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(54) **DOOR LATCH DEVICE**

(71) Applicant: **U-Shin Ltd.**, Nagano (JP)

(72) Inventors: **Nobuya AKAGI**, Hiroshima (JP); **Yuki TANAKA**, Hiroshima (JP)

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(57) **ABSTRACT**

A door latch device includes a latch mechanism, an inner lever having a connection lever and an actuation lever, and a lock mechanism switching between unlocked and locked state. The lock mechanism includes a connection member capable of transmitting operation of the connection lever to the actuation lever, a first rotating lever rotated by a motor to first and second working positions, a second rotating lever rotatable to a first rotation position where the connection member is moved to an unlock position and a second rotation position where the connection member is moved to a lock position, a connection spring connecting the first rotating lever and the second rotating lever while allowing relative rotation of them, and a holding spring having a biasing force stronger than a biasing force of the connection spring and holds the first rotating lever at the first and second working positions.

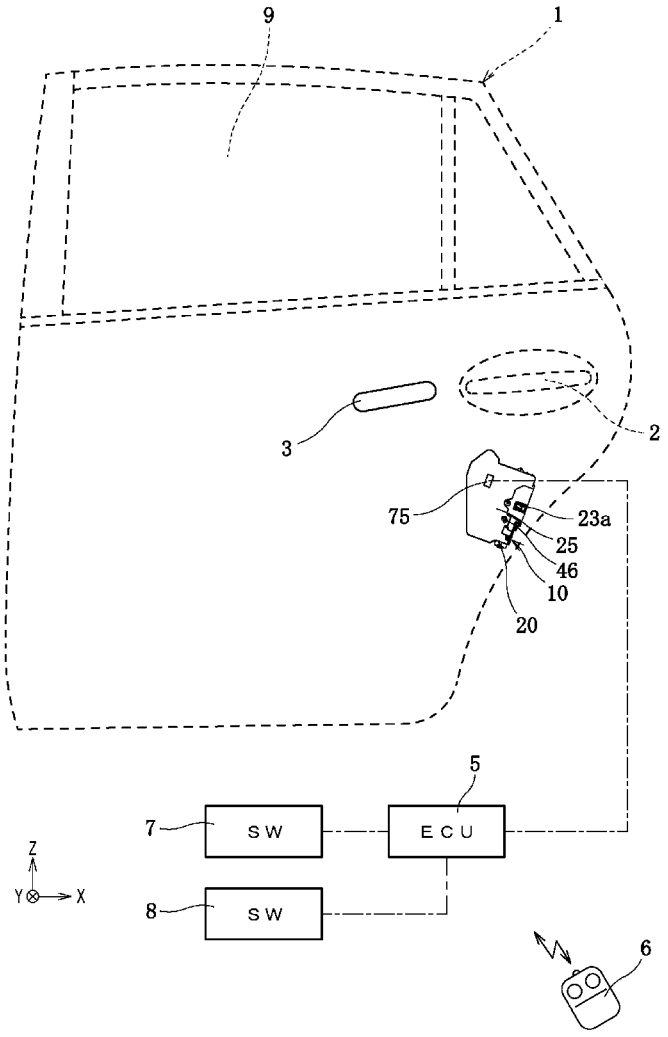

Fig. 1

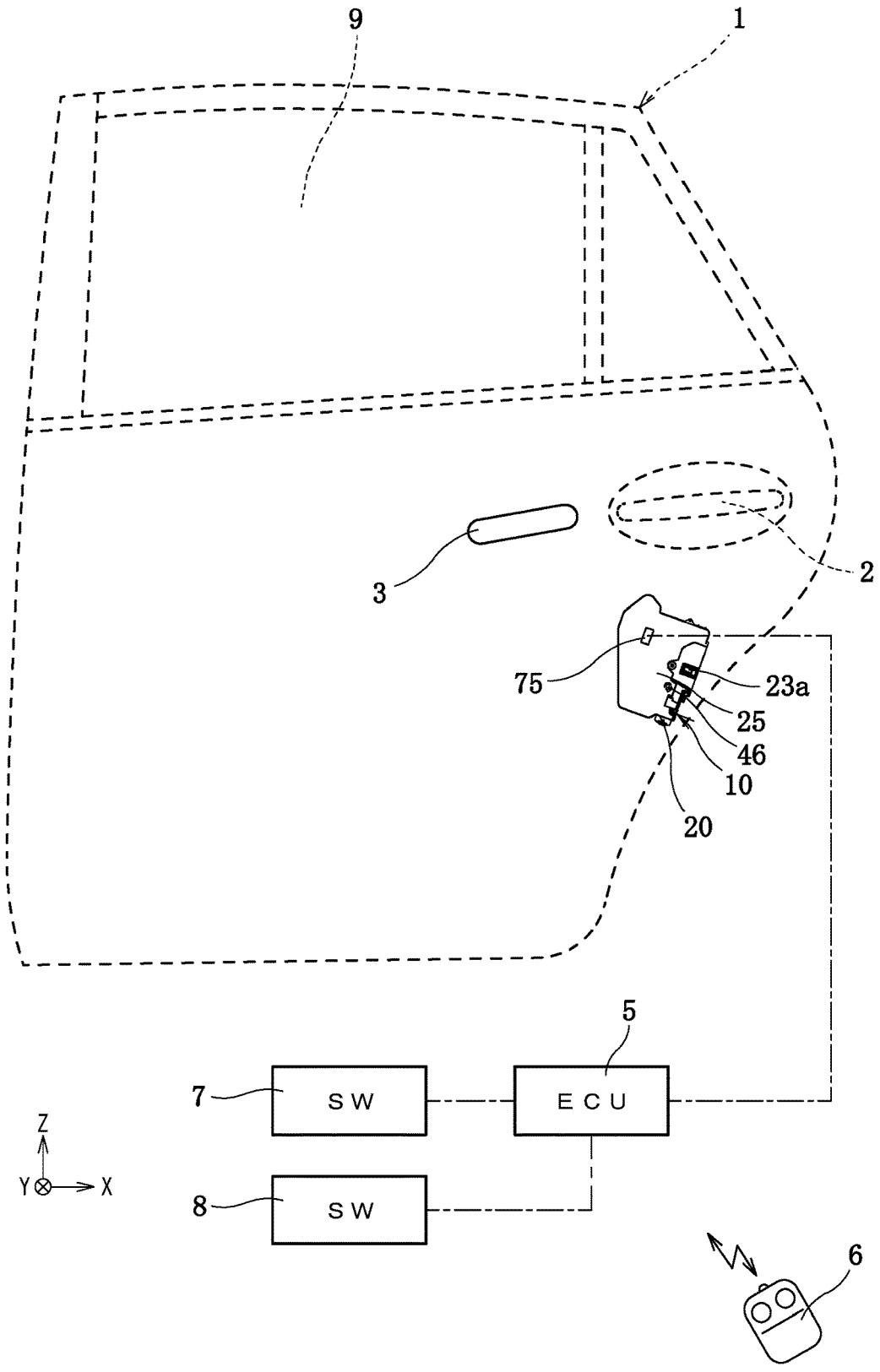

Fig. 2

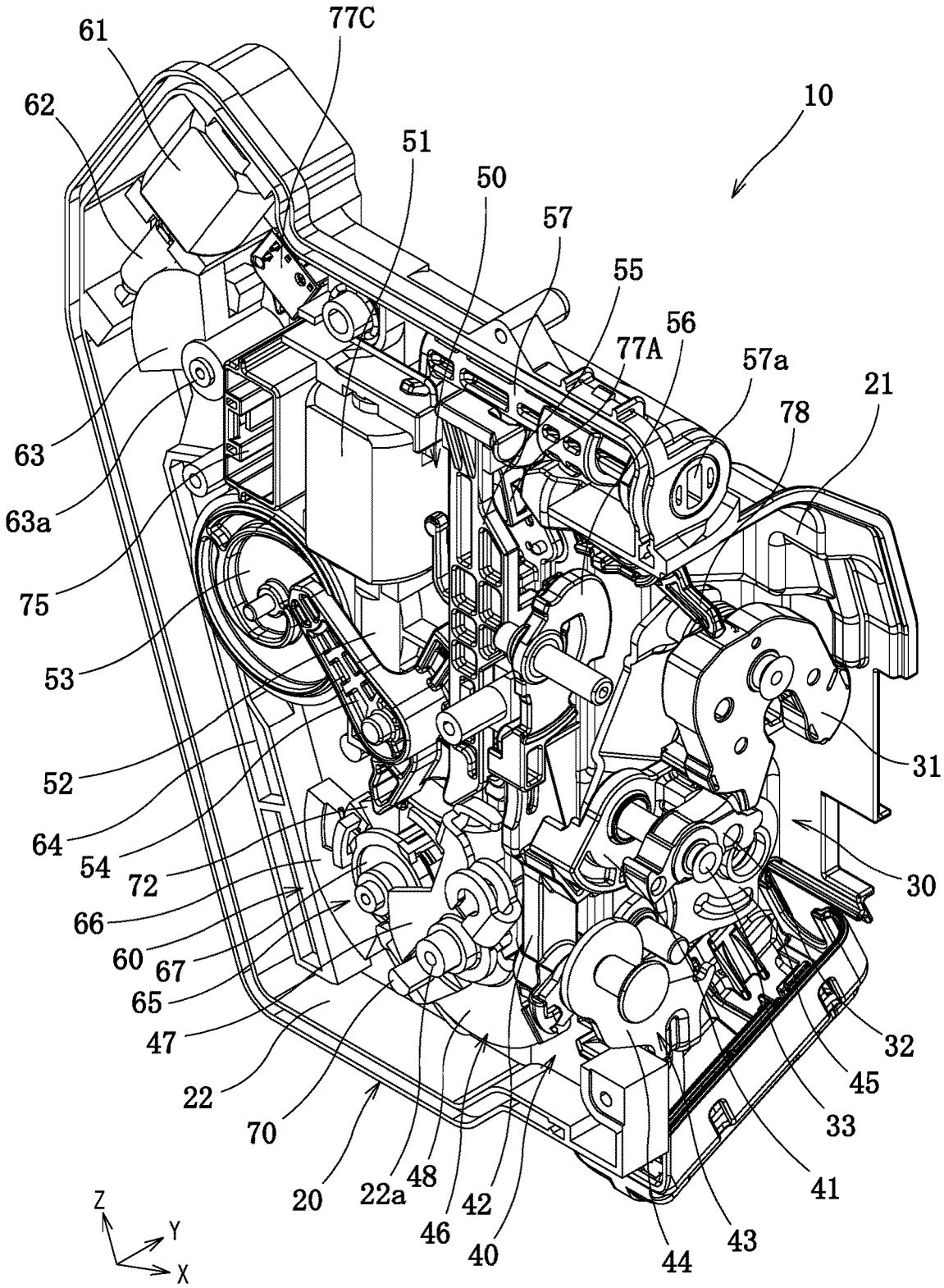
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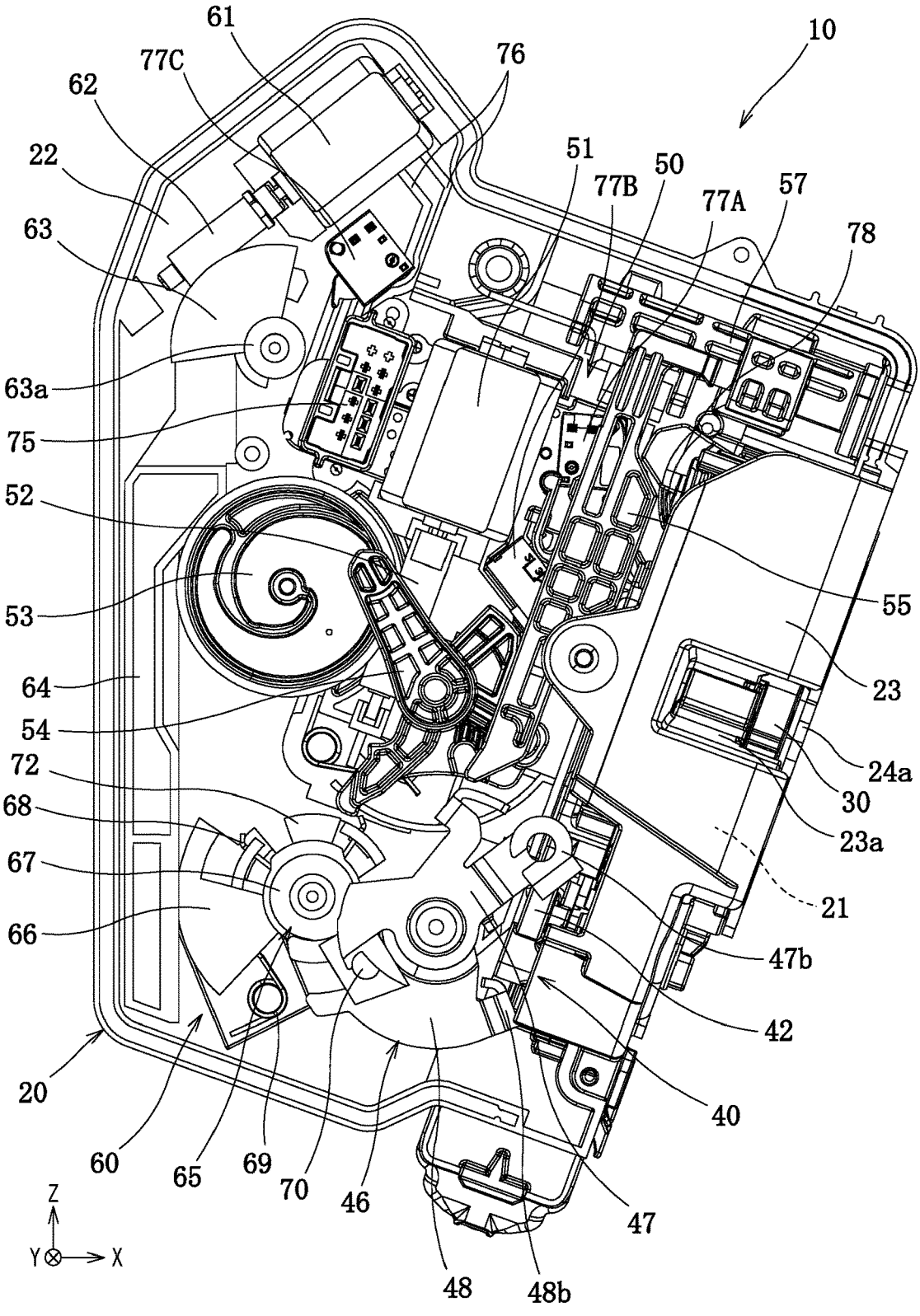
Fig. 3A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48b
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Fig. 3B

