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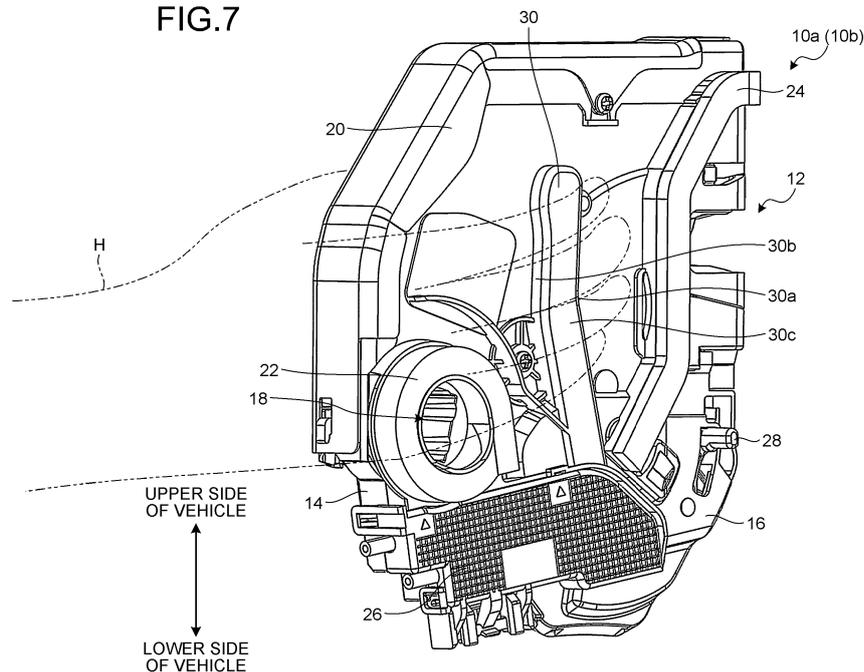
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(54) **DOOR LOCK DEVICE**

(57) A door lock device 10a includes a bulged portion 30 that extends in an up-and-down direction on the inner side of a cabin, a latch mechanism 23 that locks a door by becoming engaged with a striker S, a child lock lever 62 that disables an operation of opening the door using an inside handle by actuating the latch mechanism 23 based on an operation of switching a child lock knob 28 to ON, and a power child lock mechanism 64 that elec-

trically operates the child lock lever 62. The power child lock mechanism 64 includes a second motor 66, a power child gear 70 that is positioned above the child lock lever 62 and that is driven by the second motor 66, and a power child link 72 that joins the power child gear 70 and the child lock lever 62. The power child link 72 is positioned in the internal space of the bulged portion 30.

FIG.7



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a door lock device to lock a door of a vehicle.

2. Description of the Related Art

[0002] A door lock device for a vehicle is a device that, when the door is closed, becomes engaged with a striker on a vehicle and secures the striker, and, when the door is opened, releases the striker. During a vehicle assembly process, it is desirable if such a door lock device has a shape that is easy to carry for a worker, and that is easy to hold, to the extent possible, during the process of attaching the door lock device to the door. To address this issue, Japanese Patent No. 5282913 discloses a door lock device with a side surface on which a recessed surface permitting a worker to hook his/her fingers thereon is provided.

[0003] Patent Document 1: Japanese Patent No. 5282913

[0004] Recently, some door lock devices are provided with some additional functions that are based on electric control. One example of such an additional function includes a power child lock function. A child lock function in the related art disables an operation for opening a door using the inside handle, based on a manual operation of switching a child lock knob to ON. On the other hand, the power child lock function automatically disables the opening and closing operation using the inside handle under electric control. Such a power child lock function may be provided along with the manual child lock function.

[0005] Another example of the additional function provided to the door lock device includes a super lock function. The super lock function disables the operation of opening a door using the outside handle, as well as the inside handle, under electric control. This super lock function can prevent theft from cars in which a thief opens the door by breaking the window and operates the inside handle from the inside of the cabin. The super lock function may be provided along with the manual child lock function.

[0006] As described above, although the door lock devices have several different specifications, the door lock devices mostly have the same basic structures, and therefore, it is preferable to use as many common parts as possible among the door lock devices, so that the different specifications can be implemented merely by replacing or adding some parts.

[0007] The door lock device disclosed in Patent Document 1, however, has a recessed surface recessed inwards, and therefore, has a smaller inner space accordingly. Hence, the door lock device may have no extra

spatial allowance for mounting any additional parts, or the shapes of the parts to be additionally amounted may be restricted.

[0008] The present invention is made in consideration of the above, and an object of the present invention is to provide a door lock device that is easy-to-hold by hand, and that enables a specification change.

SUMMARY OF THE INVENTION

[0009] To resolve the above-described problem and to achieve the object, a door lock device to lock a door of a vehicle, includes: a housing; a bulged portion extending in an up-and-down direction of the vehicle, being formed on an inner side of the housing with respect to a cabin, and projecting toward inside of the cabin; and a latch mechanism locking the door by being engaged with a striker on the vehicle.

[0010] The door lock device may further includes: a child lock mechanism actuating, when a child lock knob is operated to switch ON, the latch mechanism to disable an operation of opening the door using an inside handle of the vehicle; and a power child lock mechanism electrically operating the child lock mechanism. Further, the power child lock mechanism includes: an electric motor; a power child gear, disposed on an upper side or a lower side of the child lock mechanism, being driven by the electric motor; and a power child link joining the power child gear and the child lock mechanism in the up-and-down direction, the power child link is disposed in an internal space of the bulged portion, the power child link is removable, and the power child gear is replaceable with a super lock gear (76) which is driven by the electric motor to actuate the latch mechanism.

[0011] The door lock device may further includes: a child lock mechanism actuating, when a child lock knob is operated to switch ON, the latch mechanism to disable an operation of opening the door with an inside handle on the vehicle; and a super lock mechanism actuating the latch mechanism based on an electric operation to disable an operation of opening the door using an outside handle and the inside handle on the vehicle. Further, the super lock mechanism (74) includes: an electric motor; and a super lock gear, disposed on an upper side or a lower side of the child lock mechanism, being driven by the electric motor to actuate the latch mechanism, the super lock gear is replaceable with a power child gear that is driven by the electric motor, a power child link, joining the power child gear and the child lock mechanism in the up-and-down direction, is mountable, and the power child link is disposed in an internal space of the bulged portion.

[0012] A part of the bulged portion may form a surface including an axis extending in a vehicle width direction.

