the at least one intermediate position between the closed position and the maximum open position. In one aspect, the first state of the push button 16 or touch activated button 16 is an engaged state, i.e. by pressing the push button 16 or by touching the touch-activated button 16. Pressing the push button 16 a second time or touching the push button a second time unlocks the door 2.

[0051] Other alternatives to the ones described above can be a button on or close to the doorframe on the door 2 that can be pushed by hand. Further alternatives to the push button 16 or touch activated button 16 arranged in the door can be a button, lever or proximity sensor that can be actuated by hand or by foot to activate/deactivate the stop that is situated on the vehicle body. The vehicle user can thereby open the door to the desired position and move his/her foot beneath the vehicle body to activates the locking of the door in the desired positon.

[0052] One or more conditions for actuation to take effect may be imposed, such as the vehicle standing still, the parking brake being applied, the engine not running etc. such that accidental contact with the actuator during driving will not have any effect. This is useful if the vehicle door system 1 comprises a latch (not shown) for securing the door 2 closed to the vehicle body 3 and the vehicle door system 1 comprises a manually operated latch actuator for operating the latch, wherein the manually operated actuator 7 for locking the door 2 in any one of the at least one intermediate position is integrated in the manually operated latch actuator. This applies to all example embodiments.

[0053] Figure 4 schematically shows a vehicle door system 1 according to a fourth example embodiment of the disclosure. In this example embodiment, the vehicle door arrangement comprises a door check arrangement 6 comprising a fluid cylinder 18. The door check shaft 10 is attached to a piston 19 arranged to run in the fluid cylinder 18. A valve 20 connects a first end 18a of the fluid cylinder 18 and a second end 18b of the fluid cylinder 18. In an open valve position, the valve 20 allows fluid flow between the first end 18a and the second end 18b of the fluid cylinder 18 such that the piston 19 and door check shaft 10 are free to move. In a closed valve position, the valve 20 prevents fluid flow between the first end 18a and the second end 18b of the fluid cylinder 18 such that the piston 19 and door check shaft 10 are prevented to move. Actuation of the manually operated actuator 7 moves the valve 20 between the open valve position and closed valve position.

[0054] In case the actuator connection 9 is electromechanical, the valve 20 can be actuated by a solenoid.

[0055] Figure 5 schematically shows a vehicle door system 1 according to a fifth example embodiment of the disclosure. In this example embodiment, the door check arrangement 6 is arranged in the vehicle body 3 instead of in the door 2. As mentioned above, this opens up for alternative design choices that are otherwise unavailable when the door check arrangement 6 is arranged in the door 2. As schematically shown with actuator connections 9, the manually operated actuator 7 is connected to the door check arrangement 6. In this example embodiment, the manually operated actuator 7 can be connected to the door check arrangement 6.

[0056] Figure 6 schematically shows a vehicle com-

prising a vehicle door system 1 according to the disclosure.

[0057] Figures 7a-7c schematically show a vehicle 21 comprising a vehicle door system 1 with a door 2 in different positions. In figure 7a, the door 2 is in a closed position. The vehicle is positioned next to an obstacle 22, in this case exemplified by a rock. An outer door handle 8b is shown.

[0058] In this position, the manually operated actuator is not used.

[0059] In figure 7b, the door 2 of vehicle 1 has opened to an intermediate position, between the closed position and the fully open position. A vehicle user, detecting the obstacle 22, has used the manually operated actuator 7 and locked the door 2 in the intermediate position well clear of the obstacle 22.

[0060] To reach this position, the vehicle user opens the door by means of the inner door handle 8a, if he is on the inside or by means of the outer door handle 8b if he is on the outside. The manually operated actuator is in this position in the first position according to the description of figure 2. Alternatively, the push button 16 or touch-activated button 16 has been pressed or touched according to the description of figure 3.

[0061] To unlock the door 2, the vehicle user moves inner or outer door handle 8a, 8b to the second position according to the description of figure 2 or presses or touches the push button 16 or touch activated button 16 according to the description of figure 3.

[0062] In figure 7c, the door's 2 maximum open position is illustrated in dashed line. To illustrate the advantage of the system and method according to the disclosure, the door 2 has been locked just before it impacts the obstacle 22. Without the vehicle door system 1 according to the disclosure, the door 2 could have impacted the obstacle 22 when opening the door to the maximum open position that could be the case if the vehicle user could not lock the door 2 in the intermediate position of figure 7b. Figure 7c also illustrates the example embodiment that the door 2 can be opened in more intermediate positions than the one shown in figure 7b.

[0063] Although the disclosure has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary and the disclosure is not limited to the disclosed example embodiments. It is to be understood that it is within the scope of the application to use other alternative manually operated actuators arranged for locking the door 2 in any one of the at least one intermediate position between the closed position and the maximum open position. It is also to be understood that the vehicle door system 1 can be applied to any door, front or rear of a vehicle and to doors arranged at the rear of the vehicle such as doors to luggage compartments or rear van doors.

References:

[0064]

1. Vehicle door system
2. Door
3. Vehicle body
4. Door pivoting arrangement
5. Rotation axis
6. Door check arrangement
7. Manually operated actuator
8. Door handle
    a. Inner
    b. Outer
9. Actuator connection
10. Door check shaft
11. Prismatic joint
12. Door bearing joint
13. Vehicle body bearing joint
14. Locking mechanism
15. Stop pads
16. Push button/touch activated button
17. Door panel
18. Fluid cylinder
    a. First end
    b. Second end
19. Piston
20. Valve
21. Vehicle

Claims

1. A vehicle door system (1) comprising a door (2) and a vehicle body (3), wherein the vehicle body (3) encloses a passenger compartment and defines a door opening, wherein the door (2) is moveable relative to the door opening between a closed position and a maximum open position, wherein the vehicle door-system (1) is adapted to limit the extent to which the door is allowed to open to at least one intermediate position between the closed position and the maximum open position, **characterized in that** the vehicle door system (1) comprises a manually operated actuator (7) arranged for locking the door in any one of the at least one intermediate position between the closed position and the maximum open position.