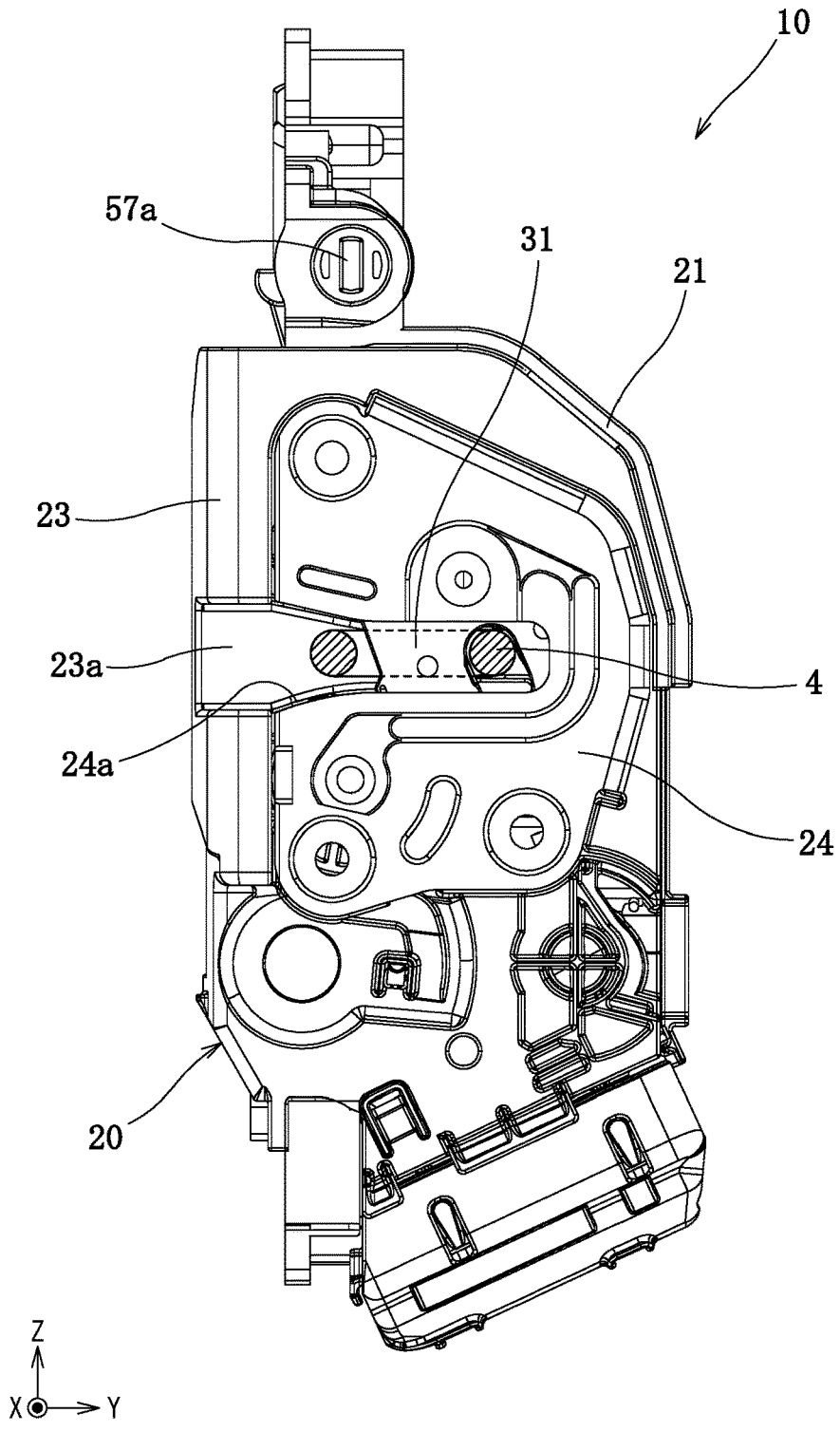


Fig. 4A

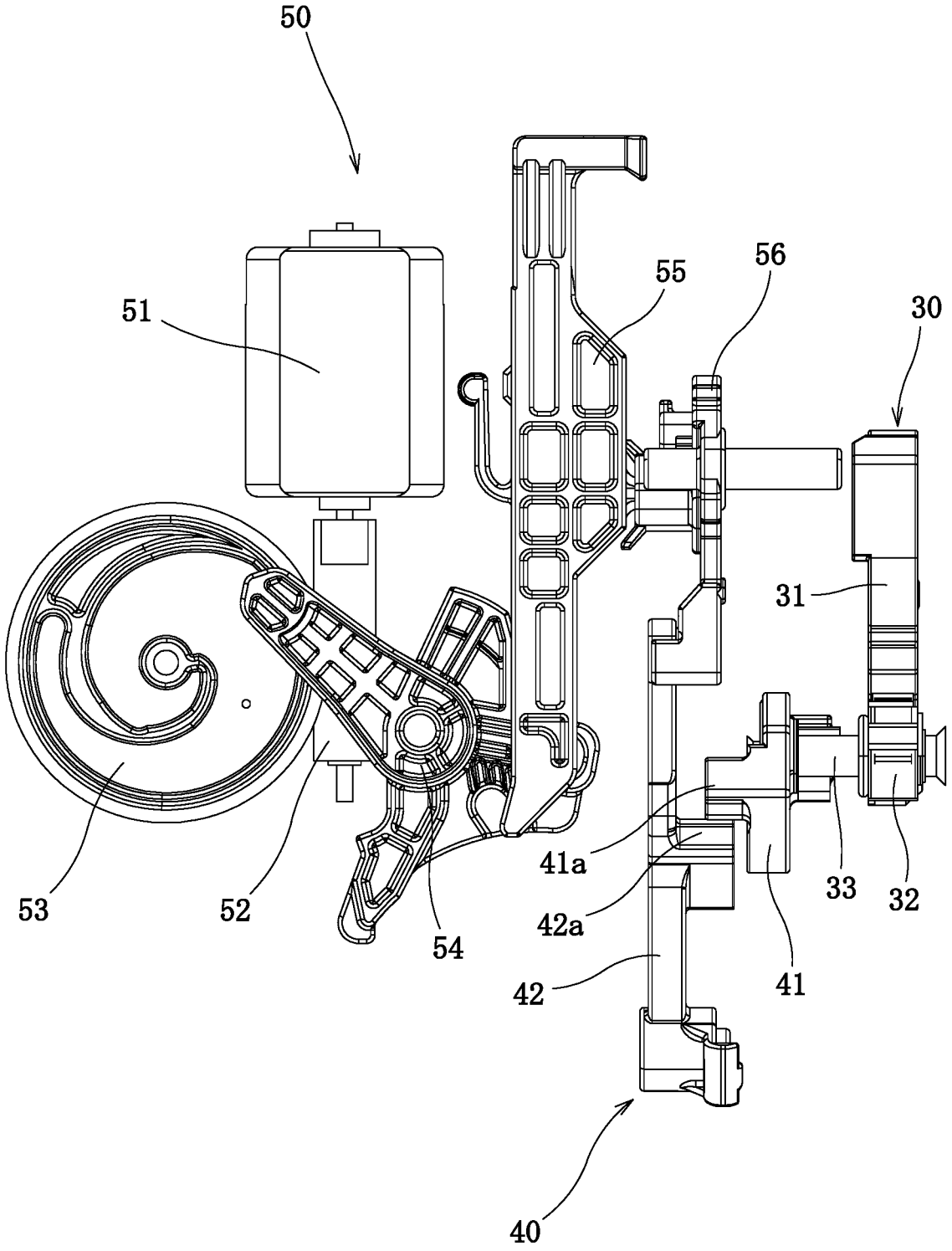


Fig. 4B

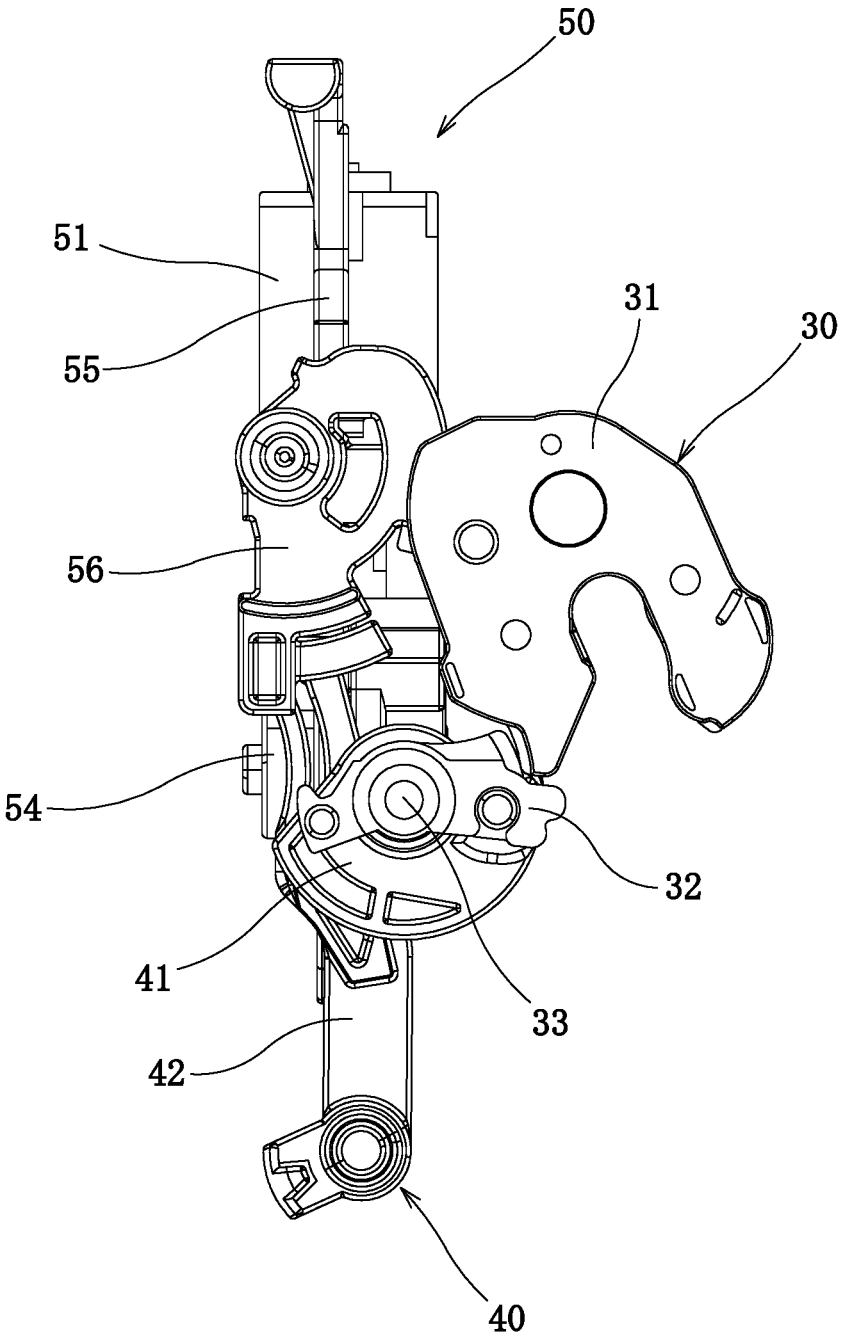
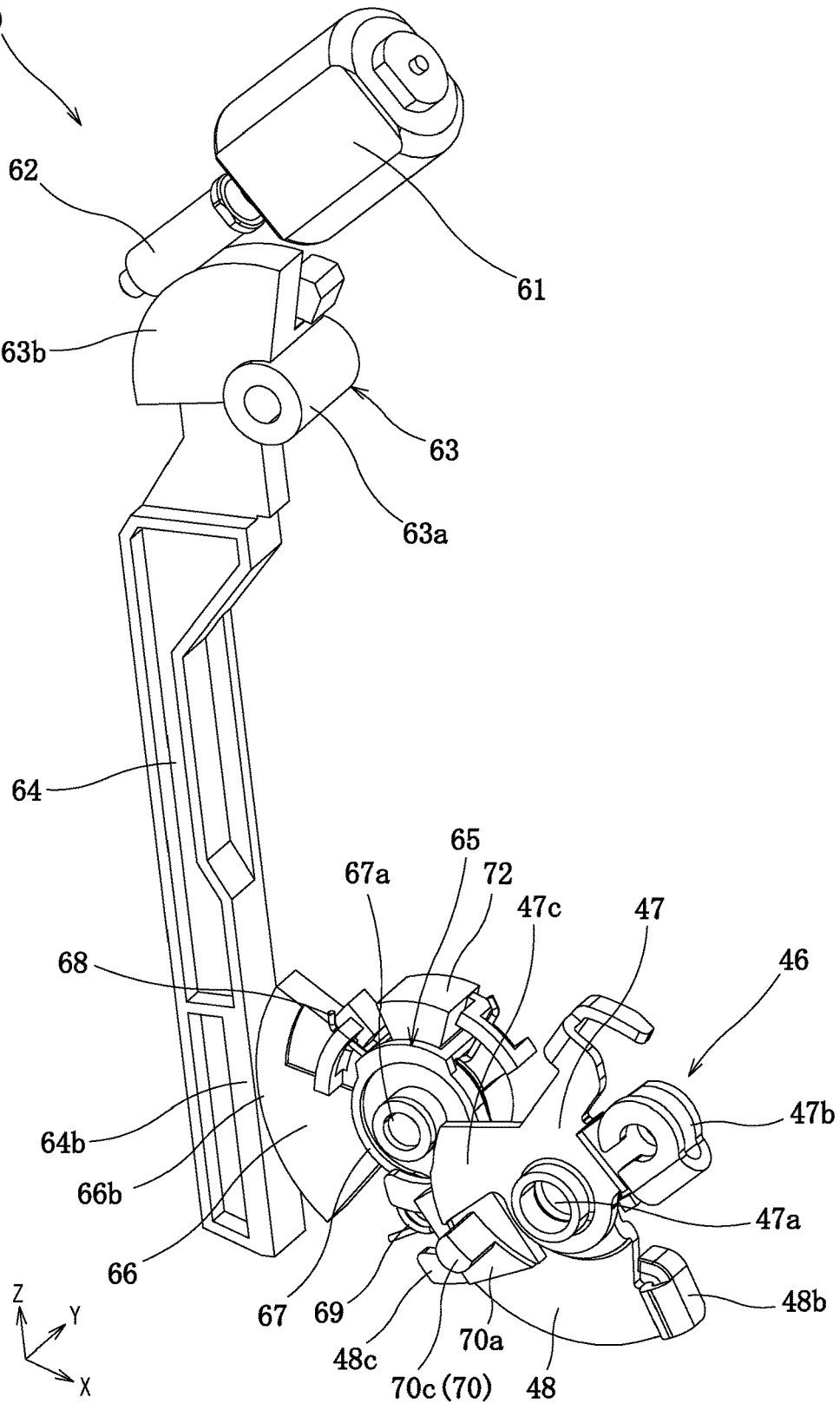


Fig. 5A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70c (70)
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Y
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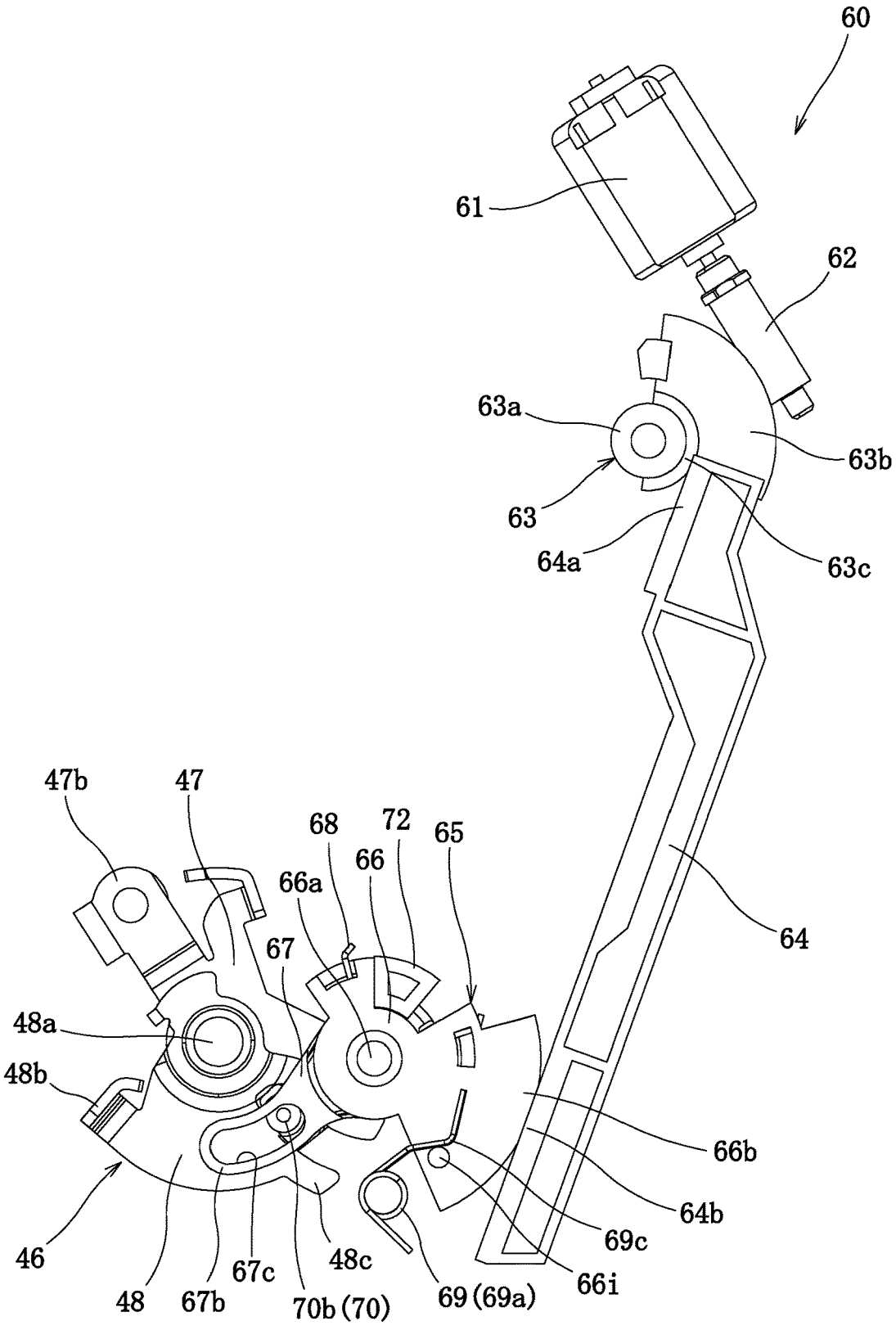
Fig. 5B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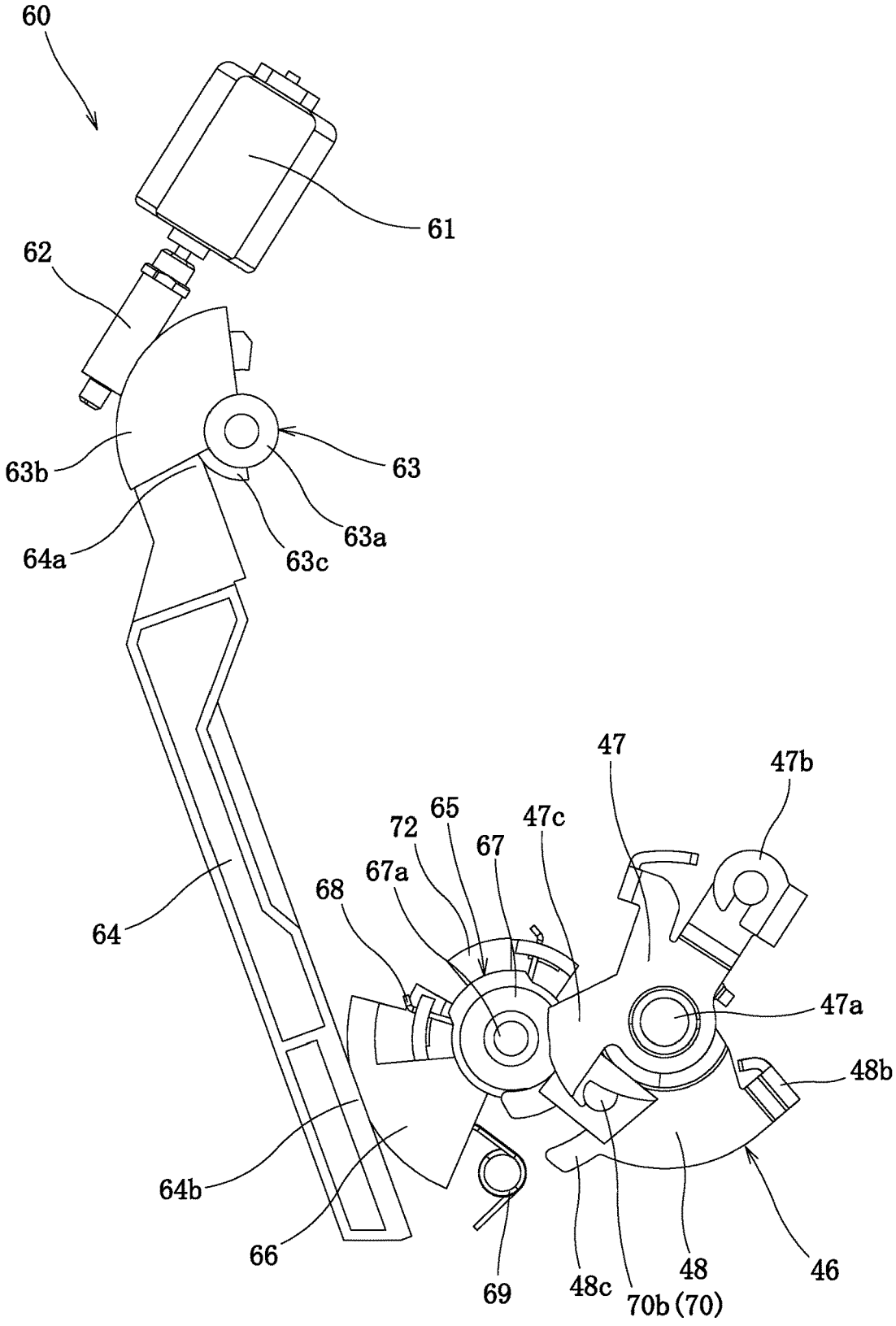
69 (69a)
66i