[0013] Because the door lock device according to the present invention has the bulged portion that extends in the up-and-down direction in the housing on the inner side of the cabin, the door lock device is easy-to-hold by

hand. Furthermore, a specification change can be made depending on whether the power child link that is positioned in the bulged portion is present or not.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

FIG. 1 is a perspective view of a door lock device when obliquely viewed from a front side according to first and second embodiments;

FIG. 2 is a perspective view of the door lock device according to the first and the second embodiments when obliquely viewed from the rear side of the outside of a vehicle;

FIG. 3 is a perspective view illustrating a rear side of a bulged portion;

FIG. 4 is a perspective view illustrating a part of an internal mechanism of the door lock device according to the first embodiment;

FIG. 5 is a side view of the door lock device when a cover is removed according to the first embodiment;

FIG. 6 is a sectional view along the line VI - VI of FIG. 1;

FIG. 7 is a perspective view of the door lock device when obliquely viewed from the rear side of an inside of the vehicle according to the first and the second embodiments; and

FIG. 8 is a side view of a door lock device when a cover is removed according to the second embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] A door lock device according to some embodiments of the present invention will now be explained in detail with reference to some drawings. These embodiments are, however, not intended to limit the scope of the present invention in any way. In the description below, directions are defined with reference to the directions in the applicable vehicle.

[0016] FIG. 1 is an external perspective view of a door lock device 10a when obliquely viewed from the rear side according to a first embodiment, and FIG. 2 is an external perspective view of the door lock device 10a when obliquely viewed from the rear side of the outside of the vehicle. A door lock device 10b according to a second embodiment has the same external appearance as that of the door lock device 10a as described below. The door lock device 10a is mounted inside of a vehicle door (e.g., the front side door), and includes a door latch device 12, a casing 14, and a cover 16. Although the casing 14 and the cover 16 have different names herein, both of these elements are integrated into one unit as a housing that covers internal parts. The casing 14 may also be referred to as an outer housing. The cover 16 may also be referred to as an inner housing. The door lock device 10a illus-

trated in FIG. 1 is an example in which the door lock device 10a is used in the right side door of a vehicle, but it is also possible to achieve a door lock device 10a to be used in the left side door by giving a right-and-left symmetric structure.

[0017] The door lock device 10a includes a coupler 18 to be electrically connected with an external appliance, a waterproofing cover 20, waterproofing seals 22 and 24, and a cable cover 26. The waterproofing cover 20 covers the boundary between the casing 14 and the cover 16, on the top surface and the front surface of the door lock device 10a. The waterproofing seal 22 covers the circumference of the coupler 18. The waterproofing seal 24 covers the upper side and both sides of the door latch device 12, and covers a part of the inner side, up to a position reaching the cable cover 26. A child lock knob 28 that is operable in the up-and-down directions is provided on a lower part of the door latch device 12.

[0018] The cover 16 has a bulged portion 30 projecting toward the inside of the cabin. The bulged portion 30 has an elongated shape, and extends in the up-and-down direction in the substantially center of the door lock device 10a, on the inner side of the door lock device 10a, being inner side of the cabin. More specifically, the bulged portion 30 extends from a position somewhat below the waterproofing cover 20 to an area near the upper end of the cable cover 26. The upper half of the bulged portion 30 is vertically oriented, and the part below a bent portion 30a that is positioned substantially in the middle is slightly inclined toward the rear side of the vehicle. With this configuration, the overall bulged portion 30 has a shape slightly projecting toward the front side of the vehicle, and slightly recessed with respect to the rear side of the vehicle. The size of the bulged portion 30 is quite small compared with the entire area of the cover 16. A hem 30b where the bulged portion 30 is connected with the cover 16 has a surface (a surface including a Y axis that is the vehicle width direction in FIG. 1) that is perpendicular to a side surface of the cover 16 (a surface including an X axis that is the front-and-back direction and a Z axis that is the up-and-down direction in FIG. 1). The part of the hem 30b above the bent portion 30a forms a vertical surface (a surface including the Z axis that is the up-and-down direction and the Y axis that is the vehicle width direction in FIG. 1). A top surface 30c of the bulged portion 30 forms a surface extending in parallel with a side surface of the cover 16. An upper end 30d of the bulged portion 30 has a substantially semi-circular arc shape, when viewed from a side. Behind the bulged portion 30, an internal space 30e surrounded by the side walls is ensured (see FIG. 3).

[0019] The door latch device 12 locks and unlocks the door of the vehicle by becoming engaged with and released from a striker provided to a vehicle body. The door latch device 12 is fixed to the casing 14 on the rear side of the vehicle, and is supported by the casing 14 under this state. The door latch device 12 includes a body 12a, a cover plate 12b, and a latch mechanism 32. The latch

mechanism 32 is provided to the body 12a, and is covered by the cover plate 12b. The cover plate 12b has an entry groove 12c, and is attached to the body 12a in such a manner that the entry groove 12c communicates with the latch mechanism 32 in the inside-and-outside direction of the vehicle. TO the entry groove 12c, the striker on the vehicle enters when the door of the vehicle is closed.

[0020] As illustrated in FIG. 4, the latch mechanism 32 includes a latch 34, a ratchet 36, and a releasing lever 38. The latch 34 is biased in the clockwise direction, and locks the door by allowing a groove 34a to become engaged with the striker S. The latch 34 stops when a part thereof abuts against an end of the ratchet 36. When the ratchet 36 rotates about an axis 36a, the latch 34 is released and rotates about an axis 34b so that the striker S is released to unlock the door. The releasing lever 38 rotates the ratchet 36, and has a part protruding toward inside of the cabin.

[0021] An open member 40 is provided near the releasing lever 38, and an outside lever 42 is provided below the ratchet 36. The open member 40 includes an open link 40a and a sub-lever link 40b. The outside lever 42 is connected to an outside handle. The open link 40a is a plate-like member, and is switched selectively between an unlock position and a lock position in response to an operation of the sub-lever link 40b. When the open link 40a is at the unlock position, the open link 40a faces a protrusion on the releasing lever 38 in the vehicle up-and-down direction. When the open link 40a is at the lock position, the open link 40a does not face the protrusion on the releasing lever 38, that is, does not abut against the releasing lever 38.

[0022] The sub-lever link 40b extends in the up-and-down direction of the vehicle. A joint hole is provided to a lower part of the sub-lever link 40b, and a joint protrusion 42a on the outside lever 42 is inserted into the joint hole. The sub-lever link 40b, joined with the outside lever 42 by inserting the joint protrusion 42a into the joint hole, is rotatable about the joint protrusion 42a within the range between the lock position and the unlock position. A long hole 40ba extending in the longitudinal direction (that is, in the up-and-down direction of the vehicle) is provided to the sub-lever link 40b.