2. Vehicle door system (1) according to claim 1, wherein the vehicle door system (1) is adapted to limit the extent to which the door is allowed to open to at least two intermediate positions between the closed position and the maximum open position.

3. Vehicle door system (1) according to claim 1, wherein the vehicle door system (1) is adapted to limit the extent to which the door is allowed to open to an infinite number of intermediate positions between the closed position and the maximum open position.

4. Vehicle door system (1) according to any one of the preceding claims, wherein manually operated actuator (7) is a door handle (8) arranged to move between a first position and a second position, wherein in the first position, the manually operated actuator (7) locks the door in any one of the at least one intermediate position between the closed position and the maximum open position.

5. Vehicle door system (1) according to any one of the preceding claims, wherein the manually operated actuator (7) is arranged in a door (2) panel.

6. Vehicle door system (1) according to any one of the preceding claims, wherein the vehicle door system (1) comprises a latch for securing the door (2) closed to the vehicle body (3), wherein the vehicle door system (1) comprises a manually operated latch actuator for operating the latch, and wherein the manually operated actuator (7) for locking the door in any one of the at least one intermediate position is integrated in the manually operated latch actuator.

7. Vehicle door system (1) according to any one of the preceding claims, wherein the vehicle door system (1) comprises a door check arrangement (6) adapted to limit the extent to which the door (2) is allowed to open, wherein the door check arrangement (6) is arranged to be connected to the manually operated actuator (7).

8. Vehicle door system (1) according to claim 7, wherein the door check arrangement (6) comprises a door check shaft (10) interconnecting the vehicle body (3) and the door (2), wherein the door check shaft (10) is movable relative the door (2) and/or the vehicle body (3), wherein the door check arrangement (6) further comprises a locking mechanism (14) arranged for locking the door in any one of the at least one intermediate position between the closed position and the maximum open position.

9. Vehicle door system (1) according to claim 7 or 8, wherein the door check arrangement (6) comprises stop pads (15) arranged to lock the door check shaft (10).

10. Vehicle door system (1) according to any one of the preceding claims 7-9, wherein the door check arrangement (6) comprises a fluid cylinder (18), wherein the door check shaft (10) is attached to a piston (19) arranged to run in the fluid cylinder (18), wherein a valve (20) connects a first end (18a) of the fluid cylinder (18) and a second end (18b) of the fluid cylinder (18), wherein in an open position, the valve (20) allows fluid flow between the first end (18a) and the second end (18b) of the fluid cylinder (18) such that the piston (19) and door check shaft (10) are free to move and, wherein in a closed position, the valve (20) prevents fluid flow between the first end (18a) and the second end (18b) of the fluid cylinder (18) such that the piston (19) and door check shaft (10) are prevented to move, wherein the manually operated actuator (7) is arranged to operate the valve.

11. Vehicle door system (1) according to any one of the preceding claims 7-10, wherein the door check arrangement (6) is arranged in the door (2).

12. Vehicle door system (1) according to any one of the preceding claims 7-11, wherein the door check arrangement (6) is arranged in the vehicle body (3).

13. Vehicle comprising a vehicle door system (1) according to any one of the preceding claims.

14. Method for locking a door (2) in any position between a closed position and an open position relative a vehicle body (3), wherein the vehicle body (3) encloses a passenger compartment and defines a door opening, wherein the door (2) is moveable relative to the door opening between a closed position and a maximum open position, wherein the method comprises the steps:

    - limiting the extent to which the door is allowed to open to at least one intermediate position between the closed position and the maximum open position in response to an actuation of a manually operated actuator (7) arranged for locking the door in any one of the at least one intermediate position between the closed position and the maximum open position.

15. Method according to claim 14, wherein the method comprises the step:

    - limiting the extent to which the door is allowed to open to any one of at least two intermediate positions between the closed position and the maximum open position in response to an actuation of the manually operated actuator (7), or
    - limiting the extent to which the door is allowed to open to any one of an infinite number of intermediate positions between the closed position and the maximum open position in response to an actuation of the manually operated actuator (7).