Fig. 6A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48c
70b (70)
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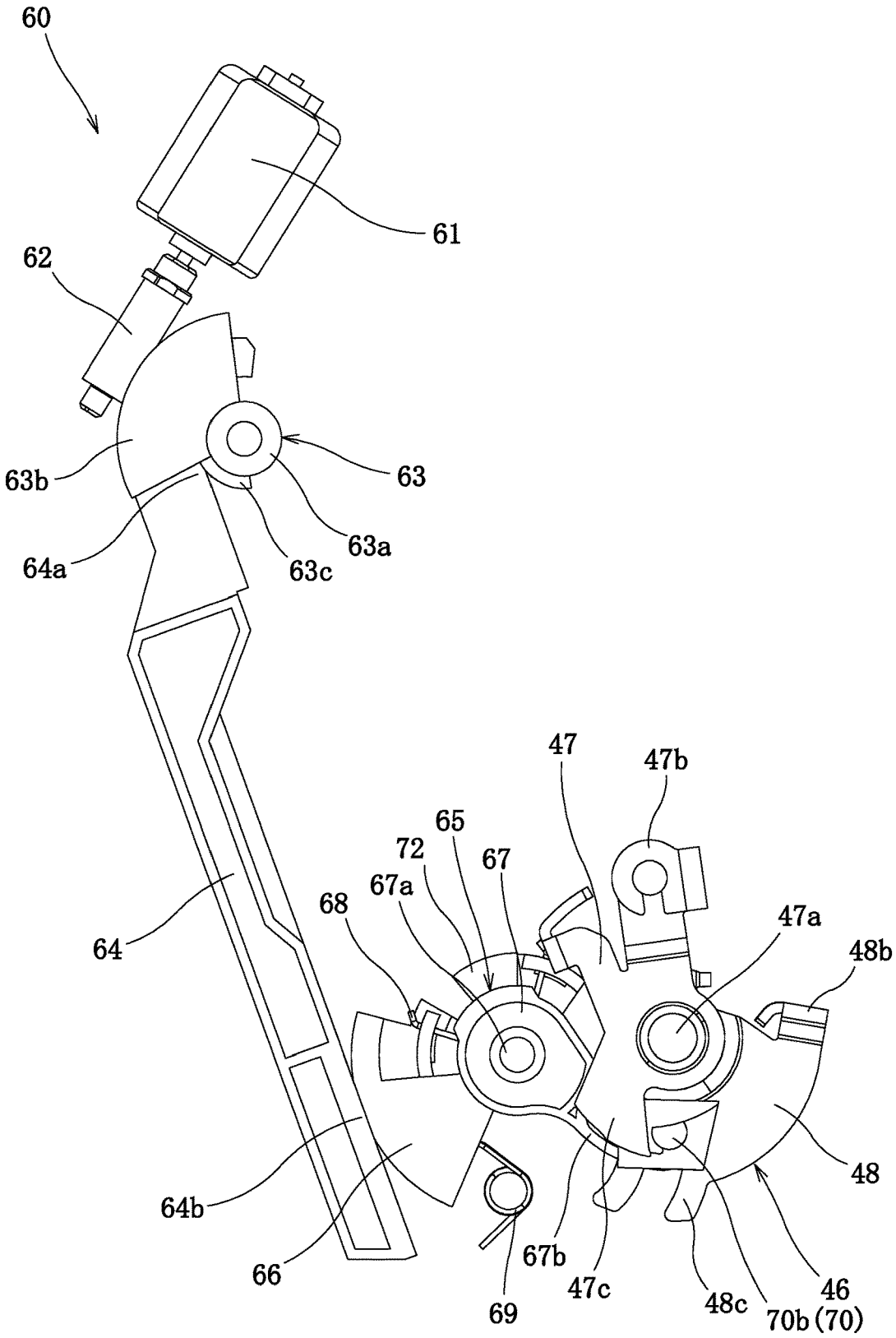
Fig. 6B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48c
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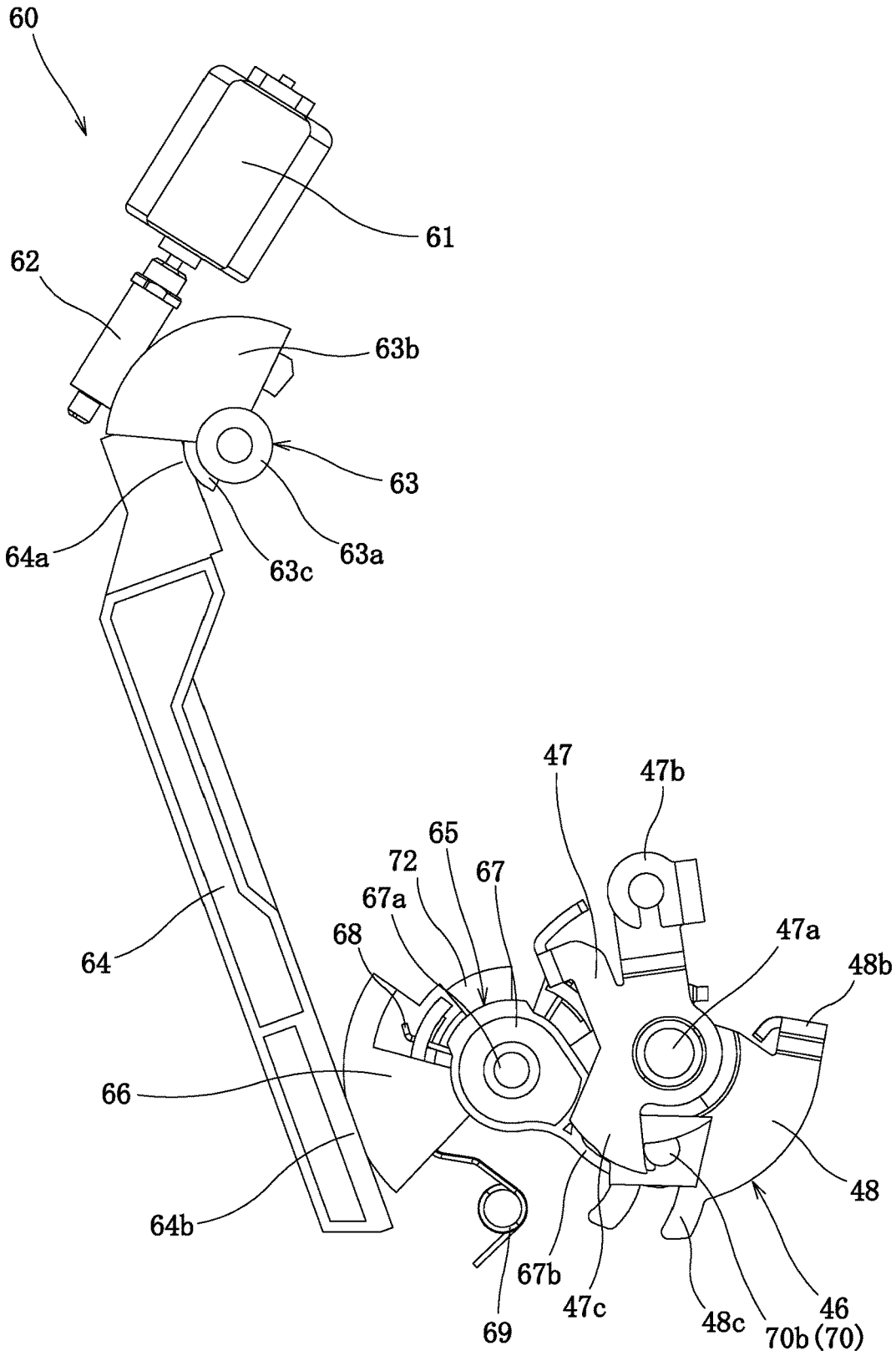
70b (70)

Fig. 6C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67b
47c
48c
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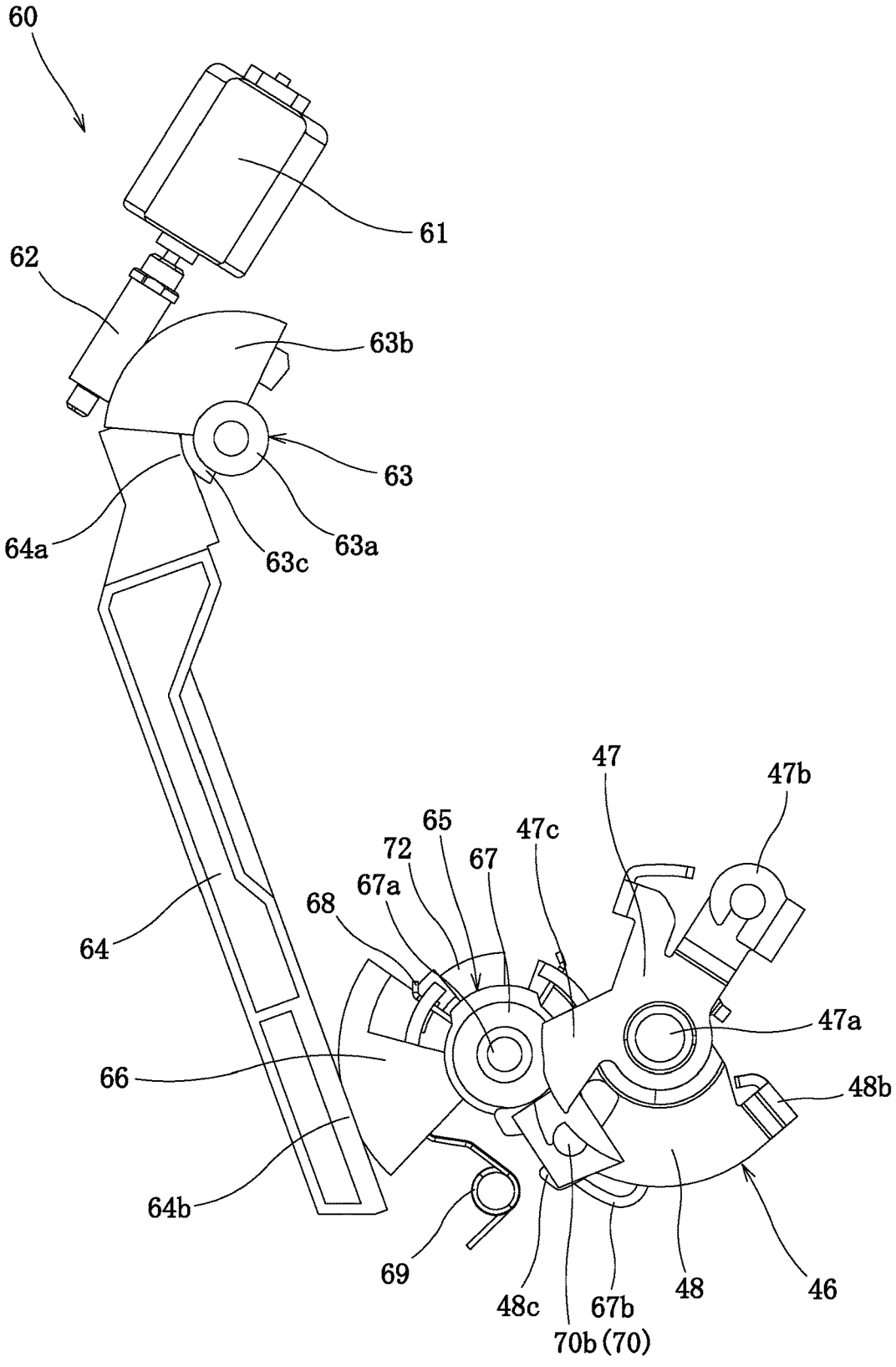
69
70b (70)

Fig. 7A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47b
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48c
67b
70b (70)
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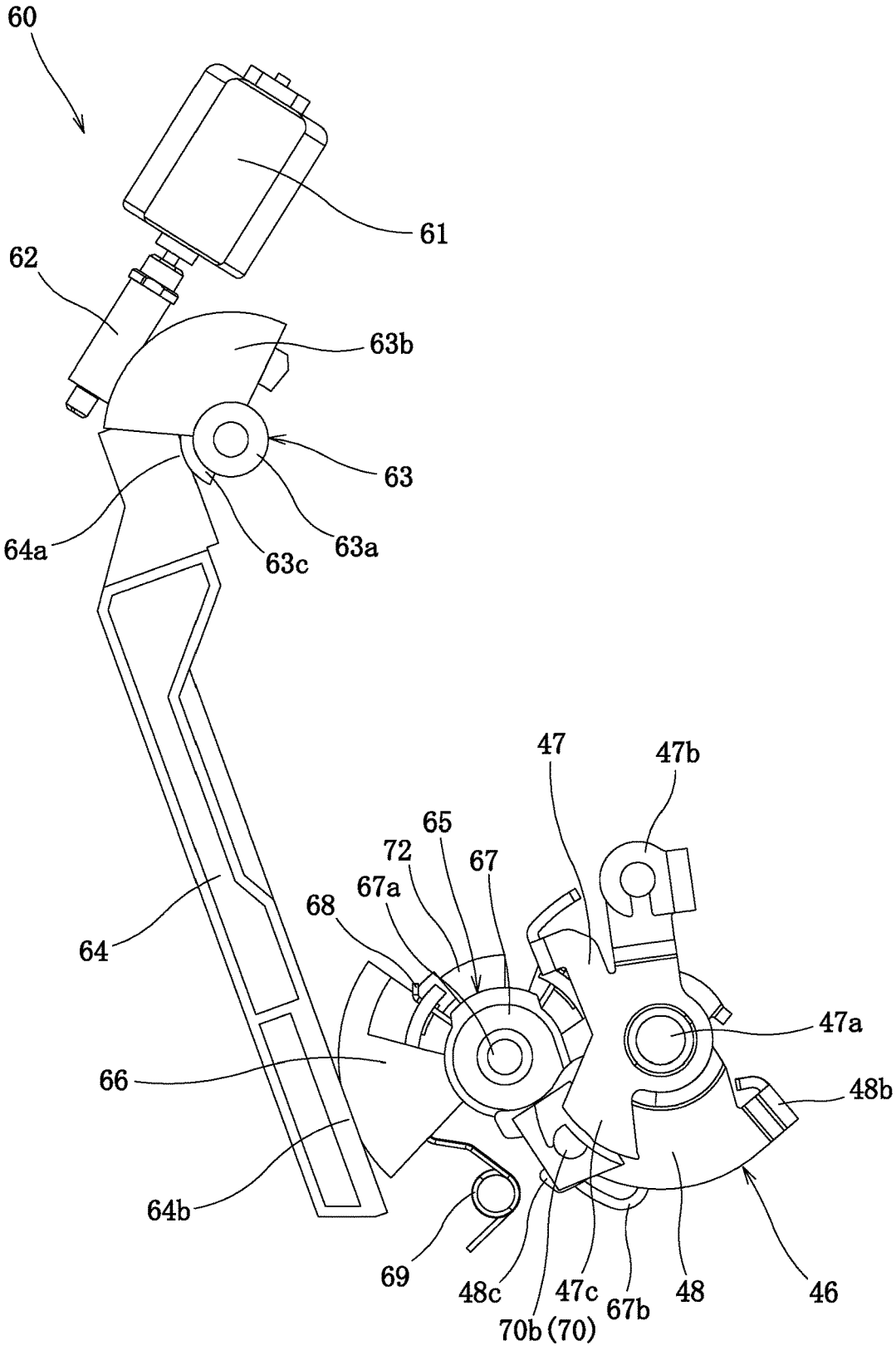
Fig. 7B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70b (70)