[0023] When the outside lever 42 is rotated about an axis 42b via an operation of the outside handle, the joint protrusion 42a pushes up the open member 40, causing the open link 40a to push up the protrusion of the releasing lever 38, thereby causing the ratchet 36 to rotate together with the releasing lever 38. The latch 34 is then released and rotated in the clockwise direction, making the striker S removable from the groove 34a, and unlocking the door.

[0024] As illustrated in FIG. 5, a lever lock 46 that rotates about an axis 44 is provided substantially at the center of the door lock device 10a. A pin 46a on one end of the lever lock 46 is fitted inside of the long hole 40ba, and the lever lock 46 can cause the open member 40 to

rotate by rotating the lever lock 46. A silencer 46b is provided to an upper part of the lever lock 46. A first motor 48 is provided on the front side, at a height that is substantially center of the door lock device 10a, and a worm gear 50 is provided to the rotational axis of the first motor 48. The worm gear 50 is engaged with a worm wheel 51. Three radial projections are provided on the rear side of the worm wheel 51, and, when the worm wheel 51 is rotated, the projections can rotate the lever lock 46 via the silencer 46b. In other words, by causing the first motor 48 to rotate under the control of a control unit, the open member 40 can be caused to rotate via the worm gear 50, the worm wheel 51, the silencer 46b, the lever lock 46, and the pin 46a, one after another in the order listed herein, and, in this manner, the door can be switched between a locked state and an unlocked state. With such a structure, functions of, for example, central door lock systems, keyless entry locks, and automatic locking activated when the vehicle speed becomes equal to or higher than a predetermined speed, can be implemented.

[0025] A lock knob lever 52 rotating about the axis 44 is provided below the lever lock 46. A part of the lock knob lever 52 is connected to a door lock knob via a cable 54, and the lock knob lever 52 is caused to rotate by an operation of the door lock knob. The rotation of the lock knob lever 52 can cause the lever lock 46 to rotate, and to be switched between the locked state and the unlocked state.

[0026] An inside lever 56 rotating about a bottom-end axis 56a is provided to the lower part of the door lock device 10a. A part of the inside lever 56 is connected to the inside handle via a cable 58, and the inside lever 56 is caused to rotate by an operation of the inside handle. When the inside lever 56 is rotated in the counter-clockwise direction, one end 56b pushes up the open member 40 and the releasing lever 38 via an intermediate member 60, so that the door can be unlocked. When the inside lever 56 is rotated in the counter-clockwise direction, another end 56c is brought into sliding contact with the lock knob lever 52, and causes the lock knob lever 52 to rotate in the clockwise direction, so that the door lock knob can be displaced to the unlocked position via the cable 54.

[0027] The axis 44 supports a child lock lever 62, as well as the lever lock 46 and the lock knob lever 52. The child lock knob 28 is provided to the rear end of the child lock lever 62, and an arc-shaped long hole 62a is provided somewhat in front of the child lock knob 28. A pin 60a of the intermediate member 60 is fitted in the long hole 62a. When the child lock knob 28 is pushed down, the child lock lever 62 is rotated in the clockwise direction, and the pin 60a abuts against the top surface of the long hole 62a and restricts the upward movement of the intermediate member 60. In this manner, unlocking operations of the inside handle and the inside lever 56 are disabled, and the child lock function is activated. That is, the child lock lever 62 alone serves as the child lock mechanism. The same is applicable to a child lock lever 78, which will be described below. In FIG. 5, the child

lock lever 62 is illustrated as a light dotted area for easy recognition purposes.

[0028] The door lock device 10a further includes a power child lock mechanism 64. The power child lock mechanism 64 realizes the power child lock function. While the child lock function achieved by the child lock lever 62 is activated by a manual operation of the child lock knob 28, the power child lock function electrically activates the child lock function.

[0029] The power child lock mechanism 64 includes a second motor (electric motor) 66, a worm gear 68, a power child gear 70, a power child link 72, and the child lock lever 62. The child lock lever 62 is commonly used as a unit for the manual child lock function.

[0030] The second motor 66 is disposed in parallel with the first motor 48, in the upper part of the door lock device 10a, and the worm gear 68 is provided to the rotational axis of the second motor 66. The power child gear 70 is a substantially 90-degree arc-shaped worm wheel that rotates about an axis 71, and the upper teeth thereof are engaged with the worm gear 68. The power child gear 70 is joined to a top end 72b of the power child link 72 at a position immediately in front of the axis 71. The power child gear 70 has a protrusion 70a protruding downwards. An end of the protrusion 70a is fitted in and guided along an arc groove 14a provided to the casing 14. In FIG. 5, the power child gear 70 is illustrated as a densely dotted area for easy recognition purposes.

[0031] A bottom end 72c of the power child link 72 is joined to the front end of the child lock lever 62. In this manner, the power child gear 70, the power child link 72, and the child lock lever 62 form a link mechanism.

[0032] When the power child link 72 is pulled upwards by the rotation of the second motor 66, the child lock lever 62 is rotated in the clockwise direction. This operation is equivalent to pushing down the child lock knob 28 positioned on the opposite side, and the door is in a child-locked state. That is, the door can be child-locked and child-unlocked electrically.

[0033] In the door lock device 10a, the power child link 72 can be attached to and removed from the power child gear 70 and the child lock lever 62. Once the power child link 72 is removed, the power child gear 70 can be attached to and removed from the axis 71, and the child lock lever 62 can be attached to and removed from the axis 44. Because the axis 44 supports not only the child lock lever 62 but also the lever lock 46 and the inside lever 56, the child lock lever 62 is provided on the front-most side with respect to the paper surface (on the outer side of the cabin). In this manner, only the child lock lever 62 can be removed, without removing the lever lock 46 and the inside lever 56. The power child gear 70 can also be removed while the worm gear 68 is still attached to the second motor 66. The power child link 72, the power child gear 70, and the child lock lever 62 can be removed integrally from the door lock device 10a as the entire link mechanism in a manner joined to one another.

[0034] The power child link 72 has a shape corre-

sponding to the shape of the bulged portion 30 described above (see FIG. 1). That is, the power child link 72 has an elongated shape, and extends along the up-and-down direction in the substantially center of the door lock device 10a. More specifically, the upper half of the power child link 72 is vertically oriented, and the part below a bent portion 72a, that is positioned substantially in the middle, is slightly inclined toward the rear side of the vehicle. With this configuration, the overall power child link 72 has a shape slightly projecting toward the front side of the vehicle and slightly recessed with respect to the rear side of the vehicle. The top end 72b of the power child link 72 is joined to the surface of the power child gear 70 on the inner side of the cabin, and the bottom end 72c is joined to the surface of the child lock lever 62 on the inner side of the cabin. In this manner, the power child link 72 is positioned on the innermost side of the cabin, amongst the internal elements of the door lock device 10a (see FIG. 4).