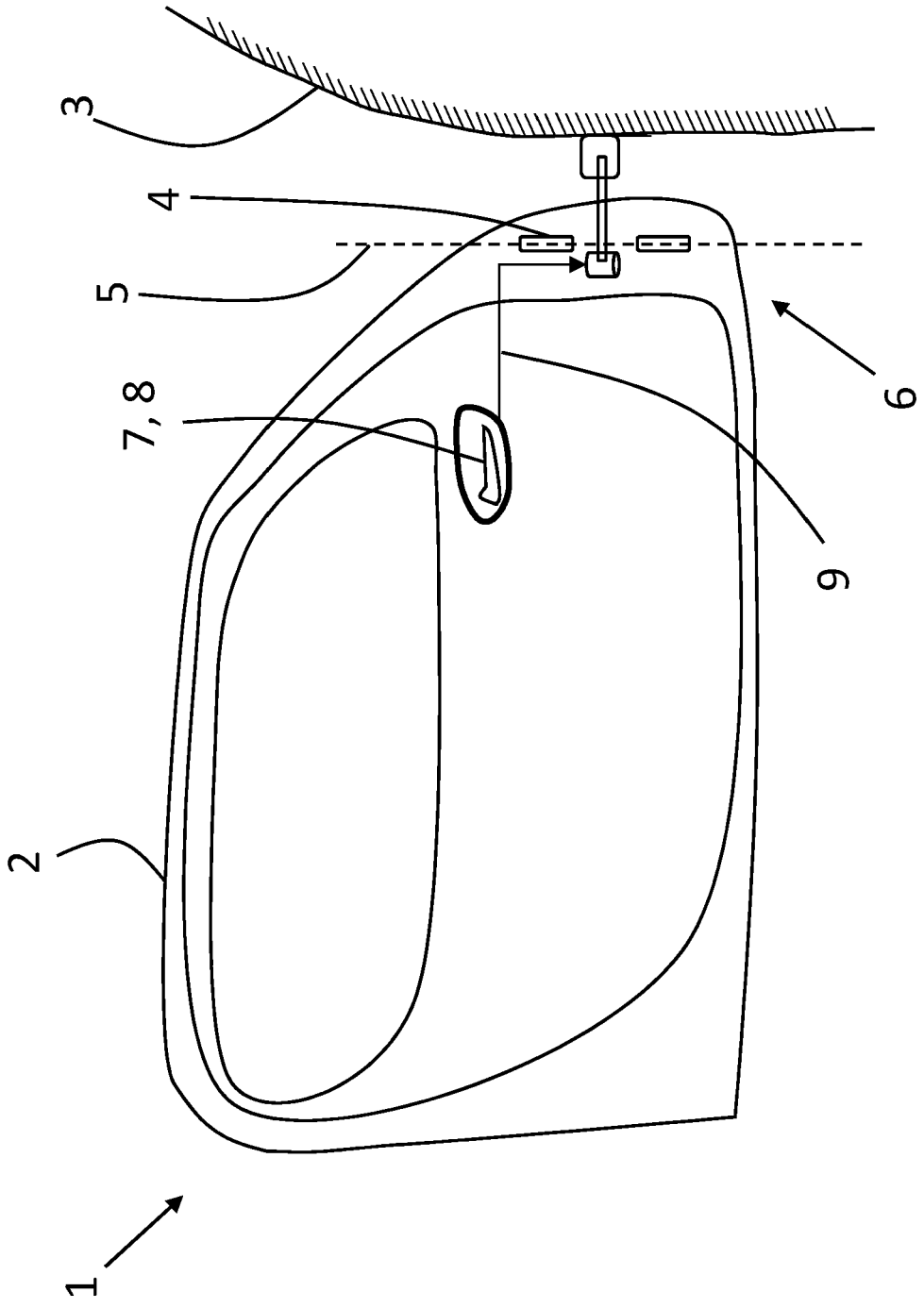

Fig. 1

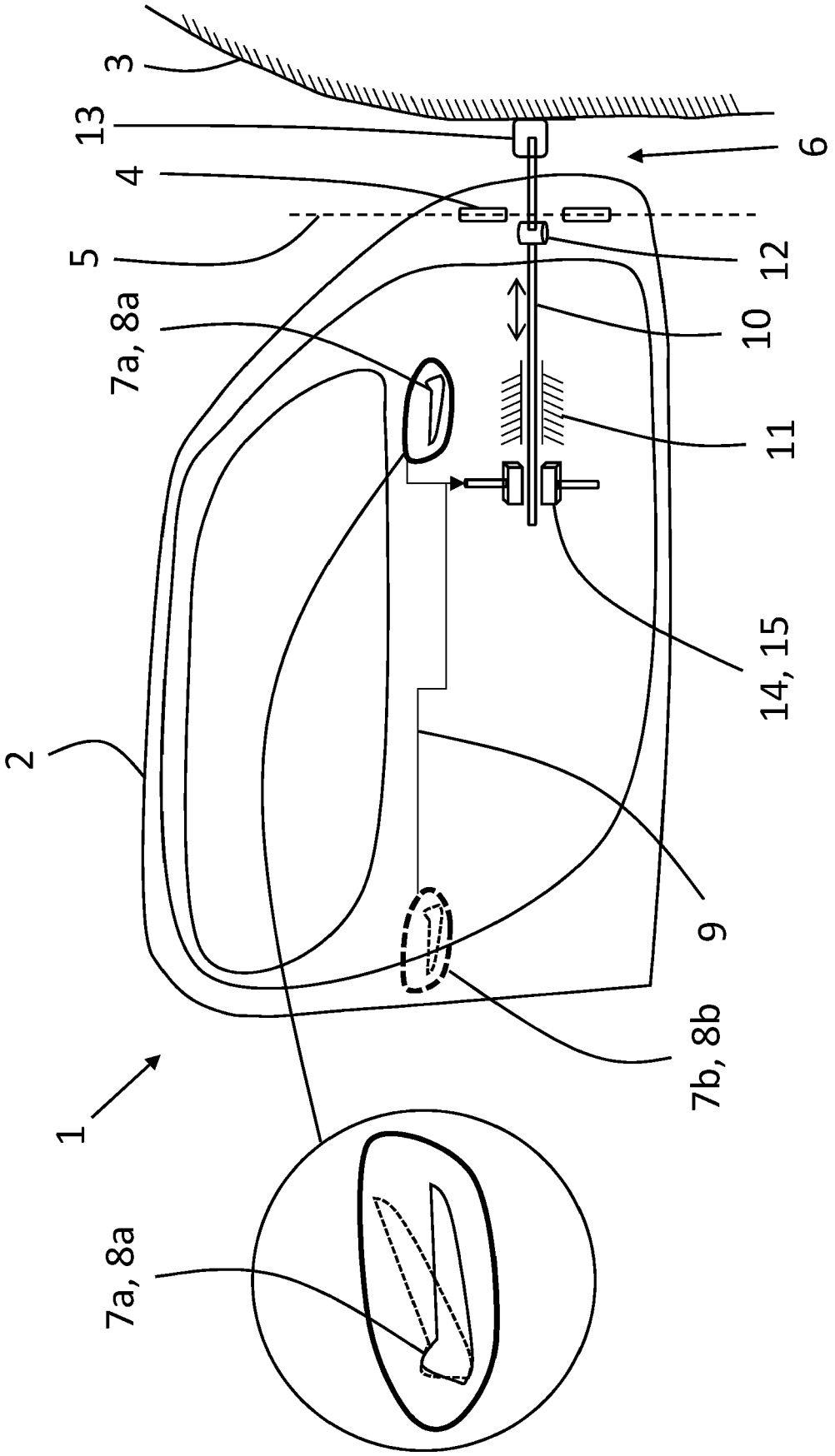

Fig. 2

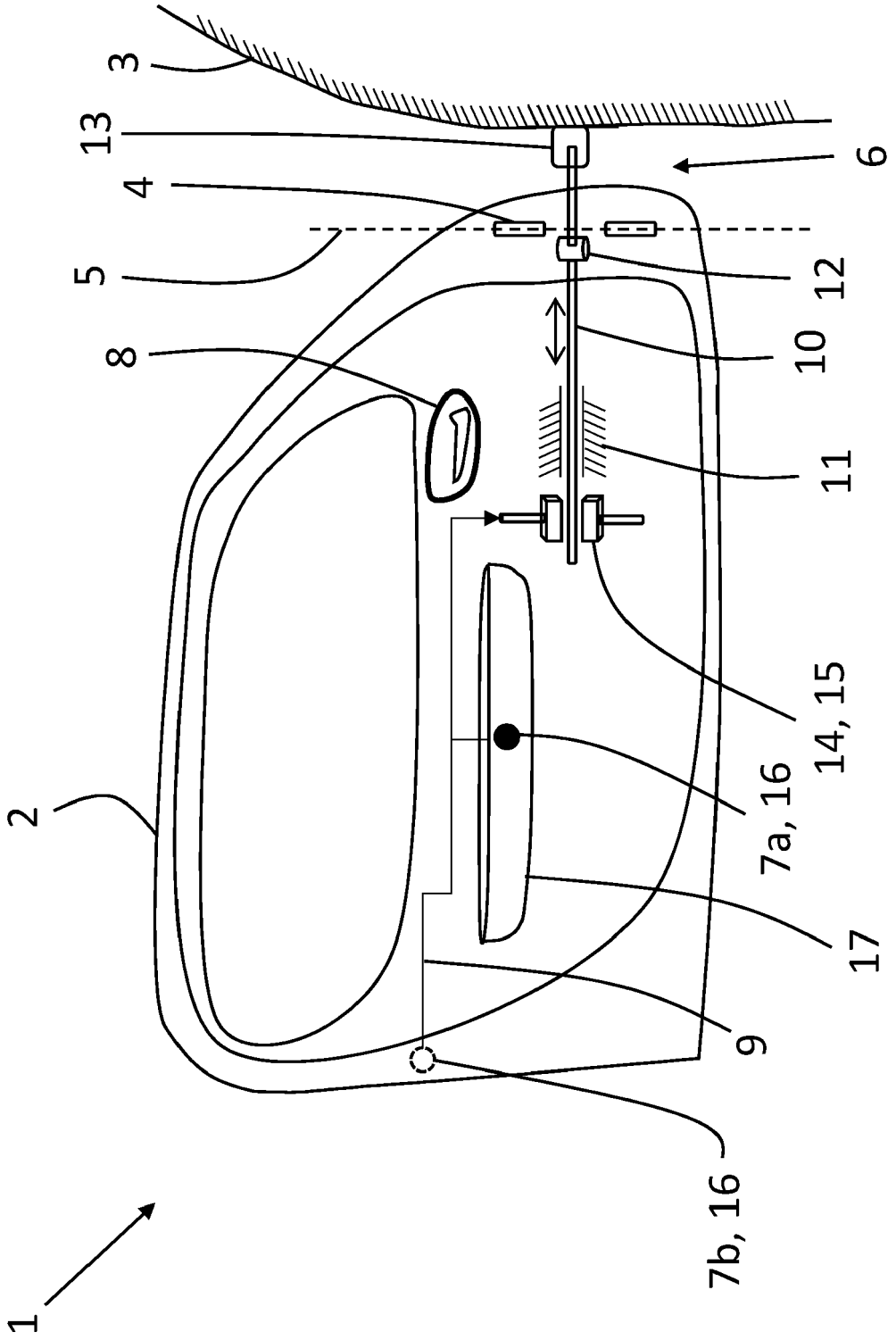