Fig. 7C

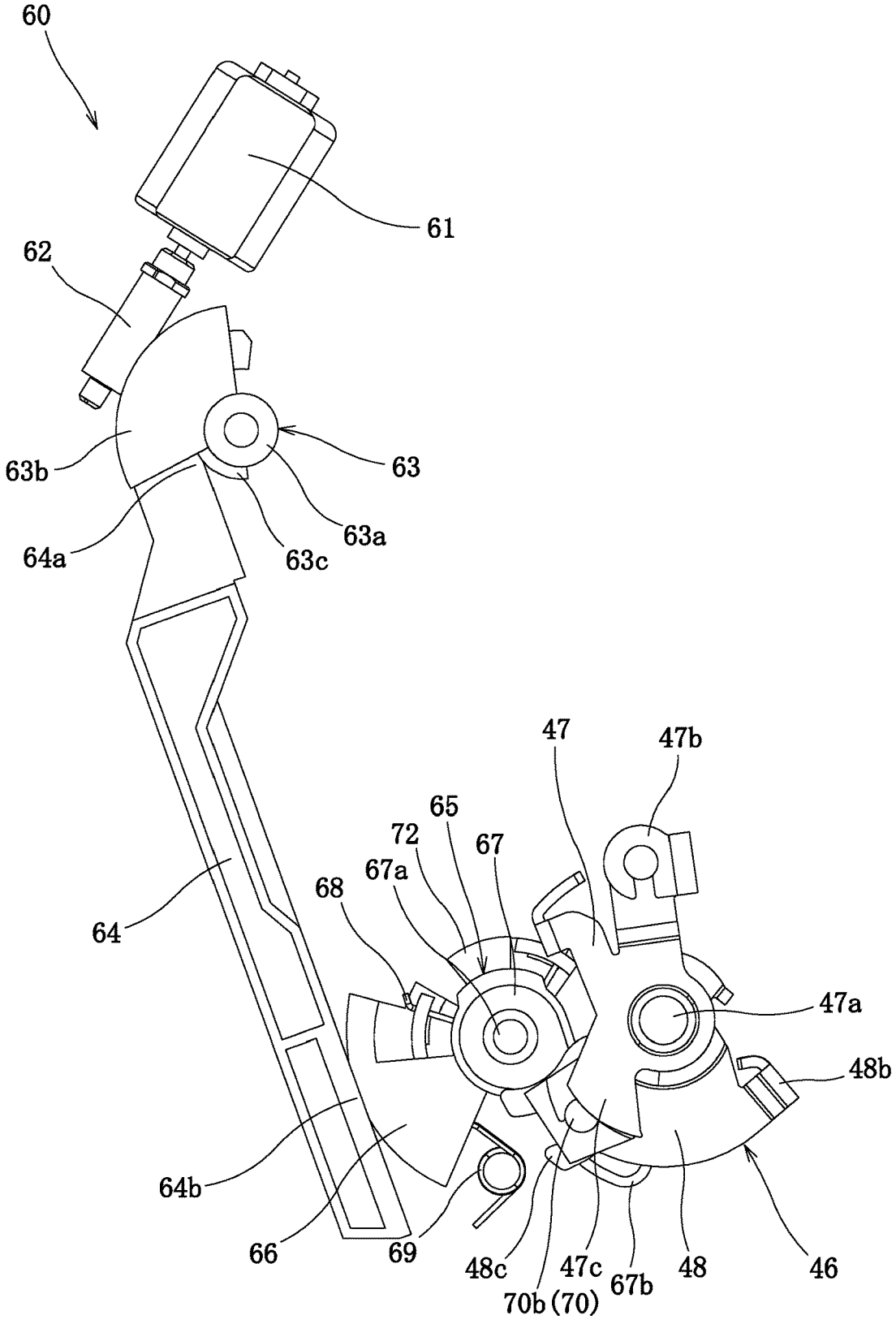
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Fig. 8

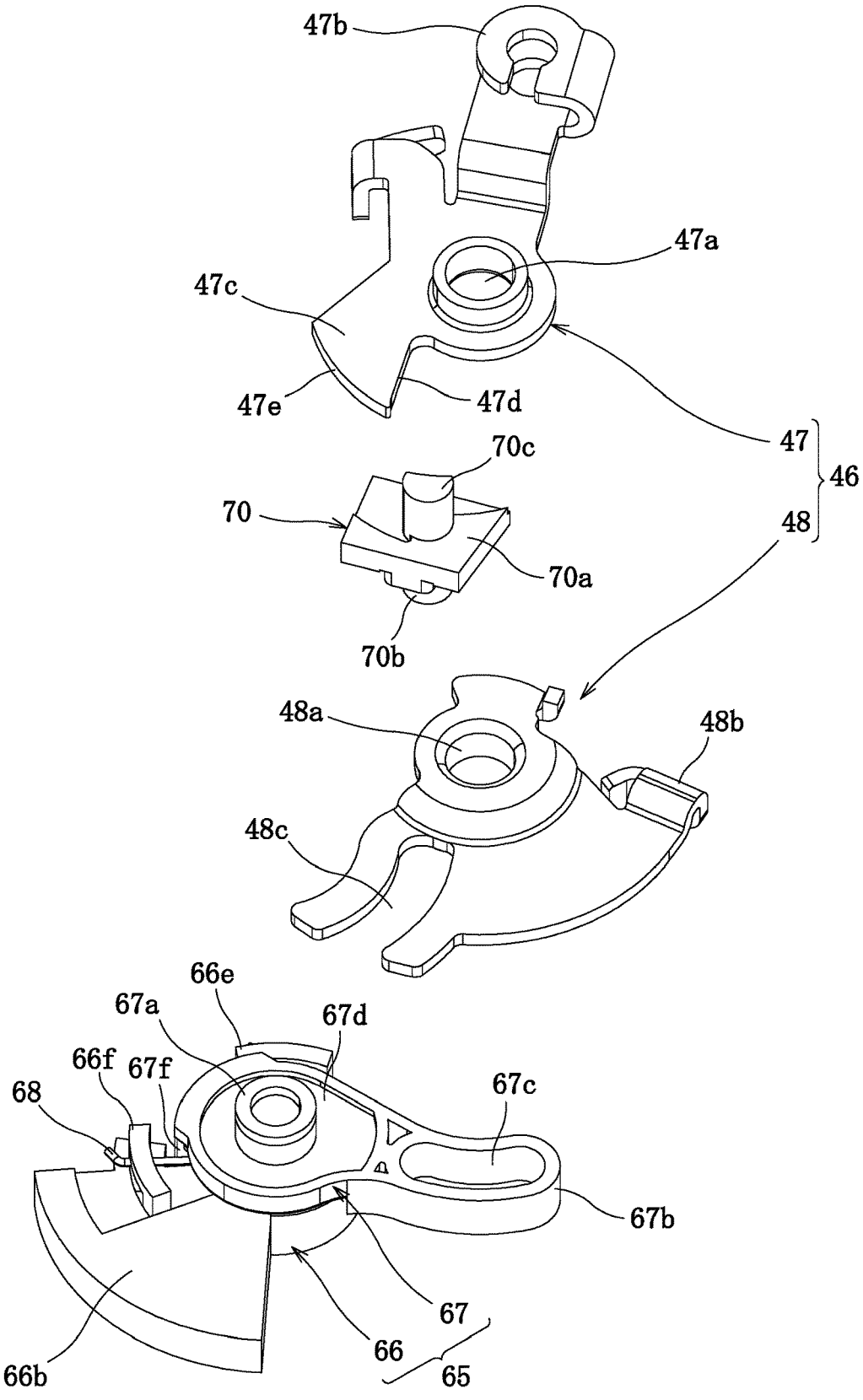
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Fig. 9A

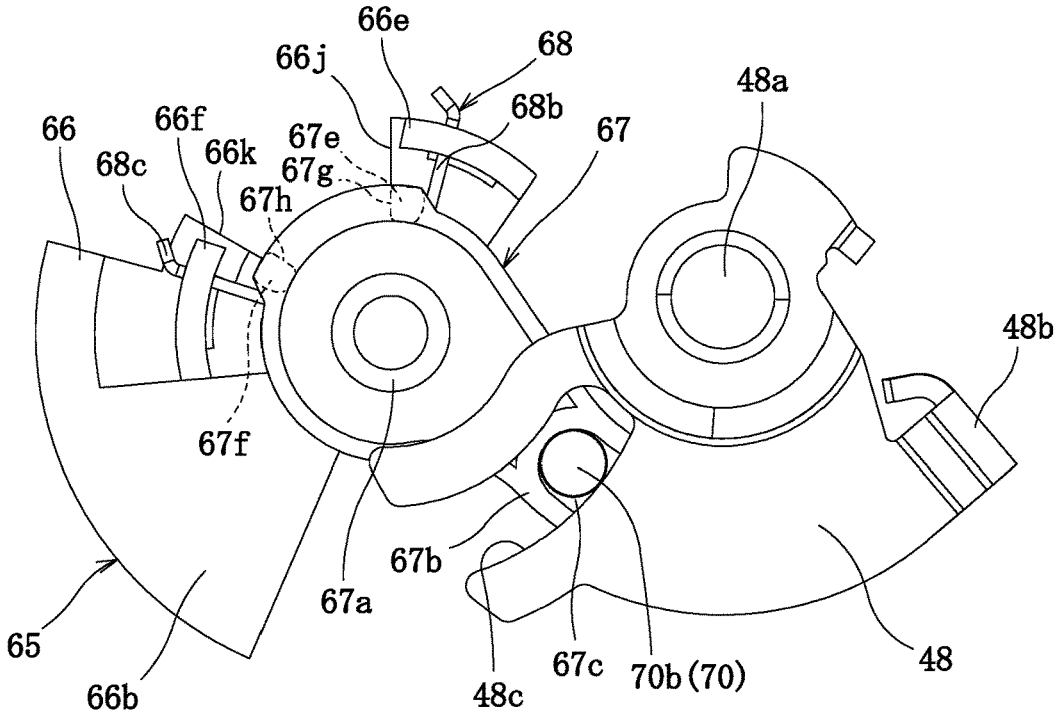
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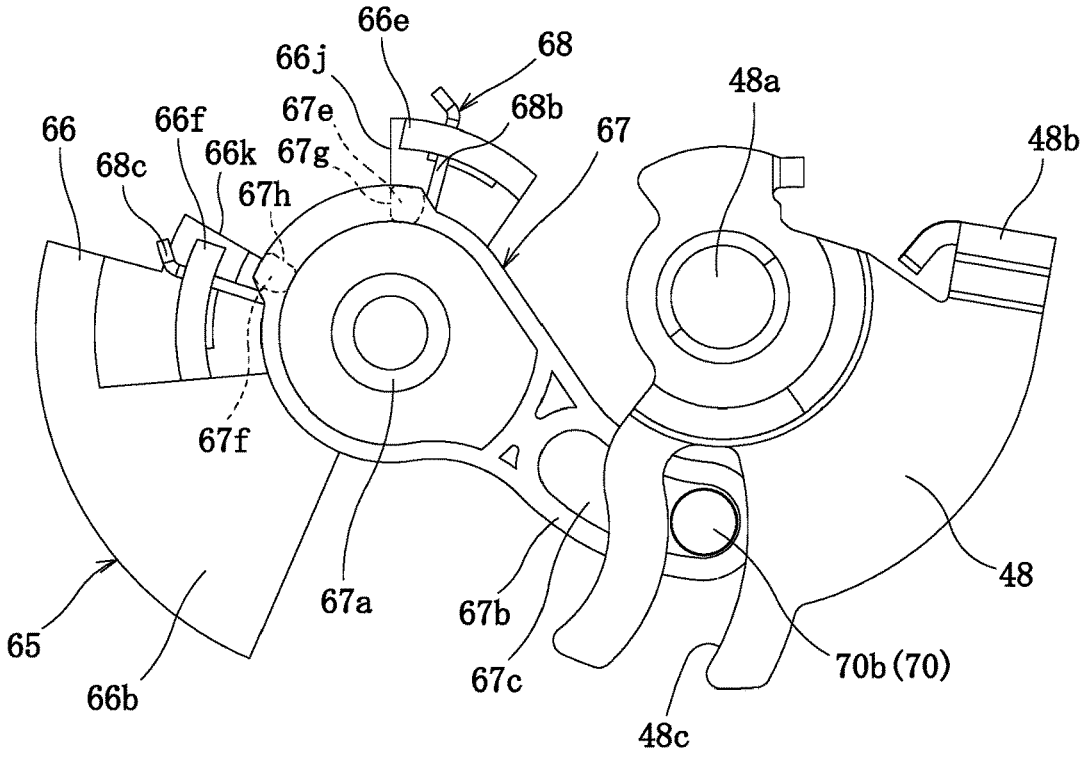
Fig. 9B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48c