[0035] In the door lock device 10a, the open member 40, the lever lock 46, and the first motor 48 for engaging and releasing the latch mechanism 23, which make up a basic component, are positioned at the center in the height direction. By contrast, the child lock lever 62 for realizing the child lock mechanism is positioned in the slightly lower part, while the second motor 66, which is the electric motor of the power child lock mechanism 64, and the power child gear 70 are positioned in the upper part. Because the power child link 72 extends in the up-and-down direction, the power child link 72 can link the child lock lever 62 and the power child gear 70 that are separated in the up-and-down directions. Even when the child lock lever 62 is positioned in the upper part and the second motor 66 and the power child gear 70 are positioned in the lower part, the power child link 72 can join the child lock lever 62 the second motor 66, and the power child gear 70, depending on designing conditions.

[0036] As illustrated in FIG. 6, at least a part of the power child link 72 is positioned in the internal space 30e of the bulged portion 30. Therefore, the width of the door lock device 10a is reduced, except for the bulged portion 30, and the door lock device 10a as a whole is reduced in size. The power child link 72 has a U-shaped cross section whose one side is open on the outer side of the vehicle, and has a light-weighted structure with a strength ensured.

[0037] When a worker holds the door lock device 10a by the hand H from the front side, as illustrated in FIG. 7, because the bulged portion 30 has an elongated shape, and extends in the up-and-down direction in the substantially center, the worker can easily hook his/her index finger, middle finger, ring finger, and little finger onto the bulged portion 30, and can easily hold the door lock device 10a. In particular, because the bulged portion 30 is slightly bent at the bent portion 30a, and the surface of the hem 30b is provided perpendicularly to the cover 16, the worker can hook his/her fingers easily, and hold with an appropriate force. To allow a user to hook his/her

fingers easily, it is preferable for at least the surface of the hem 30b on the rear side of the vehicle to be perpendicularly provided.

[0038] Furthermore, because the part above the bent portion 30a extends in the up-and-down direction of the vehicle, the worker can hook his/her fingers even more easily. An appropriate height is ensured in the bulged portion 30, so that the user can easily hook his/her first knuckle joints of the fingers. The direction in which the door lock device 10a is held by the hand H is not limited to that illustrated in FIG. 7. Furthermore, a worker can hold his/her thumb in a manner abutting against the side surface of the casing 14 without difficulty, as illustrated in FIG. 2, so that the user can easily hold the door lock device 10a. In this manner, because, in the door lock device 10a, the bulged portion 30 is provided on the side surface of the cover 16, a worker can hold the door lock device 10a by the hand H easily, and the door lock device 10a exhibits excellent workability.

[0039] The door lock device 10a is somewhat thick in the vehicle width direction on the vehicle rear side because the door latch device 12 is provided on the rear side of the vehicle, but is appropriately thin on the front side of the vehicle. Therefore, it is appropriate to hold the door lock device 10a by the hand H from the front side of the vehicle (see FIG. 2). With such design, the door latch device 12 can easily be aligned to a predetermined mounting position of the door.

[0040] A door lock device 10b according to a second embodiment will now be described with reference to FIG. 8. In the door lock device 10b, the elements that are the same as those in the door lock device 10a described above are given the same reference numerals, and detailed explanations thereof will be omitted. The door lock device 10b is the same as the door lock device 10a described above except that the power child lock mechanism 64 is replaced with a super lock mechanism 74. The super lock mechanism 74 realizes the super lock function.

[0041] The super lock mechanism 74 includes the second motor 66, the worm gear 68, and a super lock gear 76. The second motor 66 and the worm gear 68 are the same as those included in the door lock device 10a described above. That is, the super lock mechanism 74 is the same as the power child lock mechanism 64 described above (see FIG. 5) except that the power child gear 70 is replaced with the super lock gear 76 and the power child link 72 is removed.

[0042] The super lock gear 76 is a substantially 90-degree arc-shaped worm wheel rotating about the axis 71, and its upper teeth are engaged with the worm gear 68. The super lock gear 76 has a hook 76a protruding diagonally downwards toward the rear side. An engagement at which the super lock gear 76 is engaged with the worm gear 68 is the same as that in the power child gear 70. The axis 71 supports the super lock gear 76 in the same manner as the power child gear 70. In FIG. 8, the super lock gear 76 is illustrated as a densely dotted area

for easy recognition purposes.

[0043] If the super lock gear 76 is rotated in the clockwise direction by the rotation of the second motor 66 while the sub-lever link 40b is rotated in the counter-clockwise direction to the lock position, the hook 76a becomes engaged with a part of the sub-lever link 40b and restricts the operation of the sub-lever link 40b. By doing this, the door-opening operations by using the outside handle and the inside handle are disabled and the door is in a super-locked state. As the super lock gear 76 is rotated in the counter-clockwise direction by the rotation of the second motor 66, the hook 76a becomes separated from the part engaged with the sub-lever link 40b, and the super-locked state is released. The super lock gear 76 includes a protrusion 76b protruding diagonally downwards toward the front side. A distal end of the protrusion 76b is fitted in and guided along an arc groove 14a which is provided to the casing 14. A smaller protrusion 76c is provided between the hook 76a and the protrusion 76b. Together with the super lock gear 76, the protrusion 76c is carried over the top of a lump 14b that is provided to the casing 14, while slightly being warped, and a distal end of the protrusion 76c is brought into abutment with any one of the two inclined surfaces of the lump 14b. In this manner, the super lock gear 76 is kept at a super-lock ON position or at a super-lock OFF position.

[0044] In the door lock device 10b, because the power child link 72 described above (see FIG. 5) is not necessary, the child lock lever 62, which is joined to the power child link 72 in the first embodiment, is replaced with the child lock lever 78. The child lock lever 78 has the same structure as that of the child lock lever 62 except that the child lock lever 78 has no front protrusion to be joined with the power child link 72, is supported by the axis 44, has the long hole 62a, and is provided with the child lock knob 28 on the rear end. With the child lock lever 78, the door lock device 10b has a manual child lock function. In the door lock device 10b, the child lock lever 62 in the door lock device 10a may be used as it is. In FIG. 8, the child lock lever 78 is illustrated as a lightly dotted area, for easy recognition purposes.