Fig. 3

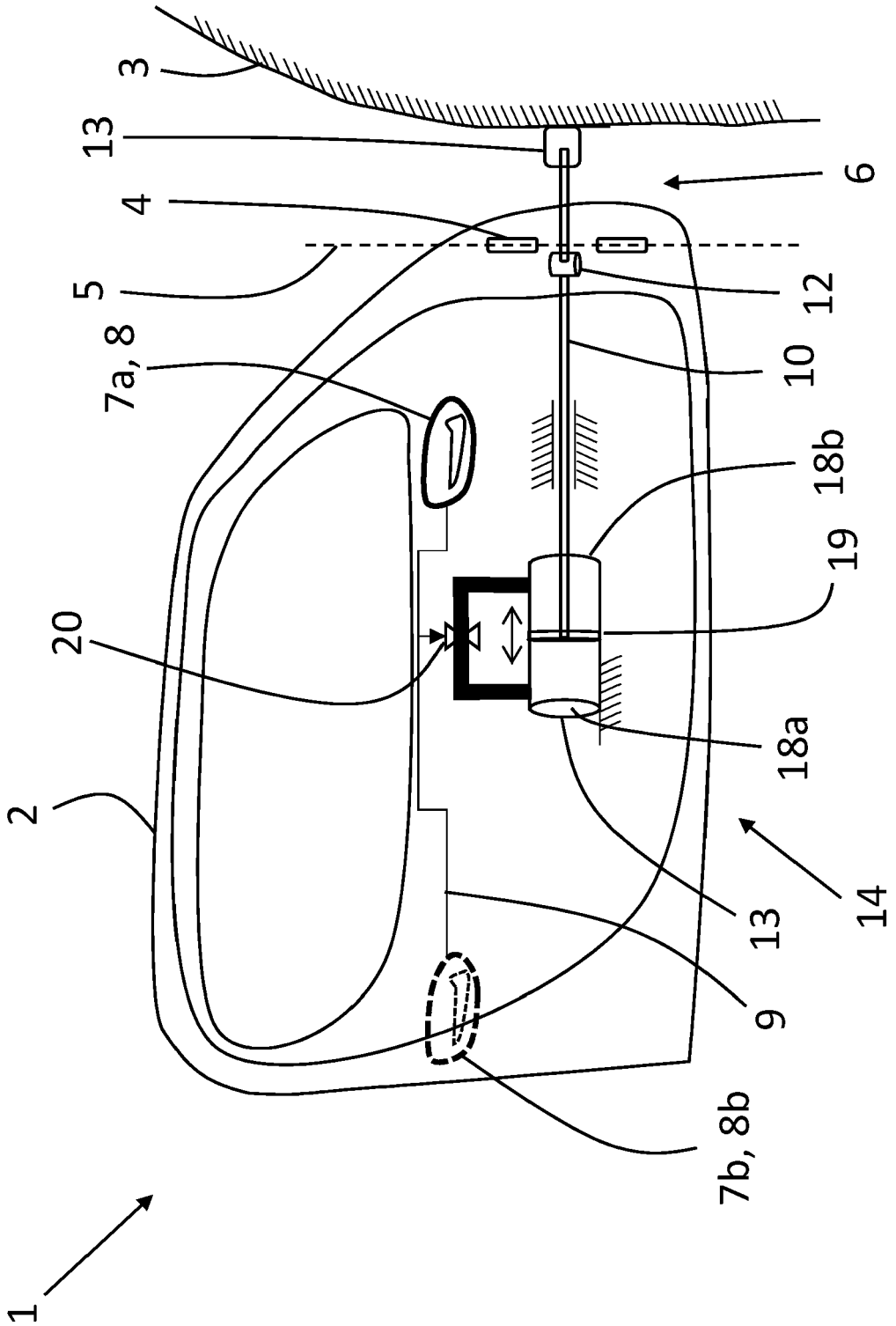

Fig. 4

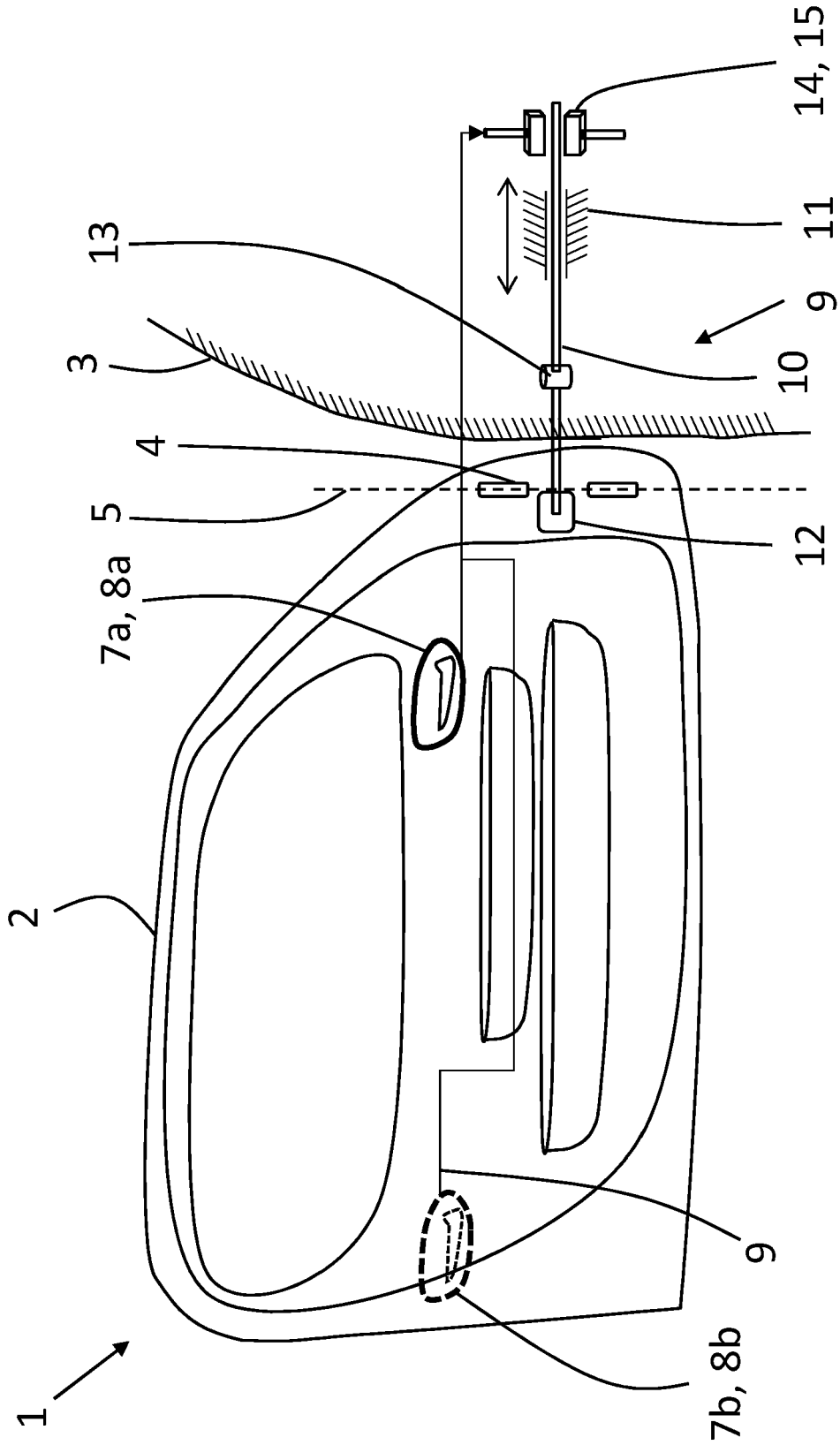

Fig. 5