Fig. 9C

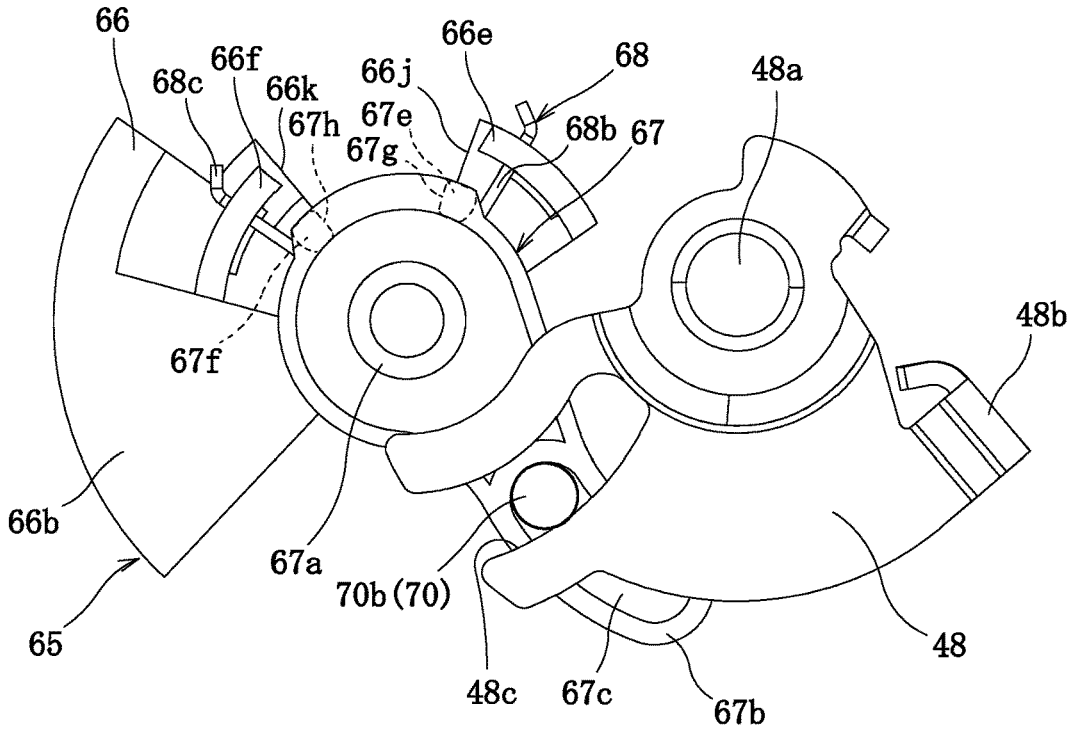


Fig. 10A

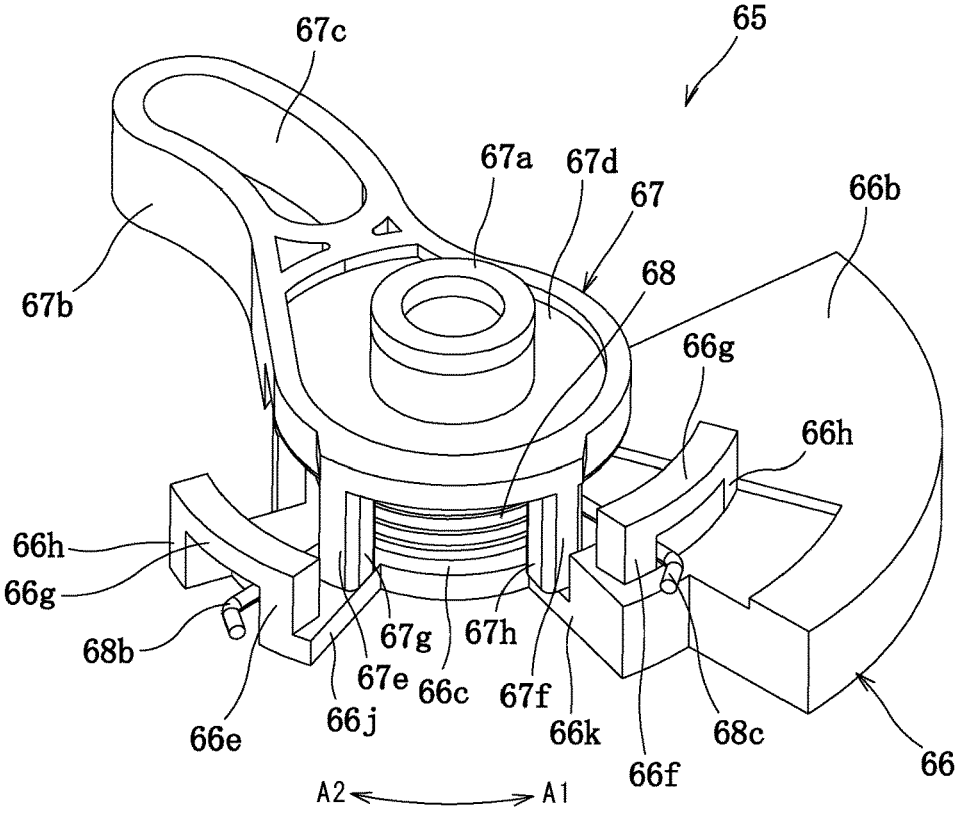
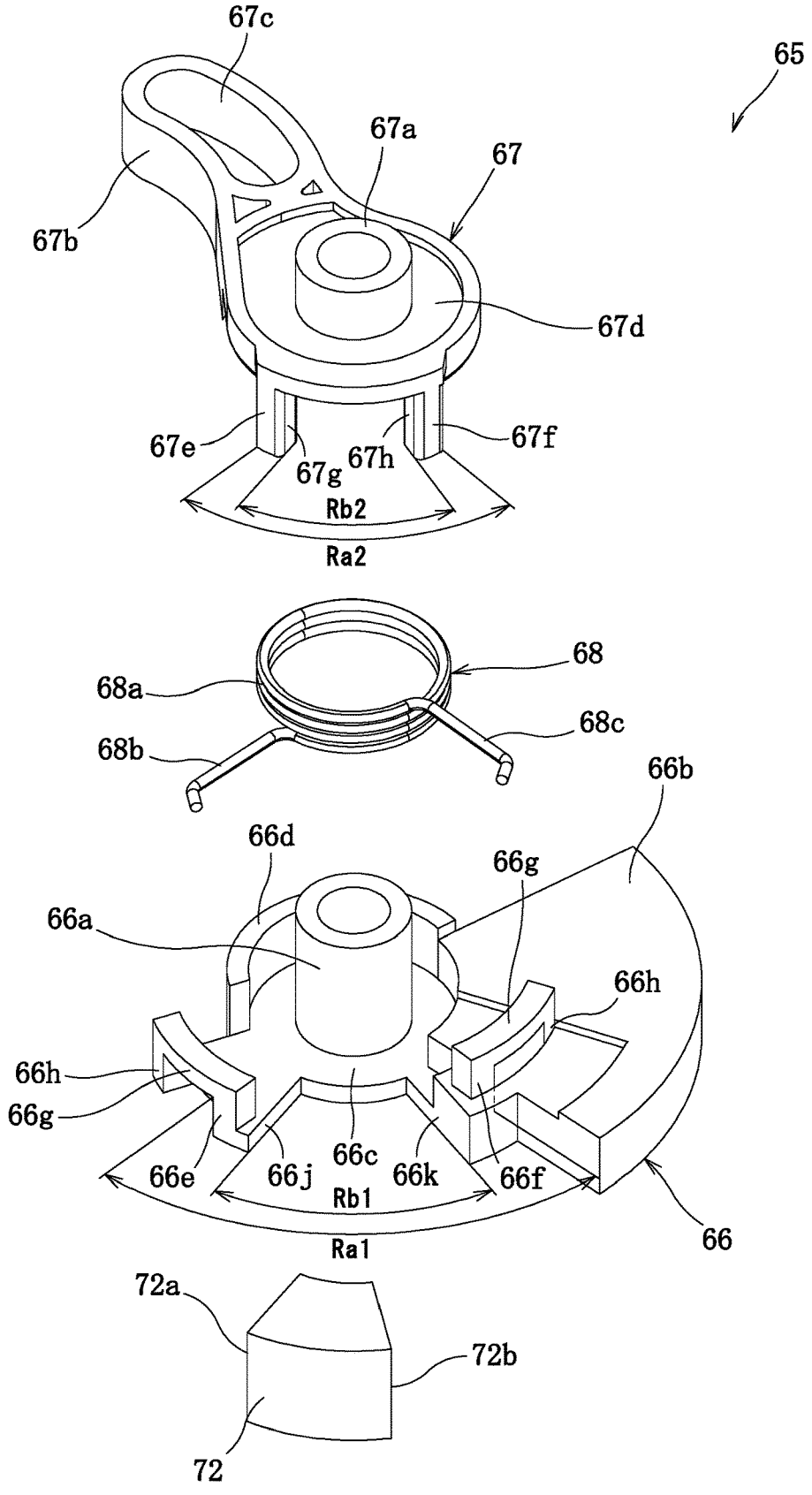


Fig. 10B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Rb1
Ra1
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72a
72b
72

Fig. 11A

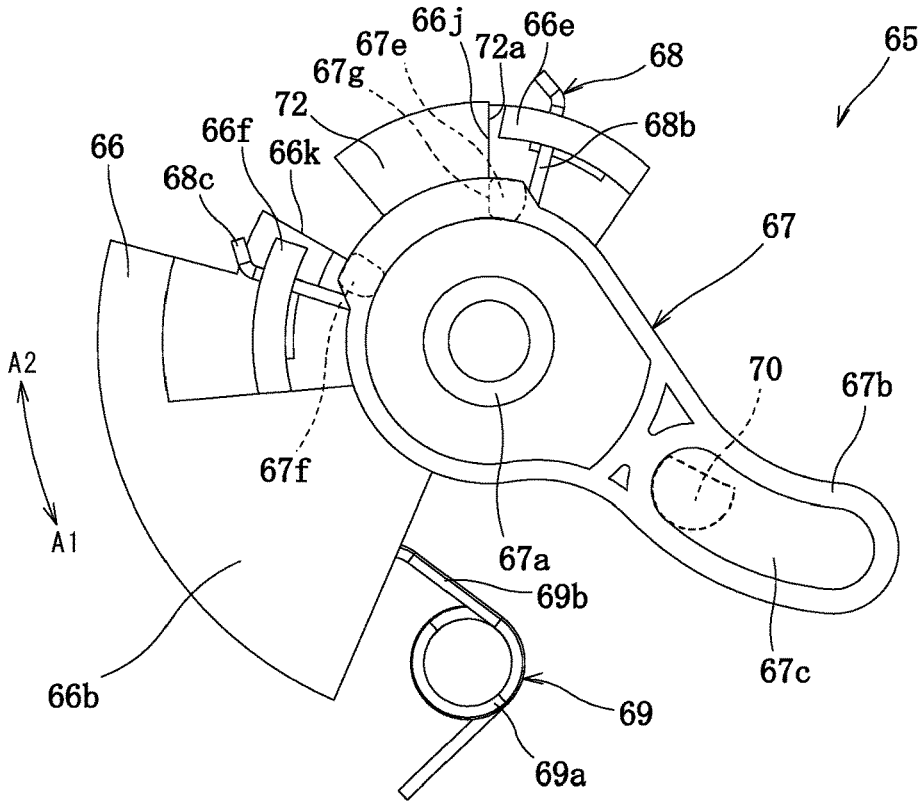

Fig. 11B

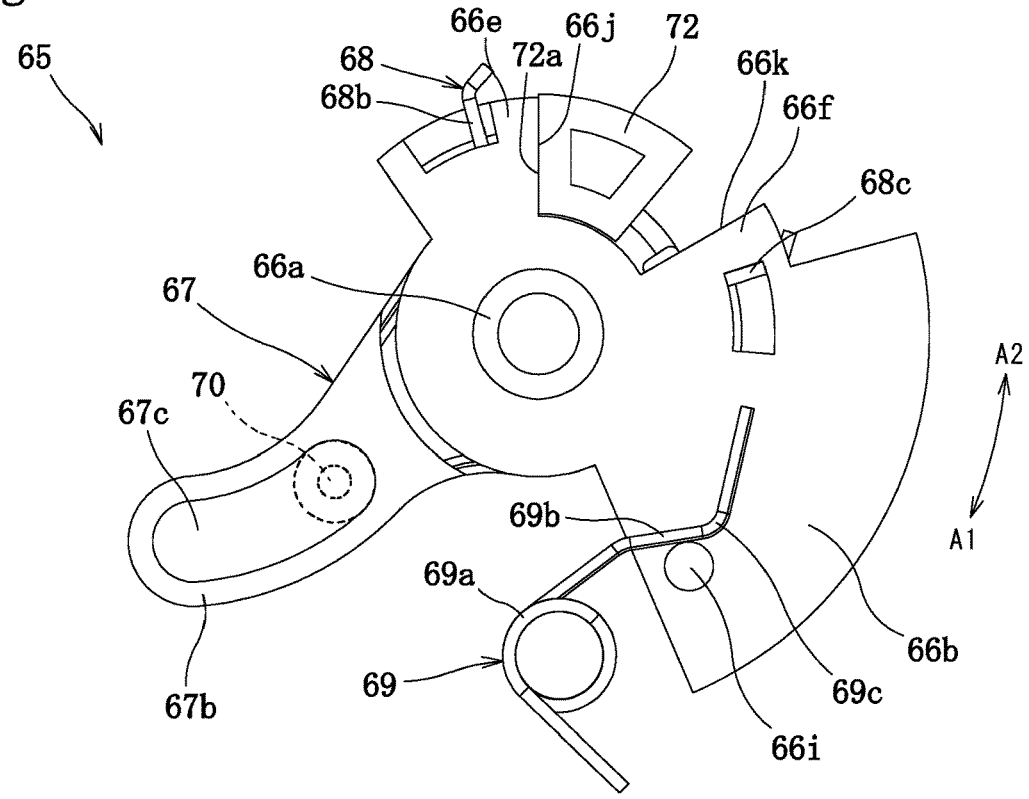

Fig. 11C

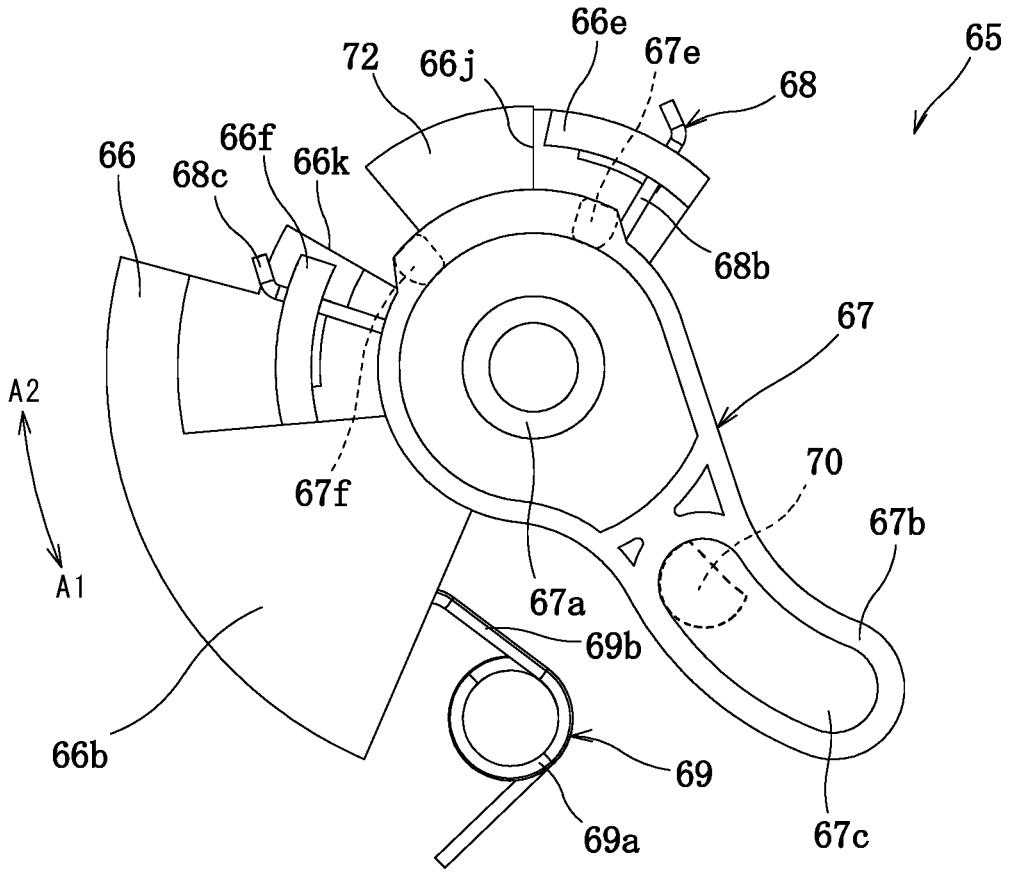
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Fig. 12A