[0045] In the door lock device 10b, the super lock gear 76 can be attached to and removed from the axis 71 and the child lock lever 78 can be attached to and removed from the axis 44. In this case, the axis 44 holds not only the child lock lever 78 but also the lock knob lever 52 and the inside lever 56. Since the child lock lever 78 is provided on the frontmost side with respect to the paper surface (on the outer side of the cabin), only the child lock lever 78 can be removed without removing the lock knob lever 52 and the inside lever 56. The super lock gear 76 can also be removed while the worm gear 68 is still attached to the second motor 66.

[0046] The external appearance of the door lock device 10b is the same as that of the door lock device 10a described above. Therefore, the door lock device 10b can also be held by the hand H easily, with the bulged portion 30 provided to the cover 16 on the side surface of the

door lock device 10b, and exhibits excellent workability (see FIG. 2 and FIG. 7).

[0047] The door lock device 10a (see FIG. 5) and the door lock device 10b (see FIG. 8) have the same structure except that the power child lock mechanism 64 (FIG.5) is replaced with the super lock mechanism 74 (FIG.8). Both the power child lock mechanism 64 and the super lock mechanism 74 have the same second motor 66 and worm gear 68. Eventually, the door lock device 10a differs from the door lock device 10b in that, while the former is provided with the power child gear 70, the power child link 72, and the child lock lever 62, the latter is provided with the super lock gear 76 and the child lock lever 78. Furthermore, each of the elements are removable.

[0048] Hence, the specifications of the door lock device 10a provided with the power child lock mechanism 64 can be changed to those of the door lock device 10b that is provided with the super lock mechanism 74, by removing the power child link 72, replacing the power child gear 70 with the super lock gear 76, and replacing the child lock lever 62 with the child lock lever 78. In such a case, it is not always necessary to replace the child lock lever 62, that is, the child lock lever 62 may be used as it is.

[0049] The specifications of the door lock device 10b that is provided with the super lock mechanism 74 can be changed to those of the door lock device 10a that is provided with the power child lock mechanism 64, by replacing the super lock gear 76 with the power child gear 70, replacing the child lock lever 78 with the child lock lever 62, and joining the power child link 72 between the power child gear 70 and the child lock lever 78.

[0050] Although not illustrated, it is also possible to prepare an appropriate number of intermediate products equivalent to the door lock device 10a or the door lock device 10b having not been completely assembled, with the cover 16 and the waterproofing cover 20 not assembled, and with none of the child lock lever 62, the power child gear 70, the power child link 72, the super lock gear 76, and the child lock lever 78 attached. With such intermediate products having not been completely assembled, the door lock device 10a can be manufactured simply by attaching the child lock lever 62, the power child gear 70, the power child link 72, the cover 16, and the waterproofing cover 20, when the door lock device 10a is required, and the door lock device 10b can be manufactured simply by attaching the super lock gear 76, the child lock lever 78, the cover 16, and the waterproofing cover 20, when the door lock device 10b is required.

[0051] In this manner, the door lock device 10a and the door lock device 10b enable an easy and quick specification change, simply by the replacement of some parts. Furthermore, because the bulged portion 30 is provided to the position where the power child link 72 is to be provided, the door lock device can be held easily by the hand H. Because the bulged portion 30 is provided in accordance with the shape of the power child link 72, no restriction is imposed on the shape of the power child link 72.

[0052] The present invention is not limited to the embodiments described above, and it should be needless to say that the embodiments may be modified freely within the scope not deviating from the essence of the present invention.

Claims

1. A door lock device (10) to lock a door of a vehicle, the door lock device comprising:
 - a housing (14, 16);
 - a bulged portion (30) extending in an up-and-down direction of the vehicle, being formed on an inner side of the housing (14, 16) with respect to a cabin, and projecting toward inside of the cabin; and
 - a latch mechanism (23) configured to lock the door by being engaged with a striker (S) on the vehicle.
2. The door lock device (10) according to claim 1, further comprising:
 - a child lock mechanism (62) configured to, when a child lock knob (28) is operated to switch ON, actuate the latch mechanism (23) to disable an operation of opening the door using an inside handle of the vehicle; and
 - a power child lock mechanism (64) configured to electrically operate the child lock mechanism (62), wherein the power child lock mechanism (62) comprises:
 - an electric motor (66);
 - a power child gear (70), disposed on an upper side or a lower side of the child lock mechanism (62), configured to be driven by the electric motor (66); and
 - a power child link (72) configured to join the power child gear (70) and the child lock mechanism (62) in the up-and-down direction,
 - the power child link (72) is disposed in an internal space of the bulged portion (30), the power child link (72) is removable, and the power child gear (70) is replaceable with a super lock gear (76) configured to be driven by the electric motor (66) to actuate the latch mechanism (23).
3. The door lock device (10) according to claim 1, further comprising:
 - a child lock mechanism (62) configured to, when a child lock knob is operated to switch ON, ac-

tuate the latch mechanism (23) to disable an operation of opening the door with an inside handle on the vehicle; and
 a super lock mechanism (74) configured to actuate the latch mechanism (23) based on an electric operation to disable an operation of opening the door using an outside handle and the inside handle on the vehicle, wherein the super lock mechanism (74) comprises:

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an electric motor (66); and
 a super lock gear (76), disposed on an upper side or a lower side of the child lock mechanism (62), configured to be driven by the electric motor (66) to actuate the latch mechanism (23),

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the super lock gear (76) is replaceable with a power child gear (70) that is driven by the electric motor (66),
 a power child link (72), configured to join the power child gear (70) and the child lock mechanism (62) in the up-and-down direction, is mountable, and
 the power child link (72) is disposed in an internal space of the bulged portion (30).

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- 4. A door lock device (10) according to any one of claims 1 to 3, wherein a part of the bulged portion (30) forms a surface including an axis extending in a vehicle width direction.