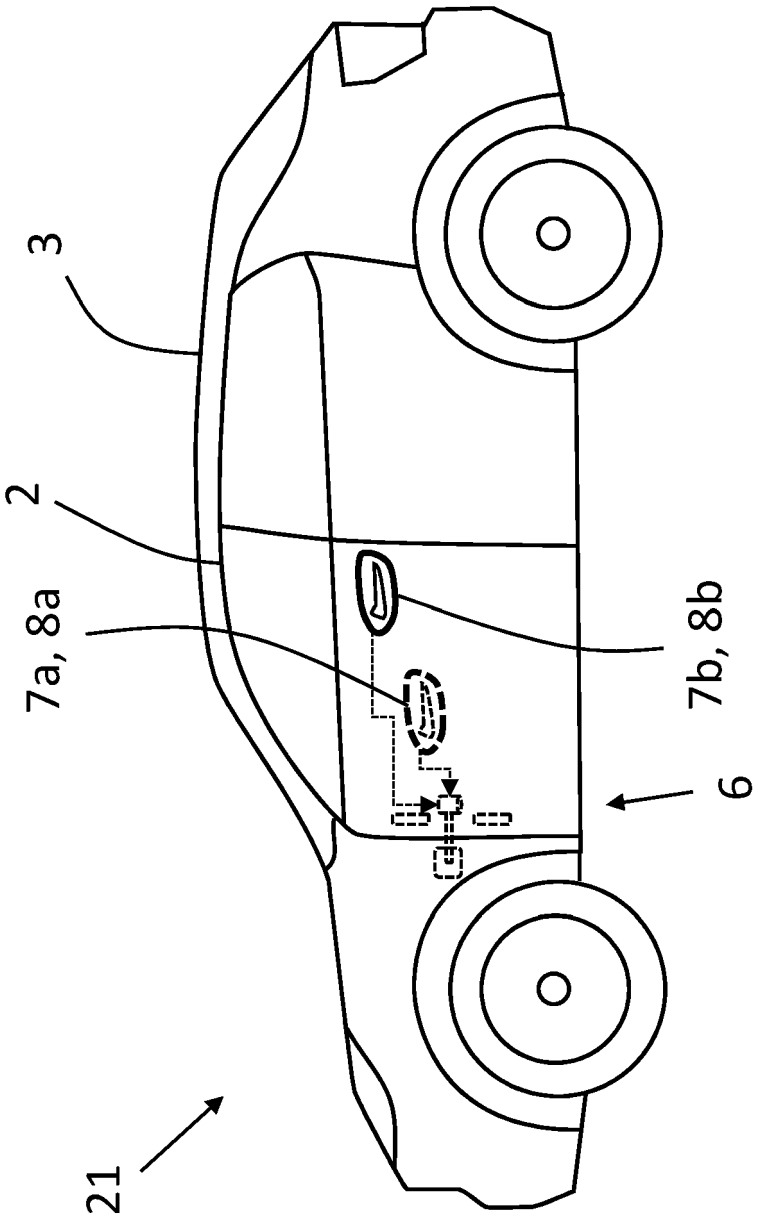

Fig. 6

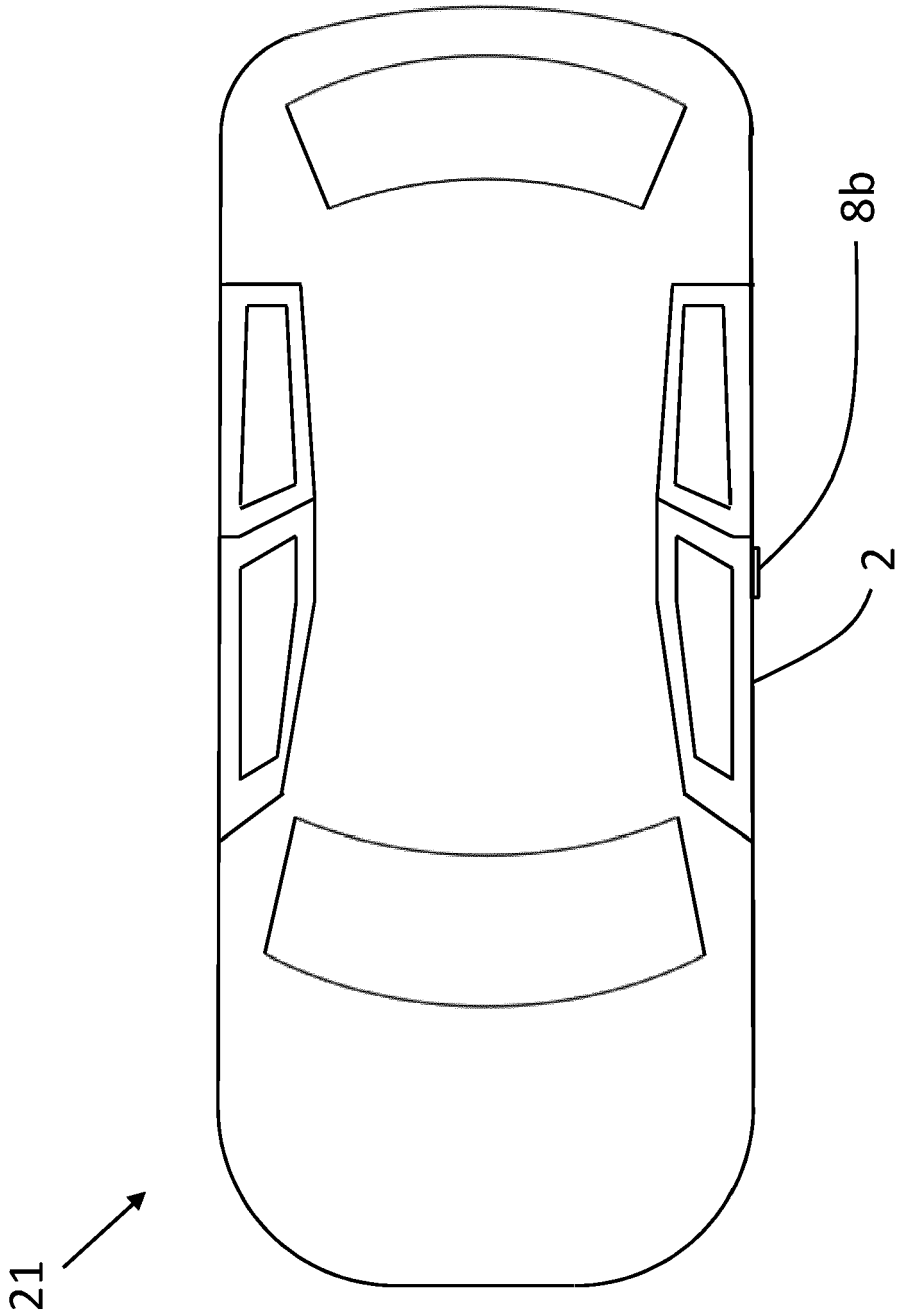

Fig. 7a

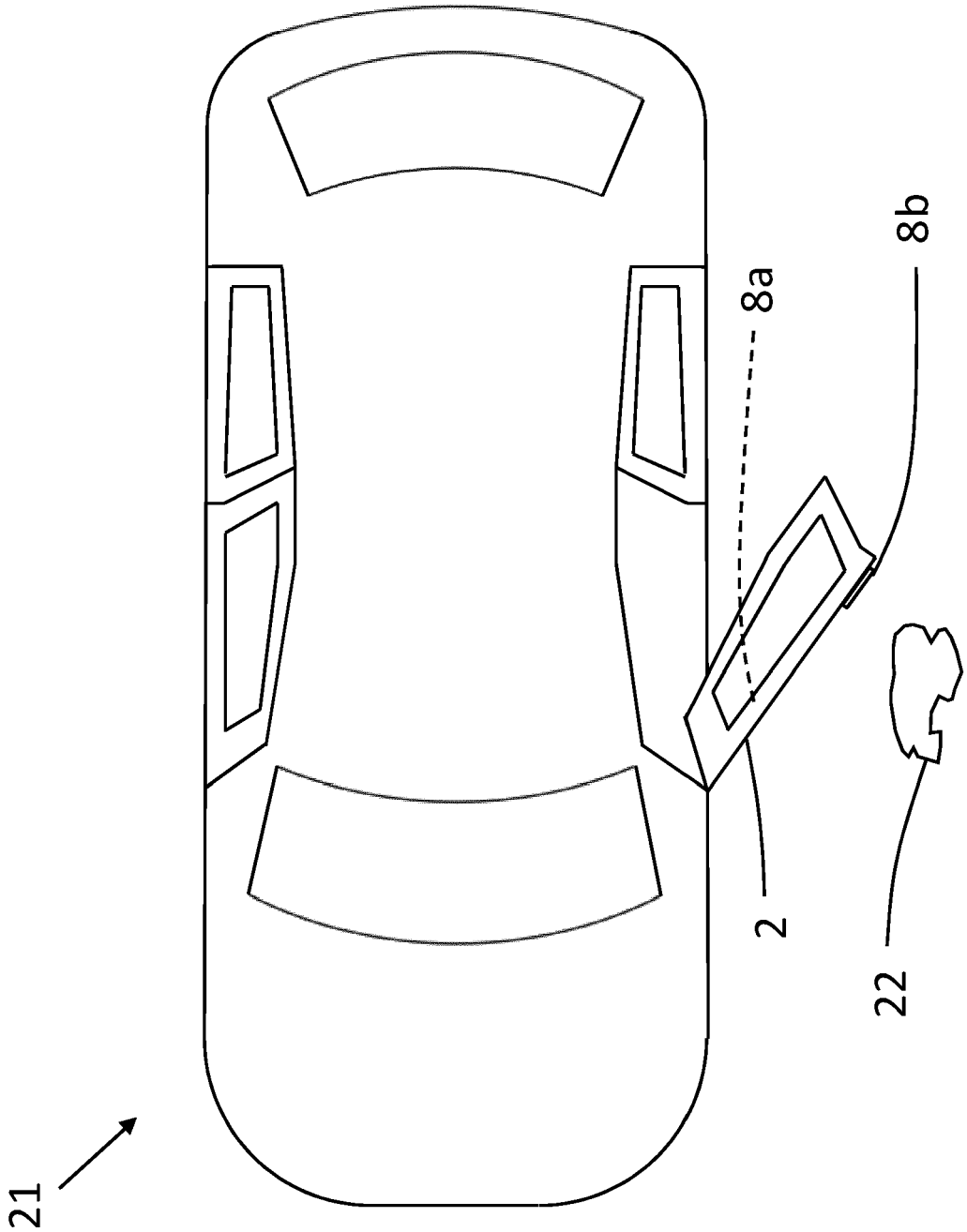