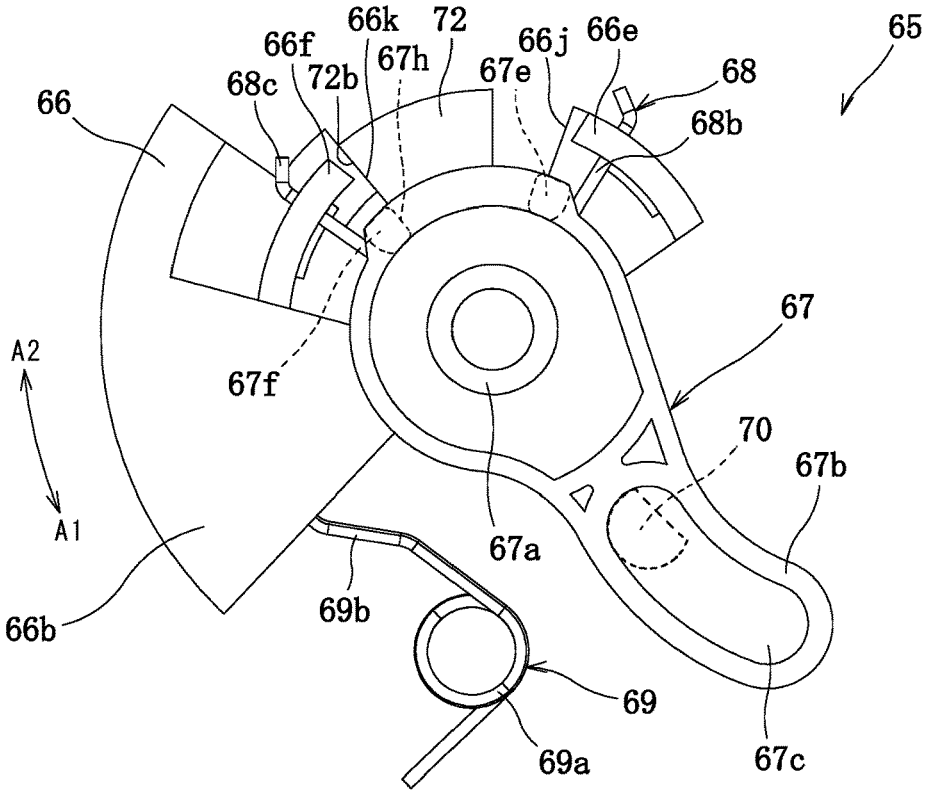


Fig. 12B

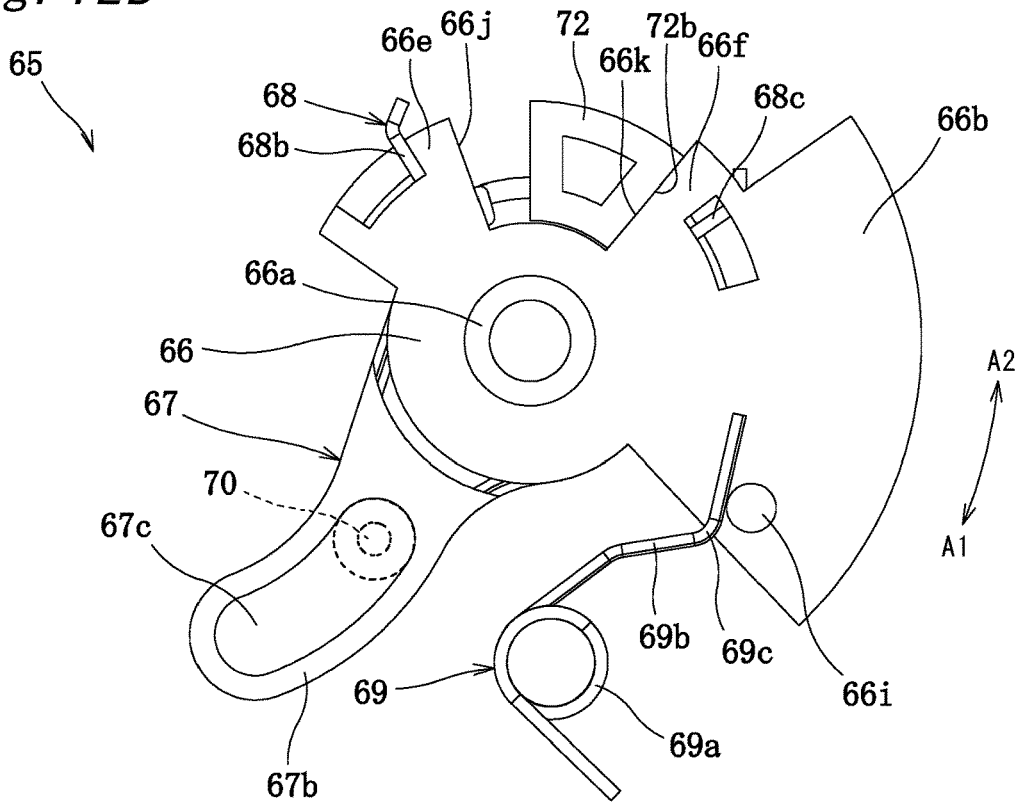


Fig. 12C

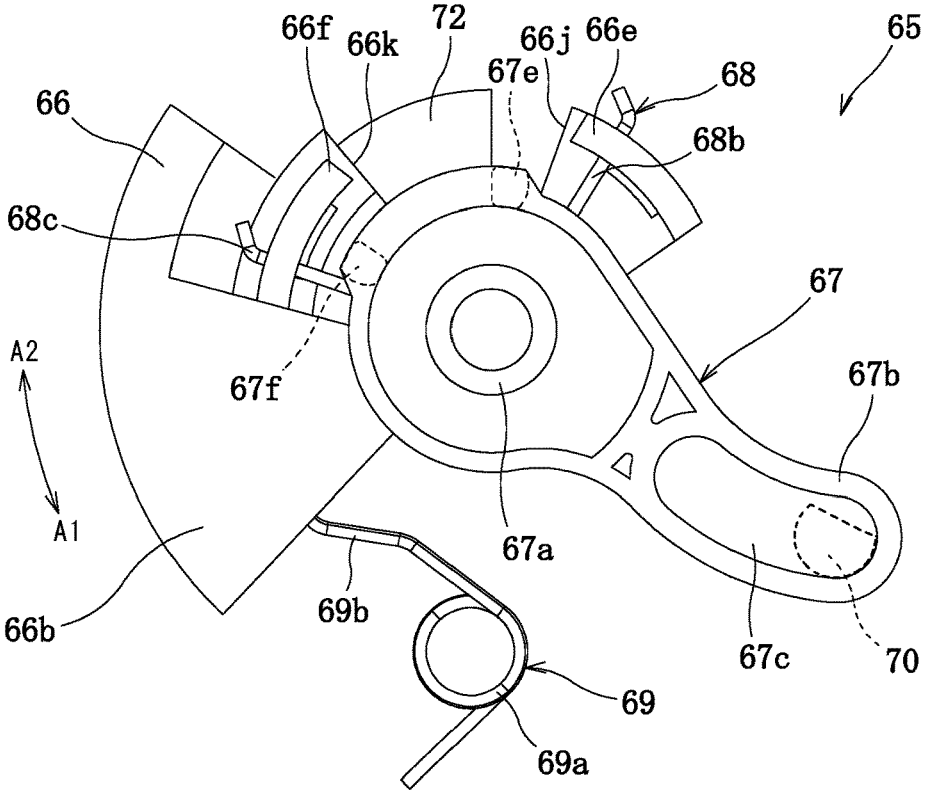
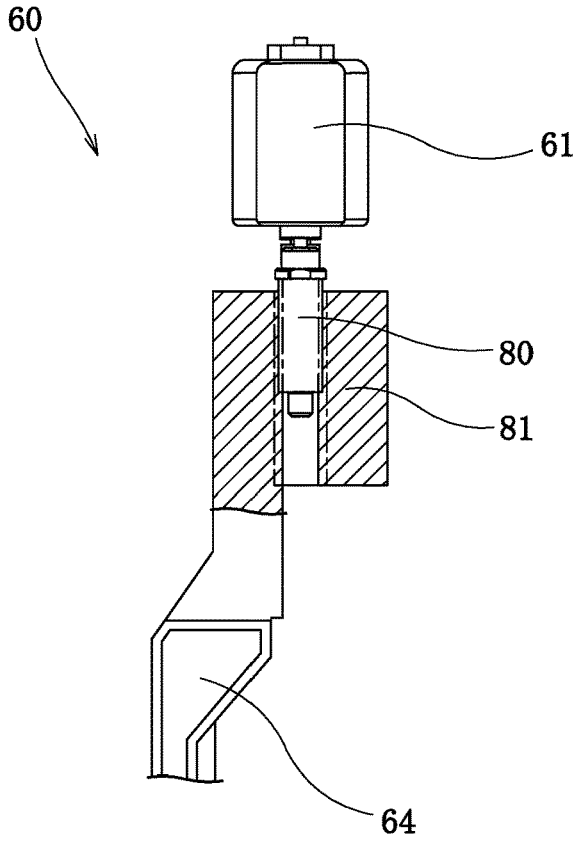


Fig. 13



DOOR LATCH DEVICE

TECHNICAL FIELD

[0001] The present invention relates to a door latch device.

BACKGROUND ART

[0002] The door latch device disclosed in Patent Document 1 includes a latch mechanism for holding a door in a closed state, an opening mechanism for opening the latch mechanism, a main lock mechanism used every time a person gets in a vehicle, and a child lock mechanism used when a small child gets in a vehicle. Among them, the opening mechanism includes an inside lever that operates as an inner handle is operated and an open lever for causing the latch mechanism to perform opening driving. The child lock mechanism includes a bush for engaging the inside lever and the open lever, and a switching mechanism including a motor for moving the bush. The switching mechanism moves the bush to an unlock position where the operating force of the inside lever can be transmitted to the open lever and a lock position where the operating force cannot be transmitted to the open lever.

PRIOR ART DOCUMENT

Patent Document

[0003] Patent Document 1: JP 2009-167594 A

SUMMARY OF THE INVENTION

Problems to be Solved by the Invention

[0004] In the door latch device of Patent Document 1, when the child lock mechanism is driven during the operation of the inner handle, the bush interferes with the inside lever. For this reason, the state of the child lock mechanism cannot be switched. That is, the child lock mechanism in the unlocked state cannot be switched to the locked state, and the child lock mechanism in the locked state cannot be switched to the unlocked state. Patent Document 1 does not consider any countermeasure against such a panic.

[0005] An object of the present invention is to provide a door latch device capable of reliably switching the lock mechanism even during operation of the inner handle.

Means for Solving the Problems

[0006] According to an aspect of the present invention, there is provided a door latch device including a latch mechanism that locks a striker and holds a door in a closed state, an inner lever that releases locking of the striker by the latch mechanism, and a first lock mechanism including a first motor for making switching between a first unlocked state in which operation of the inner lever is enabled and a first locked state in which operation of the inner lever is disabled. The inner lever includes a connection lever that is operated by operation of an inner handle, and an actuation lever for operating the latch mechanism, and the first lock mechanism includes a connection member movable to an unlock position where operation of the connection lever can be transmitted to the actuation lever and a lock position where operation of the connection lever cannot be transmitted to the actuation lever, a first rotating lever that is rotated by driving of the first motor to a first working position for moving the connection member to the unlock position and a second working position for moving the connection member to the lock position, a second rotating lever that has a rotation shaft located on a same axis as a rotation shaft of the first rotating lever, holds the connection member, and is rotatable between a first rotation position where the connection member is moved to the unlock position and a second rotation position where the connection member is moved to the lock position, a connection spring that rotatably connects the second rotating lever to the first rotating lever, allows rotation of the second rotating lever to the second rotation position with respect to the first rotating lever at the first working position and biases the second rotating lever toward the first rotation position, and allows rotation of the second rotating lever to the first rotation position with respect to the first rotating lever at the second working position and biases the second rotating lever toward the second rotation position, and a holding spring that has a biasing force stronger than a biasing force of the connection spring, biases the first rotating lever rotated to the first working position side beyond a specific position between the first working position and the second working position to the first working position and holds the first rotating lever, and biases the first rotating lever rotated to the second working position side beyond the specific position to the second working position and holds the first rotating lever.

[0007] According to this door latch device, the second rotating lever is biased by the connection spring toward the first rotation position while being allowed to rotate to the second rotation position with respect to the first rotating lever at the first working position. Therefore, in a case where the first lock mechanism is driven to unlock in a state where the connection member moves to the lock position and the inner lever (connection lever) is operated, the connection member interferes with the connection lever, so that the first rotating lever at the second working position is rotated to the first working position, while the second rotating lever is maintained in a state of being rotated to the second rotation position. Then, when the connection lever rotates to the non-operation position, the second rotating lever rotates to the first rotation position by the connection spring with respect to the first rotating lever held at the first working position by the holding spring, so that the connection member moves to the unlock position.

[0008] Further, the second rotating lever is biased by the connection spring toward the second rotation position while being allowed to rotate to the first rotation position with respect to the first rotating lever at the second working position. Therefore, in a case where the first lock mechanism is driven to lock in a state where the connection member moves to the unlock position and the connection lever is operated, the connection member interferes with the connection lever, so that the first rotating lever at the first working position is rotated to the second working position, while the second rotating lever is maintained in a state of being rotated to the first rotation position. Then, when the connection lever rotates to the non-operation position, the second rotating lever rotates to the second rotation position by the connection spring with respect to the first rotating lever held at the second working position by the holding spring, so that the connection member moves to the lock position.

[0009] As described above, even if the connection member interferes with the inner lever, the first lock mechanism

can be switched to the unlocked state or the locked state after the end of the operation of the inner lever by the connection spring that connects the first rotating lever and the second rotating lever. Therefore, the safety of the door latch device can be improved.

Effect of the Invention

[0010] In the door latch device of the present invention, the lock mechanism can be reliably switched even during the operation of the inner handle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. **1** is a schematic view illustrating a state where a door latch device according to an embodiment of the present invention is disposed in a door of a vehicle;

[0012] FIG. **2** is a perspective view of the door latch device;

[0013] FIG. **3**A is a front view of the door latch device;

[0014] FIG. **3**B is a side view of the door latch device;

[0015] FIG. **4**A is a front view illustrating a main lock mechanism and a latch mechanism;

[0016] FIG. **4**B is a side view illustrating the main lock mechanism and the latch mechanism;

[0017] FIG. **5**A is a perspective view illustrating a sub-lock mechanism;

[0018] FIG. **5**B is a rear view illustrating the sub-lock mechanism;

[0019] FIG. **6**A is a front view illustrating the sub-lock mechanism in an unlocked state;

[0020] FIG. **6**B is a front view illustrating an operation state of the sub-lock mechanism in the unlocked state;

[0021] FIG. **6**C is a front view illustrating a state in which the sub-lock mechanism is driven to lock in the state of FIG. **6**B;

[0022] FIG. **7**A is a front view illustrating the sub-lock mechanism in a locked state;

[0023] FIG. **7**B is a front view illustrating an operation state of the sub-lock mechanism in the locked state;

[0024] FIG. **7**C is a front view illustrating a state in which the sub-lock mechanism is driven to unlock in the state of FIG. **7**B;

[0025] FIG. **8** is an exploded perspective view of a switching lever, a bush, and an inner lever;

[0026] FIG. **9**A is a front view illustrating a state of an actuation lever at a non-operation position with respect to the switching lever at a first working position;

[0027] FIG. **9**B is a front view illustrating a state of the actuation lever at an operation position with respect to the switching lever at the first working position;

[0028] FIG. **9**C is a front view illustrating a state of the actuation lever with respect to the switching lever at a second working position;

[0029] FIG. **10**A is a perspective view of the switching lever;

[0030] FIG. **10**B is an exploded perspective view of the switching lever;

[0031] FIG. **11**A is a front view of the switching lever in an unlocked state;

[0032] FIG. **11**B is a rear view of the switching lever in the unlocked state;

[0033] FIG. **11**C is a front view illustrating a state in which a second rotating lever rotates to a second rotation position with respect to a first rotating lever at a first working position;

[0034] FIG. **12**A is a front view of the switching lever in a locked state;

[0035] FIG. **12**B is a rear view of the switching lever in the locked state;

[0036] FIG. **12**C is a front view illustrating a state in which the second rotating lever rotates to a first rotation position with respect to the first rotating lever at a second working position;

[0037] and FIG. **13** is a schematic view illustrating a variation of a drive mechanism of the sub-lock mechanism.

DESCRIPTION OF EMBODIMENTS

[0038] Hereinafter, an embodiment of the present invention will be described with reference to the drawings.

[0039] FIGS. **1** and **2** show a door latch device **10** according to an embodiment of the present invention. As shown in FIG. **1**, the door latch device **10** is disposed in a door **1** of a rear seat of a vehicle, and holds the door **1** in a closed state in an openable manner with respect to a vehicle body (not illustrated). The door **1** includes an outer handle **2** disposed outside the vehicle and an inner handle **3** disposed inside the vehicle. The door latch device **10** switches the operation of the outer handle **2** and the inner handle **3** for opening the door **1** between an unlocked state in which the operation is enabled and a locked state in which the operation is disabled. In description below, a vehicle length direction of the door **1** may be referred to as an X direction, a vehicle width direction of the door **1** may be referred to as a Y direction, and a vehicle height direction of the door **1** may be referred to as a Z direction.

Outline of Door Latch Device

[0040] As illustrated in FIG. **2**, the door latch device **10** includes a latch mechanism **30**, an opening mechanism **40**, an electric main lock mechanism (second lock mechanism) **50**, and an electric sub-lock mechanism (first lock mechanism) **60**, which are disposed in a casing **20**.

[0041] The latch mechanism **30** closes the door **1** with respect to the vehicle body to detachably lock a striker **4** (see FIG. **3**B) disposed in the vehicle body, and holds the door **1** in a closed state. The opening mechanism **40** operates to release locking of the striker **4** by the latch mechanism **30** by the operation of the outer handle **2** and the inner handle **3**. The main lock mechanism **50** switches the door latch device **10** between an unlocked state (second unlocked state) in which the operation of the opening mechanism **40** (the operation of the outer handle **2** and the inner handle **3**) is enabled and a locked state (second locked state) in which the operation of the opening mechanism **40** is disabled. The sub-lock mechanism **60** switches the door latch device **10** between an unlocked state (first unlocked state) in which the operation of the inner handle **3** is enabled and a locked state (first locked state) in which the operation of the inner handle **3** is disabled.

[0042] Referring to FIG. **1**, the door latch device **10** is electrically connected to an electronic control unit (ECU) **5** mounted on a vehicle, and is driven by a command of the ECU **5**. When a key (portable device) **6** possessed by the user or a switch **7** provided in the vehicle is operated for

unlocking, the main lock mechanism **50** of the door latch device **10** that receives a command output from the ECU **5** is driven to unlock. When the key **6** or the switch **7** is operated for locking, the main lock mechanism **50** of the door latch device **10** receiving a command output from the ECU **5** is driven to lock. When a switch **8** provided in the vehicle is operated for unlocking, the sub-lock mechanism **60** of the door latch device **10** that receives a command output from the ECU **5** is driven to unlock. When the switch **8** provided in the vehicle is operated for locking, the sub-lock mechanism **60** of the door latch device **10** that receives a command output from the ECU **5** is driven to lock.

Outline of Casing

[0043] As shown in FIGS. **2**, **3**A, and **3**B, the casing **20** is made from resin, and includes a first housing portion **21** disposed along an end surface (substantially YZ plane) of the door **1** with respect to the door **1**, and a second housing portion **22** disposed along an inner panel (XZ plane) of the door **1**.

[0044] A fence block **23** made from resin is arranged in the first housing portion **21**, and the latch mechanism **30**, a part of the opening mechanism **40**, and a part of the main lock mechanism **50** are disposed in the fence block **23**. Note that the fence block **23** is not illustrated in FIG. **2**. The rest of the opening mechanism **40**, the rest of the main lock mechanism **50**, and the sub-lock mechanism **60** are disposed in the second housing portion **22**. Referring to FIG. **3**B, a part of an end surface of the fence block **23** is covered with a metal cover **24**. Referring to FIG. **1**, the second housing portion **22** is covered with a resin cover **25**.