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FIG.2

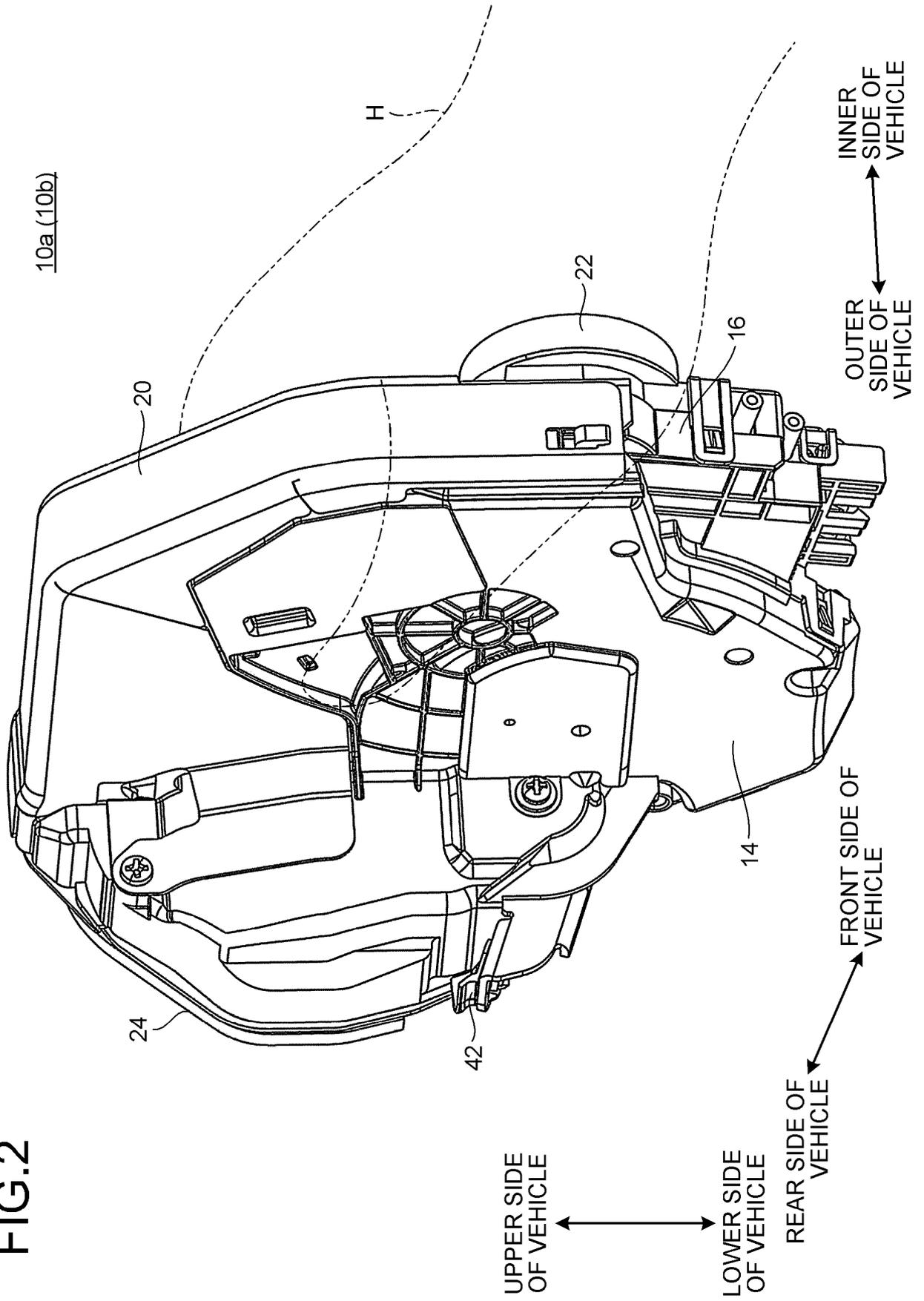


FIG.3

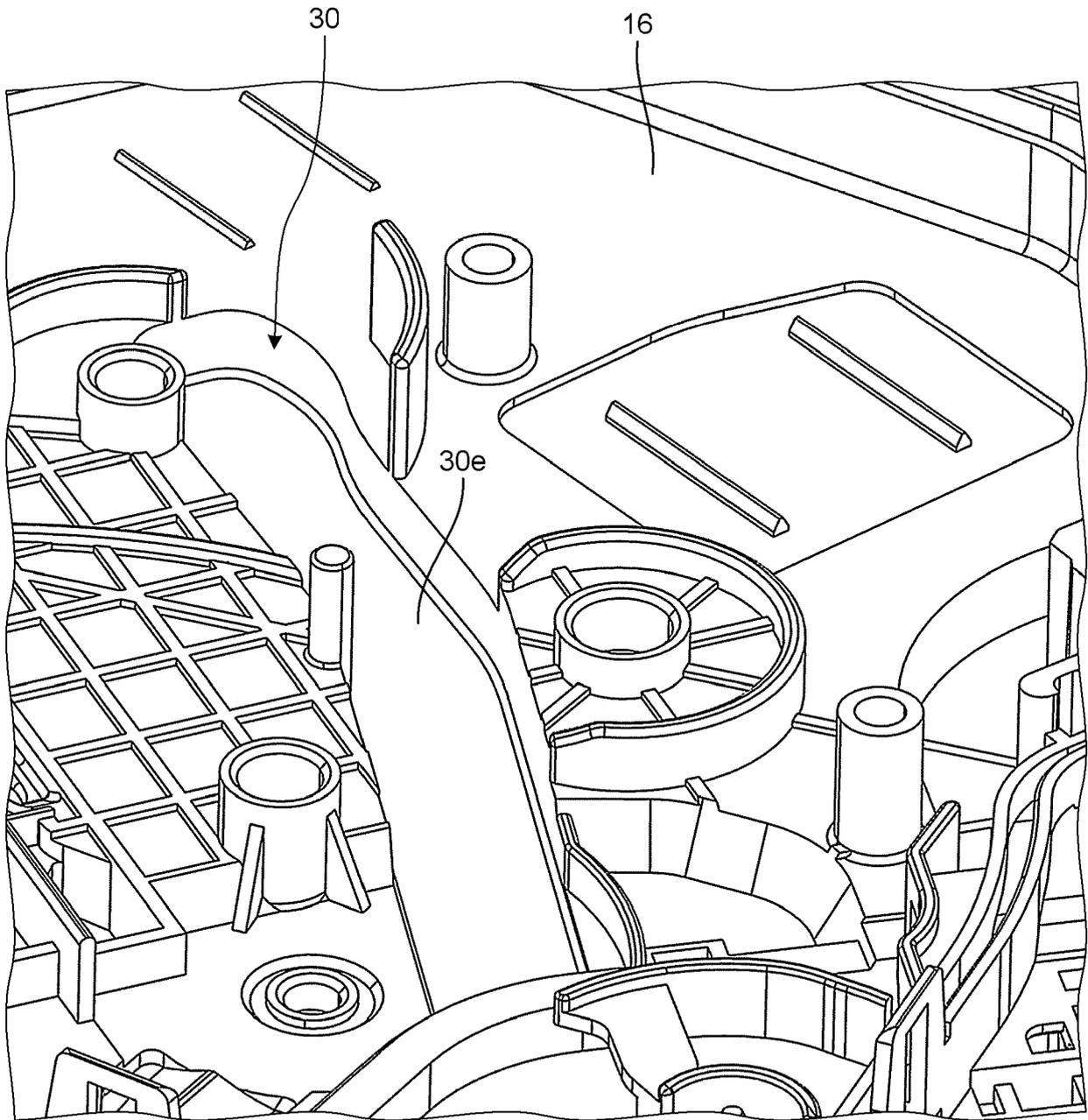