Fig. 7b

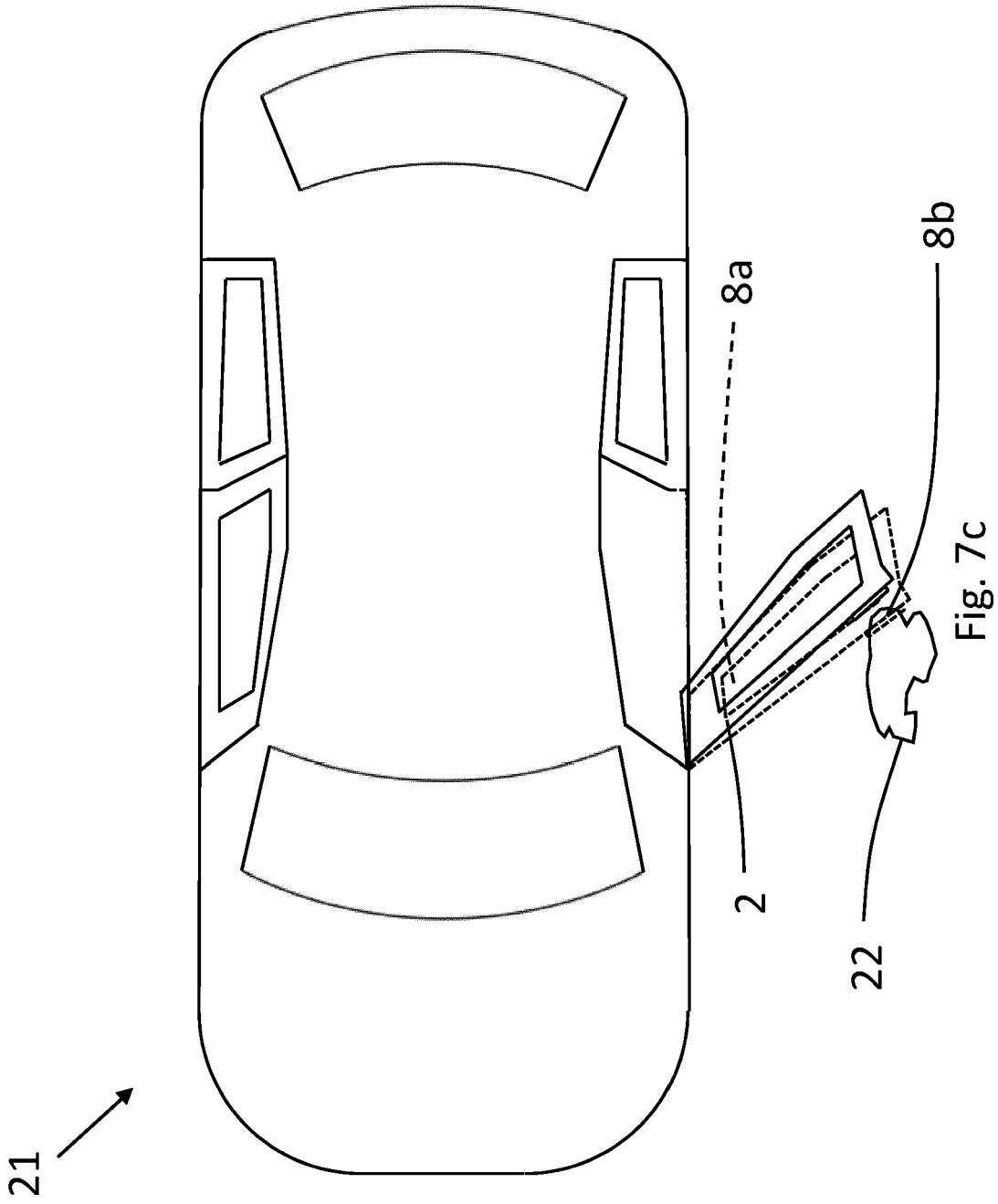

Fig. 7c

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EUROPEAN SEARCH REPORT

Application Number
EP 20 17 9289

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Place of search	Date of completion of the search	Examiner
The Hague	27 October 2020	Geerts, Arnold

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