[0045] As illustrated in FIGS. **3**A and **3**B, an insertion groove **23***a* through which the striker **4** is inserted is formed so as to be located substantially at the center in the entire height direction (Z direction) of the casing **20** in the fence block **23**. The insertion groove **23***a* extends from the vehicle interior side to the vehicle exterior side in the vehicle width direction (Y direction), and is recessed from the rear side to the front side in the vehicle length direction (X direction). That is, the insertion groove **23***a* has a substantially U shape in which the X direction outer side located on the opposite side of a hinge connecting portion of the door **1** which is the rear side in the vehicle length direction and the vehicle interior side in the Y direction are opened. An insertion groove **24***a* corresponding to the insertion groove **23***a* is formed on the cover **24**.

Outline of Latch Mechanism

[0046] As illustrated in FIGS. **2** and **4**B, the latch mechanism **30** includes a fork **31** and a claw **32**. The pressing of the striker **4** that has entered the insertion grooves **23***a* and **24***a* causes the fork **31** at the open position to rotate counterclockwise. When the claw **32** locks the fork **31** rotated to the latch position shown in FIG. **4**B, the door **1** is held in a closed state. When the claw **32** at a locking position illustrated in FIG. **4**B is rotated clockwise by the opening mechanism **40**, the locking of the fork **31** by the claw **32** is released, and the fork **31** is rotated clockwise by a biasing force of a spring (not illustrated). When the fork **31** rotates to the open position, the striker **4** can be detached from the fork **31**. The claw **32** whose operation by the opening mechanism **40** is stopped is rotated to the locking position by a biasing force of a spring (not illustrated).

Outline of Opening Mechanism

[0047] Referring to FIGS. **2** and **3**A, the opening mechanism **40** includes an opening lever **41** connected to a same rotation shaft **33** as that of the claw **32**, a link **42** for operating the opening lever **41**, and an outer lever **43** and an inner lever **46** for operating the link **42**. Note that the outer lever **43** is not illustrated in FIG. **3**A. The outer lever **43** includes a connection lever **44** connected to the outer handle **2** via a cable (not illustrated) and an actuation lever **45** engaged with the link **42**. The inner lever **46** includes a connection lever **47** connected to the inner handle **3** via a cable (not illustrated) and an actuation lever **48** for operating the link **42**.

[0048] When the outer handle **2** is operated, the connection lever **44** rotates counterclockwise in FIG. **2**, so that the actuation lever **45** rotates clockwise in FIG. **2**. In this manner, the link **42** linearly moves toward the opening lever **41**. When the inner handle **3** is operated, the connection lever **47** rotates counterclockwise in FIG. **2**, so that the actuation lever **48** rotates counterclockwise in FIG. **2**. In this manner, the link **42** linearly moves toward the opening lever **41**. In a case where the main lock mechanism **50** is in the unlocked state, the link **42** abuts on the opening lever **41**, and the opening lever **41** rotates clockwise in FIG. **4**B. In this manner, the locking of the fork **31** by the claw **32** coupled with the opening lever **41** via the rotation shaft **33** is released. In a case where the main lock mechanism **50** is in the locked state, the link **42** cannot abut on the opening lever **41**, and the locking of the fork **31** by the claw **32** cannot be released.

Outline of Main Lock Mechanism

[0049] As shown in FIGS. **2** and **3**A, the main lock mechanism **50** switches the locking of the striker **4** by the latch mechanism **30** between the unlocked state in which the locking can be released by the operation of the outer handle **2** and the inner handle **3** and the locked state in which the locking cannot be released. That is, the main lock mechanism **50** switches the operation of both the handles **2** and **3** between an enabled state and a disabled state. Specifically, the main lock mechanism **50** includes a motor (second motor) **51**, a worm **52**, a worm wheel **53**, a rotor **54**, a joint **55**, and a switching lever **56**.

[0050] The motor **51** is disposed in the second housing portion **22** so as to be located above the insertion groove **23***a*. An output shaft of the motor **51** protrudes downward, and the worm **52** is attached to the output shaft. The worm wheel **53** is rotatably disposed in the second housing portion **22** so as to be adjacent to the worm **52** on the side opposite to the latch mechanism **30**. The rotor **54** is rotatably disposed in the second housing portion **22** so as to be adjacent to the worm wheel **53** on the latch mechanism **30** side. The joint **55** is disposed in the second housing portion **22** so as to be adjacent to the rotor **54** on the latch mechanism **30** side. The switching lever **56** is located above the insertion groove **23***a*, and is disposed in a portion protruding toward the second housing portion **22** side of the fence block **23** (first housing portion **21**) so as to be adjacent to the joint **55** on the latch mechanism **30** side.

[0051] Next, the operation of the main lock mechanism **50** will be described with reference to FIGS. **4**A and **4**B. Note that FIGS. **4**A and **4**B illustrate the unlocked state.

[0052] When the key **6** or the switch **7** is operated for locking, the motor **51** rotates forward according to a command of the ECU **5**, so that the worm wheel **53** rotates clockwise in FIG. **4**A via the worm **52**. In this manner, the rotor **54** rotates counterclockwise in FIG. **4**A, so that the joint **55** linearly moves upward in FIG. **4**A. Further, the switching lever **56** at a rotation position illustrated in FIG. **4**B rotates counterclockwise. In this manner, an upper end of the link **42** swings clockwise in FIG. **4**B, and the link **42** stops at a lock position where an operation portion (see FIG. **4**A) **42***a* is separated from an abutment portion (see FIG. **4**A) **41***a* of the opening lever **41**. In this locked state, even if the link **42** is linearly moved by the operation of the handles **2** and **3**, the operation portion **42***a* idles without abutting on the abutment portion **41***a* of the opening lever **41**, and the latch mechanism **30** cannot be driven to open by the opening mechanism **40**. Therefore, the door **1** is maintained in the closed state.

[0053] When the key **6** or the switch **7** is operated for unlocking, the motor **51** rotates backward according to a command of the ECU **5**, so that the worm wheel **53** rotates counterclockwise in FIG. **4**A via the worm **52**. In this manner, the rotor **54** rotates clockwise in FIG. **4**A, so that the joint **55** linearly moves downward in FIG. **4**A. Further, the switching lever **56** rotates clockwise and stops at the rotation position illustrated in FIG. **4**B. In this manner, the upper end of the link **42** swings counterclockwise, and the link **42** stops at the unlock position illustrated in FIG. **4**B. In this unlocked state, when the link **42** is linearly moved by the operation of the handles **2** and **3**, the operation portion **42***a* abuts on the abutment portion **41***a* of the opening lever **41**, and the latch mechanism **30** can be driven to open by the opening mechanism **40**. Therefore, the door **1** in the closed state can be opened.

[0054] Note that a member denoted by reference numeral **57** in FIGS. **2** and **3**A is an emergency shaft for mechanically driving the main lock mechanism **50** to lock in an emergency in which the motor **51** cannot be driven. The emergency shaft **57** is disposed in the second housing portion **22** so as to be located at an upper end of the joint **55**. When a plate member (not illustrated) inserted into an insertion hole **57***a* shown in FIGS. **2** and **3**B is operated clockwise, the columnar emergency shaft **57** rotates about an axis. In this manner, the joint **55** linearly moves upward, so that the switching lever **56** can be rotated via the joint **55** and the link **42** can be moved to the lock position.

Outline of Sub-Lock Mechanism

[0055] As shown in FIGS. **2** and **3**A, the sub-lock mechanism **60** switches the locking of the striker **4** by the latch mechanism **30** between the unlocked state in which the locking can be released by the operation of the inner handle **3** (inner lever **46**) and the locked state in which the locking cannot be released. That is, the sub-lock mechanism **60** switches only the operation of the inner handle **3** between the enabled state and the disabled state, and does not disable the operation of the outer handle **2**. The sub-lock mechanism **60** can be used, for example, as a child lock function when a small child gets in a vehicle. Specifically, the sub-lock mechanism **60** includes a motor (first motor) **61**, a worm **62**, a worm wheel **63**, a joint (transmission member) **64**, a switching lever **65**, and a bush (connection member) **70**.

[0056] The motor **61** is disposed in the second housing portion **22** so as to be located above the insertion groove **23***a*. An output shaft of the motor **61** protrudes downward and is inclined in a direction away from the latch mechanism **30** toward the downward side, and the worm **62** is attached to the output shaft. The worm wheel **63** is rotatably disposed in the second housing portion **22** so as to be adjacent to the worm **62** on the latch mechanism **30** side. The joint **64** is adjacent to a shaft portion **63***a* of the worm wheel **63** on the side opposite to the latch mechanism **30**, and is arranged to be linearly movable in the second housing portion **22** so as to extend in the vehicle height direction (Z direction). The switching lever **65** is located below the insertion groove **23***a*, is located between the joint **64** and the inner lever **46**, and is rotatably disposed in the second housing portion **22** so as to be adjacent to these. The bush **70** is disposed on the switching lever **65**.

[0057] Referring to FIGS. **5**A and **5**B, the worm wheel **63** includes a first gear portion **63***b* with which the worm **62** meshes and a second gear portion **63***c* with which the joint **64** meshes. The first gear portion **63***b* protrudes from the shaft portion **63***a* in a fan shape, and teeth are formed on the outer periphery of the first gear portion **63***b*. The second gear portion **63***c* protrudes from the shaft portion **63***a* in a semi-annular shape, and teeth are formed on the outer periphery of the second gear portion **63***c*.

[0058] The joint **64** is a transmission member that transmits the driving force of the motor **61** to the switching lever **65**, and extends from the upper side to the lower side of the insertion groove **23***a*. The joint **64** is disposed on the side opposite to the latch mechanism **30** with respect to the worm wheel **63**. A first gear portion **64***a* meshing with the second gear portion **63***c* is formed on an upper portion of the joint **64**. A second gear portion **64***b* meshing with the switching lever **65** is formed on a lower portion of the joint **64**. Teeth are formed on each of the gear portions **64***a* and **64***b*. The latch mechanism **30** side of the joint **64** is supported by the worm wheel **63** and the switching lever **65**, and the side opposite to the latch mechanism **30** of the joint **64** is supported by an outer peripheral wall of the second housing portion **22**. Further, one surface of the joint **64** is supported by an arrangement surface (end wall) of the second housing portion **22**, and the other surface of the joint **64** is supported by the first gear portion **63***b* of the worm wheel **63**. In this manner, the joint **64** is guided so as to be linearly movable in a predetermined direction in the second housing portion **22**.

[0059] The switching lever **65** includes a first rotating lever **66** and a second rotating lever **67** disposed to overlap each other in the Y direction. A shaft portion (rotation shaft) **66***a* of the first rotating lever **66** and a shaft portion (rotation shaft) **67***a* of the second rotating lever **67** are disposed on the same axis. The first rotating lever **66** and the second rotating lever **67** are relatively rotatably connected by a connection spring **68** disposed between them. Further, the first rotating lever **66** (switching lever **65**) is biased by a holding spring **69** to a first working position illustrated in FIG. **6**A and a second working position illustrated in FIG. **7**A.

[0060] The first rotating lever **66** includes a fan-shaped gear portion **66***b* that protrudes radially outward from the shaft portion **66***a* and meshes with the second gear portion **64***b*. Teeth are formed on the outer periphery of the gear

portion **66***b*. Referring to FIG. **5**B, the second rotating lever **67** includes a holding portion **67***b* on which the bush **70** is disposed. The holding portion **67***b* protrudes radially outward from the shaft portion **67***a*, and includes the holding groove **67***c* for movably holding the bush **70**. In a state where the second rotating lever **67** rotates to a first rotation position described later, the holding groove **67***c* is an arc oval around a rotation shaft **22***a* (see FIG. **2**) of the inner lever **46**.

[0061] The bush **70** is provided to make switching between the unlocked state in which the operation of the inner lever **46** (the operation of the inner handle **3**) is enabled and the locked state in which the operation of the inner lever **46** is disabled. The bush **70** is moved to the unlock position illustrated in FIGS. **6**A and **6**B and the lock position illustrated in FIGS. **7**A and **7**B by the rotation of the switching lever **65**. The bush **70** allows the operating force of the connection lever **47** to be transmitted to the actuation lever **48** at the unlock position, and does not allow the operating force of the connection lever **47** to be transmitted to the actuation lever **48** at the lock position. Specifically, as illustrated in FIG. **8**, the bush **70** includes a rectangular substrate **70***a*, a mounting portion **70***b* disposed in the holding groove **67***c*, and a protruding portion **70***c* protruding toward an opening of the second housing portion **22**.

[0062] Reference is made to FIG. **8** continuously, the inner lever **46** includes the connection lever **47** and the actuation lever **48** as previously described. These are rotatably attached to one of the rotation shaft **22***a* (see FIG. **2**) protruding from the second housing portion **22**.

[0063] The connection lever **47** includes a mounting hole **47***a* through which the rotation shaft **22***a* passes and a connection portion **47***b* connected to the inner handle **3**. The connection lever **47** is provided with a protruding portion **47***c* protruding toward the protruding portion **70***c* of the bush **70**. A side edge of the protruding portion **47***c* located on the right side in FIG. **8** is a pressing edge **47***d* for pressing the bush **70**. When the connection lever **47** at a non-operation position illustrated in FIGS. **6**A and **7**A rotates to the operation position illustrated in FIGS. **6**B and **7**B, the pressing edge **47***d* can abut on the protruding portion **70***c* at the unlock position (see FIG. **6**B) and cannot abut on the protruding portion **70***c* at the lock position (see FIG. **7**B).

[0064] The actuation lever **48** includes a mounting hole **48***a* through which the rotation shaft **22***a* passes, and an actuating portion **48***b* that presses to linearly move the link **42** upward. A guide groove **48***c* for guiding the bush **70** to the unlock position and the lock position is formed on the actuation lever **48**. In a state where the actuation lever **48** is rotated to the non-operation position, the guide groove **48***c* has an arc shape around shaft portions **66***a* and **67***a* of the switching lever **65**. Referring to FIGS. **9**A to **9**C, the guide groove **48***c* of the actuation lever **48** and the holding groove **67***c* of the switching lever **65** cross each other. Therefore, as the mounting portion **70***b* is disposed in the holding groove **67***c* by penetrating the guide groove **48***c*, the operation of the connection lever **47** is transmitted to the actuation lever **48** via the bush **70** at the unlock position.

[0065] Next, the operation of the sub-lock mechanism **60** will be described with reference to FIGS. **6**A and **6**B and FIGS. **7**A and **7**B. Note that FIGS. **6**A and **6**B illustrate the unlocked state, and FIGS. **7**A and **7**B illustrate the locked state.

[0066] When the switch (child lock changeover switch) **8** is operated for unlocking when the sub-lock mechanism **60** is in the locked state, the motor **61** rotates forward according to a command of the ECU **5**, so that each component moves from the position illustrated in FIG. **7**A to the position illustrated in FIG. **6**A. Specifically, when the worm wheel **63** rotates counterclockwise via the worm **62**, the joint **64** linearly moves downward. Further, referring also to FIGS. **9**C and **9**A, when the switching lever **65** at the second working position rotates counterclockwise, the bush **70** moves into a rotation track of the protruding portion **47***c*. In this manner, the sub-lock mechanism **60** in the locked state is switched to the unlocked state. Note that, in a case where the switch **8** is operated for unlocking in the unlocked state, the sub-lock mechanism **60** is not driven to unlock.

[0067] When the inner handle **3** is operated in the unlocked state illustrated in FIG. **6**A, the connection lever **47** rotates counterclockwise as illustrated in FIG. **6**B. Further, referring also to FIGS. **9**A and **9**B, when the protruding portion **47***c* of the connection lever **47** presses the protruding portion **70***c* of the bush **70**, the actuation lever **48** rotates counterclockwise via the bush **70**. In this manner, since the link **42** illustrated in FIG. **4**A moves toward the opening lever **41**, the latch mechanism **30** is driven to open in a case where the main lock mechanism **50** is in the unlocked state. As a result, the door **1** in the closed state can be opened. However, in a case where the main lock mechanism **50** is in the locked state, the link **42** idles, and thus the latch mechanism **30** cannot be driven to open. As a result, the door **1** is maintained in the closed state.

[0068] When the switch **8** is operated for unlocking when the sub-lock mechanism **60** is in the unlocked state, the motor **61** rotates backward according to a command of the ECU **5**, so that each component moves from the position illustrated in FIG. **6**A to the position illustrated in FIG. **7**A. Specifically, when the worm wheel **63** rotates clockwise via the worm **62**, the joint **64** linearly moves upward. Further, referring also to FIGS. **9**A and **9**C, when the switching lever **65** at the first working position rotates clockwise, the bush **70** moves out of the rotation track of the protruding portion **47***c*. In this manner, the sub-lock mechanism **60** in the unlocked state is switched to the locked state. Note that, in a case where the switch **8** is operated for locking in the locked state, the sub-lock mechanism **60** is not driven to lock.

[0069] When the inner handle **3** is operated in the locked state illustrated in FIG. **7**A, the connection lever **47** rotates counterclockwise as in the case of the unlocked state. However, since the bush **70** moves out of the rotation track of the protruding portion **47***c*, as illustrated in FIG. **7**B, the protruding portion **47***c* cannot press the bush **70** and idles. Therefore, since the actuation lever **48** does not rotate counterclockwise, the latch mechanism **30** cannot be driven to open via the opening mechanism **40**. As a result, the door **1** is maintained in the closed state.