FIG.5

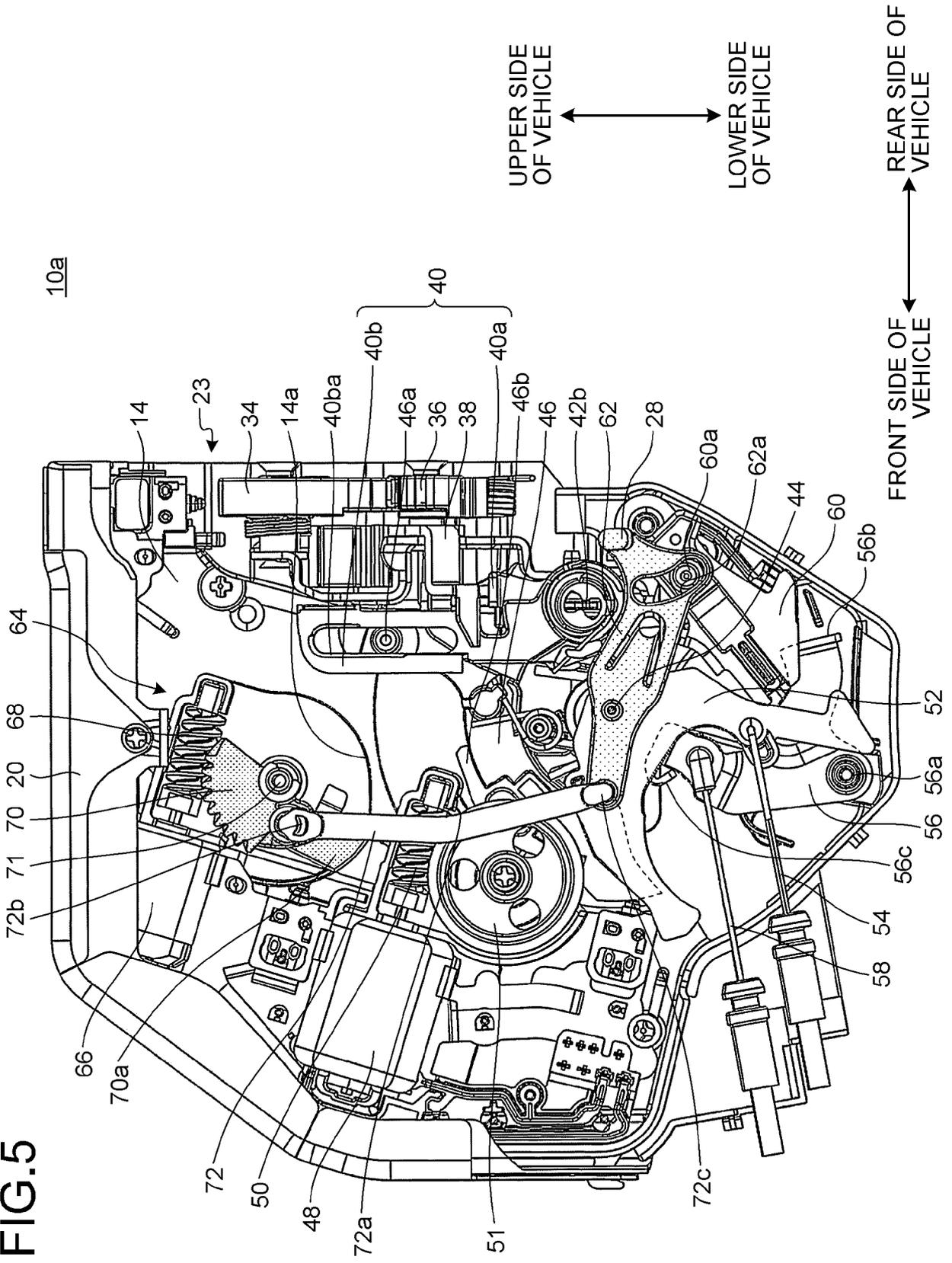
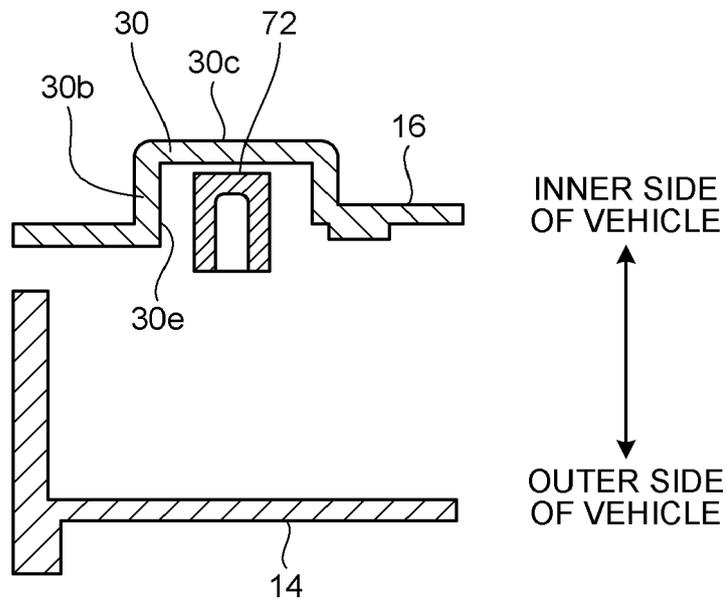
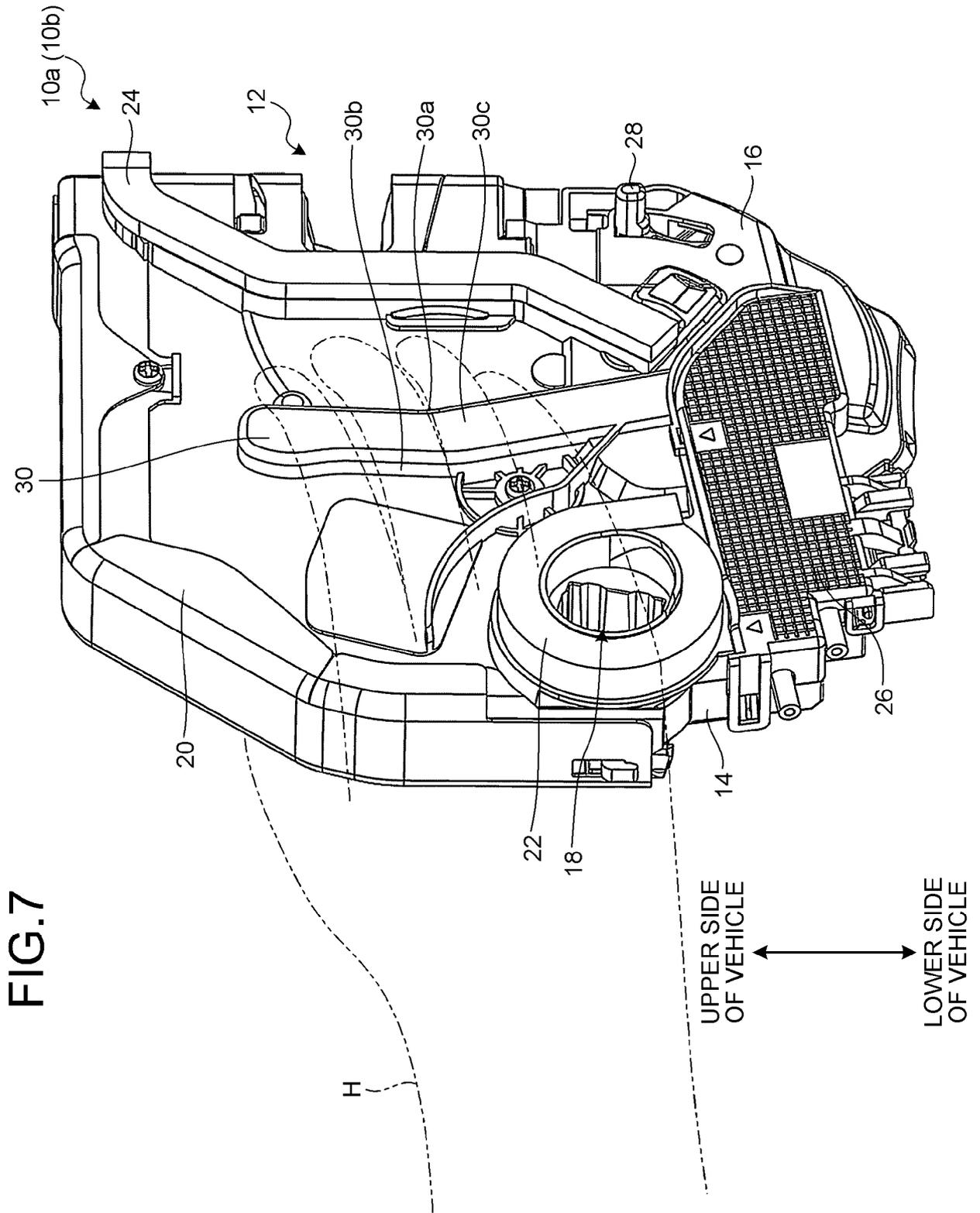
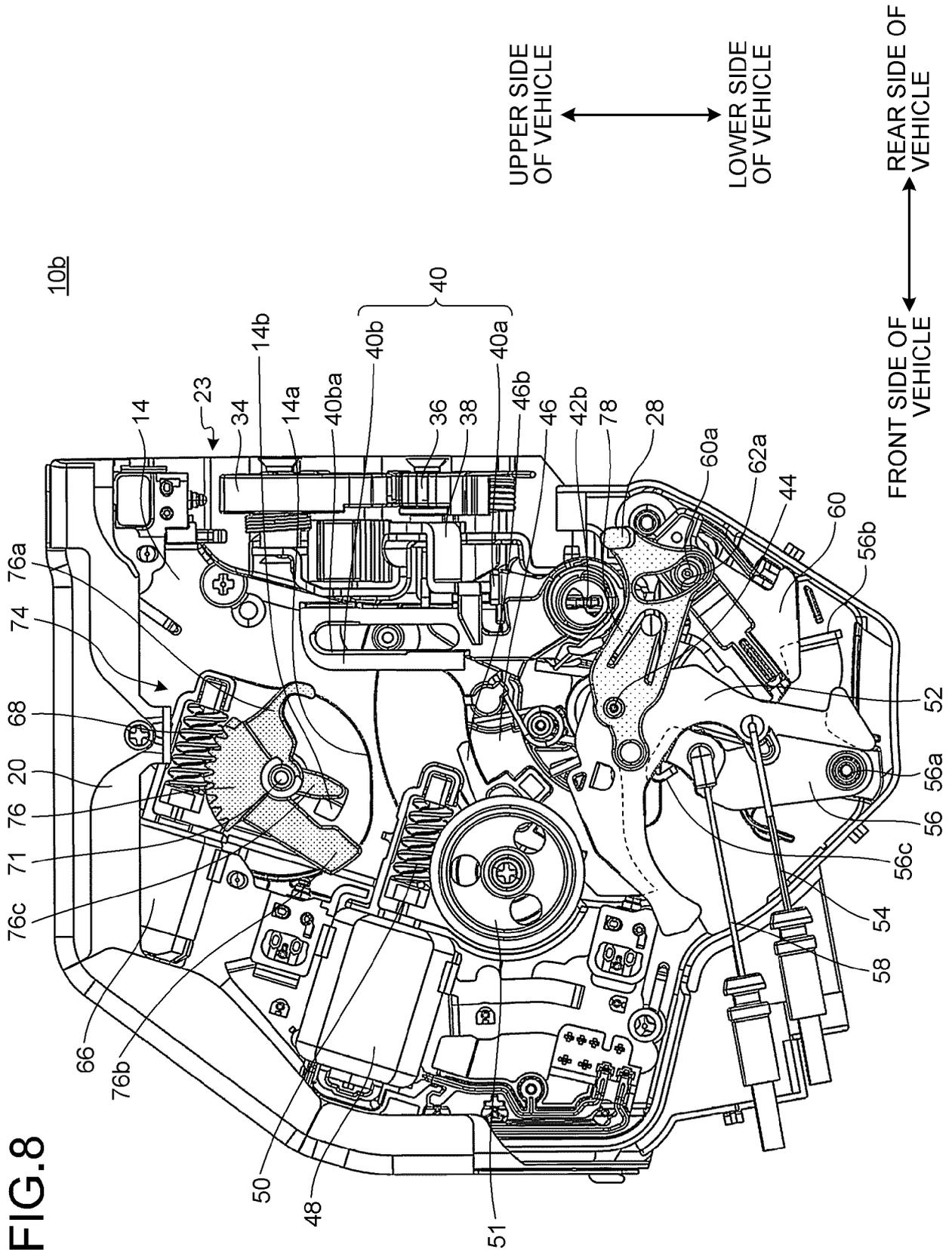


FIG.6









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