Outline of Arrangement of Electric Components

[0070] As illustrated in FIG. **3**A, the door latch device **10** includes, as electric components, the motor **51** of the main lock mechanism **50**, the motor **61** of the sub-lock mechanism **60**, and three detection switches **77**A to **77**C. In order to electrically connect these components to the ECU **5** and a battery (not illustrated), the door latch device **10** further includes a connector **75** and a bus bar **76**. These are disposed

in the second housing portion **22** so as to be located above the insertion groove **23***a* that is possibly immersed in water by being exposed to the outside of the vehicle.

[0071] Note that the detection switch **77**A detects whether the fork **31** is rotated to the latch position or the open position via a detection member **78** (see FIG. **2**). The detection switch **77**B detects the rotation position of the rotor **54** to detect whether the main lock mechanism **50** is in the unlocked state or the locked state. The detection switch **77**C detects the rotation position of the worm wheel **63** in order to detect whether the sub-lock mechanism **60** is in the unlocked state or the locked state.

[0072] As described above, since the electric components of the door latch device **10** are disposed above insertion groove **23***a*, it is possible to prevent a failure or a short circuit of the electric components due to water entering casing **20** through insertion groove **23***a*. Further, even if water enters the casing **20** from an exposed hole of the inner lever **46** on a cable connecting the inner handle **3** and the inner lever **46**, the electric components do not fail or short-circuit.

Panic Countermeasure Structure of Sub-Lock Mechanism

[0073] As illustrated in FIG. **7**B, the sub-lock mechanism **60** may be driven to unlock in a state where the bush **70** moves to the lock position and the connection lever **47** rotates to the operation position. Further, as illustrated in FIG. **6**B, the sub-lock mechanism **60** may be driven to lock in a state where the bush **70** moves to the unlock position and the connection lever **47** (inner lever **46**) rotates to the operation position. In these cases, the bush **70**, which interferes with the protruding portion **47***c* of the connection lever **47**, cannot be moved to the unlock position or the lock position by resistance. The door latch device **10** of the present embodiment is provided with a panic countermeasure for preventing such inconvenience.

[0074] Specifically, as a panic countermeasure for the sub-lock mechanism **60**, as illustrated in FIGS. **10**A and **10**B, the switching lever **65** includes the first rotating lever **66** and the second rotating lever **67**. Further, the connection spring **68** that relatively rotatably connects the first rotating lever **66** and the second rotating lever **67** and the holding spring **69** that holds the first rotating lever **66** at the first working position and the second working position are provided.

[0075] As described above, the first rotating lever **66** includes the shaft portion **66***a* rotatably attached to the second housing portion **22** and the gear portion **66***b* protruding from the shaft portion **66***a*. The first rotating lever **66** is rotatable about the shaft portion **66***a* between the first working position illustrated in FIGS. **6**A, **11**A, and **11**B and the second working position illustrated in FIGS. **7**A, **12**A, and **12**B. The first rotating lever **66** is rotated by the ECU **5** to the first working position to move the bush **70** to the unlock position and to the second working position to move the bush **70** to the lock position.

[0076] As described above, the second rotating lever **67** includes the shaft portion **67***a* disposed on the same axis as the shaft portion **66***a* and the holding portion **67***b* for holding the bush **70**. The second rotating lever **67** is rotatable about the shaft portion **67***a* in conjunction with the rotation of the first rotating lever **66** to the first rotation position illustrated in FIGS. **6**A, **11**A, and **11**B and the second rotation position illustrated in FIGS. **7**A, **12**A, and **12**B. The second rotating lever **67** is rotated to the first rotation position to move the bush **70** into the rotation track (unlock position) of the protruding portion **47***c*, and is rotated to the second rotation position to move the bush **70** out of the rotation track (lock position) of the protruding portion **47***c*.

[0077] As shown most clearly in FIG. **10**B, the connection spring **68** is disposed between the first rotating lever **66** and the second rotating lever **67**, and rotatably biases the second rotating lever **67** to the first rotating lever **66**. Specifically, the connection spring **68** includes a torsion spring having a winding portion **68***a*, a first end portion **68***b*, and a second end portion **68***c*. The first end portion **68***b* biases the second rotating lever **67** to the first rotating lever **66** in a first direction A**1** toward the first rotation position. The second end portion **68***c* biases the second rotating lever **67** to the first rotating lever **66** in a second direction A**2** toward the second rotation position.

[0078] As shown most clearly in FIG. **10**B, in the first rotating lever **66**, a spring arrangement portion **66***c* where the winding portion **68***a* is disposed is provided concentrically with the shaft portion **66***a*. In the spring arrangement portion **66***c*, a substantially semi-cylindrical outer peripheral wall **66***d* continuous to one end of the gear portion **66***b* in the circumferential direction is formed.

[0079] A first locking portion **66***e* to which the first end portion **68***b* is locked and a second locking portion **66***f* to which the second end portion **68***c* is locked are provided on the opposite side of the outer peripheral wall **66***d* in the radial direction of the spring arrangement portion **66***c*. These locking portions **66***e* and **66***f* protrude radially outward with respect to the spring arrangement portion **66***c* and are formed at intervals in the circumferential direction. A fan-shaped gap in which a stopper **72** to be described later is disposed is formed between the locking portions **66***e* and **66***f*. The first locking portion **66***e* also functions as a stopper that restricts the biasing of the first end portion **68***b*, and the second locking portion **66***f* also functions as a stopper that restricts the biasing of the second end portion **68***c*. An outer frame portion **66***g* is provided at the end of the locking portions **66***e* and **66***f*, and a restricting portion **66***h* is provided at the end of the outer frame portion **66***g*, and these define a slit through which the end portions **68***a* and **68***b* can move while preventing detachment of the end portions **68***a* and **68***b*.

[0080] The second rotating lever **67** includes a substantially disk-shaped cover portion **67***d* that covers the outer end of the spring arrangement portion **66***c*. A first locking portion **67***e* to which the first end portion **68***b* is locked and a second locking portion **67***f* to which the second end portion **68***c* is locked are provided on the outer periphery of the cover portion **67***d*. These protrude in a rod shape toward the first rotating lever **66**, and are formed at intervals in the circumferential direction so as to be adjacent to the inner side in the radial direction of the locking portions **66***e* and **66***f*.

[0081] As illustrated in FIG. **10**A, in a case where no load is applied to the second rotating lever **67**, the first end portion **68***b* of the connection spring **68** is locked to the first locking portion **66***e* of the first rotating lever **66** and the first locking portion **67***e* of the second rotating lever **67**. Further, the second end portion **68***c* of the connection spring **68** is locked to the second locking portion **66***f* of the first rotating lever **66** and the second locking portion **67***f* of the second

rotating lever **67**. That is, an angular range Ra**1** from the first locking portion (surface) **66***e* of the first rotating lever **66** to the second locking portion **66***f* (surface) and an angular range Ra**2** from the first locking portion (surface) **67***e* of the second rotating lever **67** to the second locking portion **67***f* (surface) illustrated in FIG. **10**B are formed substantially the same. In this manner, the first rotating lever **66** and the second rotating lever **67** are connected without rattling via the connection spring **68**, and integrally rotate as illustrated in FIGS. **11**A and **11**B and FIGS. **12**A and **12**B.

[0082] FIG. **11**C illustrates a state in which a load is applied to the second rotating lever **67** at the second rotation position, and FIG. **12**C illustrates a state in which a load is applied to the second rotating lever **67** at the first rotation position. In these cases, as shown in FIGS. **11**A and **11**C and FIGS. **12**A and **12**C, the connection spring **68** allows the relative rotation of the first rotating lever **66** and the second rotating lever **67**. Specifically, as illustrated in FIG. **11**C, with respect to the first rotating lever **66** at the first working position, the first end portion **68***b* of the connection spring **68** allows the rotation of the second rotating lever **67** to the second rotation position, and biases the second rotating lever **67** toward the first rotation position. Further, as illustrated in FIG. **12**C, with respect to the first rotating lever **66** at the second working position, the second end portion **68***c* of the connection spring **68** allows the rotation of the second rotating lever **67** to the first rotation position, and biases the second rotating lever **67** toward the second rotation position.

[0083] However, in a case where the rotation of the first rotating lever **66** is not restricted, the first rotating lever **66** rotates with respect to the second rotating lever **67** to which a load is applied by the biasing force of the connection spring **68**. Therefore, for rotation of the second rotating lever **67** with reference to the first rotating lever **66**, the holding spring **69** that restricts the rotation of the first rotating lever **66** is provided.

[0084] The holding spring **69** is disposed between the second housing portion **22** and the first rotating lever **66**. As illustrated in FIGS. **11**B and **12**B, the holding spring **69** includes an action spring including a winding portion **69***a* and a biasing portion **69***b*. An end portion on the side opposite to the biasing portion **69***b* of the winding portion **69***a* is locked to the second housing portion **22** so as to be non-rotatably fixed to the second housing portion **22**. The biasing portion **69***b* is bent in a substantially V shape, and a top portion **69***c* of the biasing portion **69***b* is disposed at the center between the first working position and the second working position of the first rotating lever **66**. On a bottom surface of the first rotating lever **66** facing the second housing portion **22**, a biased portion **66***i* biased by sliding contact of the top portion **69***c* is provided to protrude in a columnar shape. The biasing force of the holding spring **69** is stronger than the biasing force of the connection spring **68**.

[0085] When the first rotating lever **66** at the second working position illustrated in FIGS. **12**A and **12**B rotates to the first working position side (first direction A**1**) illustrated in FIGS. **11**A and **11**B, and the biased portion **66***i* moves beyond the top portion (specific position) **69***c*, the holding spring **69** biases the first rotating lever **66** to the first working position. Conversely, when the first rotating lever **66** at the first working position rotates toward the second working position side (second direction A**2**), and the biased portion **66***i* moves beyond the top portion **69***c*, the holding spring **69** biases the first rotating lever **66** to the second working position.

[0086] Therefore, as illustrated in FIG. **6**B, even in a case where the sub-lock mechanism **60** is driven to lock in a state where the bush **70** moves to the unlock position and the connection lever **47** is operated, the driving for locking can be reliably performed. Further, as illustrated in FIG. **7**B, even in a case where the sub-lock mechanism **60** is driven to unlock in a state where the bush **70** moves to the unlock position and the connection lever **47** is operated, the driving for unlocking can be reliably performed.

[0087] Referring to FIG. **8**, the protruding portion **47***c* of the connection lever **47** with which the bush **70** interferes is provided with an arc-shaped sliding contact edge **47***e* around the mounting hole **47***a* on the outer edge facing the bush **70** at the lock position. The sliding contact edge **47***e* is provided to allow the connection lever **47** to rotate from the operation position to the non-operation position in a state where the bush **70** is pressed (caused to abut) by the biasing force of the connection spring **68** during the unlocking driving illustrated in FIG. **7**C.

[0088] Next, the operation of the sub-lock mechanism **60** in the operating state of the inner handle **3** will be described.

[0089] As shown in FIGS. **7**B and **7**C, in the case of the unlocking driving, the bush **70** interferes with the protruding portion **47***c*, so that the first rotating lever **66** at the second working position is rotated to the first working position. However, the second rotating lever **67** is maintained in a state of being substantially rotated to the second rotation position. Then, when the operation of the inner handle **3** is stopped and the connection lever **47** is rotated to the non-operation position and the interference between the bush **70** and the protruding portion **47***c* is released, the second rotating lever **67** is rotated to the first rotation position by the connection spring **68** with respect to the first rotating lever **66** held at the first working position by the holding spring **69**. In this manner, the bush **70** moves to the unlock position.

[0090] As shown in FIGS. **6**B and **6**C, in the case of the locking driving, the bush **70** interferes with the connection lever **47**, so that the first rotating lever **66** at the first working position is rotated to the second working position. However, the second rotating lever **67** is maintained in a state of being rotated to the first rotation position. Then, when the operation of the inner handle **3** is stopped and the connection lever **47** is rotated to the non-operation position and the interference between the bush **70** and the connection lever **47** is released, the second rotating lever **67** is rotated to the second rotation position by the connection spring **68** with respect to the first rotating lever **66** held at the second working position by the holding spring **69**. In this manner, the bush **70** moves to the lock position.

[0091] As described above, in the door latch device **10** of the present embodiment, even if the sub-lock mechanism **60** is driven during the operation of the inner handle **3**, the sub-lock mechanism **60** can be switched to the unlocked state or the locked state after the operation of the inner handle **3** is finished. Accordingly, the problem that the sub-lock mechanism **60** is not switched even though the user performs the switching operation can be solved, so that the safety of the door latch device **10** can be improved.

[0092] Further, since the protruding portion **47***c* of the connection lever **47** includes the sliding contact edge **47***e*, even if the bush **70** interferes with the protruding portion **47***c*

at the time of unlocking driving, the sliding contact edge **47***e* comes into sliding contact with the bush **70**, and it is possible to prevent catching between them. Therefore, since the connection lever **47** at the operation position can be reliably rotated to the non-operation position, the sub-lock mechanism **60** can be reliably switched to the unlocked state.

[0093] Further, in the door latch device **10** of the present embodiment, a structure capable of preventing the second rotating lever **67** from vibrating and generating abnormal noise due to vibration at the time of traveling of the vehicle or the like is used. Specifically, since the first rotating lever **66** is constantly biased by the holding spring **69**, abnormal noise due to vibration is not generated. Although the second rotating lever **67** is biased by the connection spring **68**, in a case where the first end portion **68***b* and the second end portion **68***c* are also locked to the first rotating lever **66**, there is a possibility that the second rotating lever **67** vibrates due to a manufacturing error and generates abnormal noise. Therefore, in the present embodiment, when the second rotating lever **67** rotates to the first rotation position and the second rotation position, the second rotating lever **67** can be maintained in a biased state by the connection spring **68**.

[0094] Specifically, as illustrated in FIG. **10**B, a rubber stopper **72** is disposed between the first locking portion **66***e* and the second locking portion **66***f* of the first rotating lever **66** and between the first locking portion **67***e* and the second locking portion **67***f* of the second rotating lever **67**. The stopper **72** has a fan shape around the shaft portions **66***a* and **67***a*, and regulates the rotation of the first rotating lever **66** toward the first working position and the second working position and the rotation of the second rotating lever **67** toward the first rotation position and the second rotation position.

[0095] The first rotating lever **66** includes a first abutment portion **66***j* that abuts on a first end surface **72***a* of the stopper **72** by the rotation of the first rotating lever **66** to the first working position, and a second abutment portion **66***k* that abuts on a second end surface **72***b* of the stopper **72** by the rotation of the first rotating lever **66** to the second working position. The first abutment portion **66***j* is a surface extending in the radial direction about the shaft portion **66***a*, and protrudes from the first locking portion **66***e* toward the second locking portion **66***f*. The second abutment portion **66***k* is a surface extending in the radial direction about the shaft portion **66***a*, and protrudes from the second locking portion **66***f* toward the first locking portion **66***e*.

[0096] Referring to FIGS. **11**A and **11**B, in a state where the first abutment portion **66***j* abuts on the stopper **72**, a gap having an angular range that allows rotation from the first working position to the second working position is formed between the second abutment portion **66***k* and the stopper **72**. Referring to FIGS. **12**A and **12**B, in a state where the second abutment portion **66***k* abuts on the stopper **72**, a gap having an angular range that allows rotation from the second working position to the first working position is formed between the first abutment portion **66***j* and the stopper **72**.

[0097] As illustrated in FIG. **10**B, the second rotating lever **67** includes a first abutment portion **67***g* that abuts on the first end surface **72***a* of the stopper **72** by the rotation of the second rotating lever **67** to the first rotation position, and a second abutment portion **67***h* that abuts on the second end surface **72***b* of the stopper **72** by the rotation of the second rotating lever **67** to the second rotation position. The first abutment portion **67***g* includes an end surface of the first locking portion **67***e* facing the second locking portion **67***f*. The second abutment portion **67***h* includes an end surface of the second locking portion **67***f* facing the first locking portion **67***e*.

[0098] In a state where the first abutment portion **67***g* abuts on the stopper **72**, a gap having an angular range that allows rotation from the first rotation position to the second rotation position is formed between the second abutment portion **67***h* and the stopper **72**. In a state where the second abutment portion **67***h* abuts on the stopper **72**, a gap having an angular range that allows rotation from the second rotation position to the first rotation position is formed between the first abutment portion **67***g* and the stopper **72**.

[0099] Referring to FIG. **10**B, as described above, the angular range Ra**1** between a pair of the locking portions **66***e* and **66***f* of the first rotating lever **66** and the angular range Ra**2** between a pair of locking the portions **67***e* and **67***f* of the second rotating lever **67** are substantially the same. In contrast, an angular range Rb**1** from the first abutment portion (surface) **66***j* to the second abutment portion (surface) **66***k* of the first rotating lever **66** is formed to be wider than an angular range Rb**2** from the first abutment portion (surface) **67***g* to the second abutment portion (surface) **67***h* of the second rotating lever **67**.

[0100] In this manner, in a state where the first end portion **68***b* of the connection spring **68** is locked to the first locking portions **66***e* and **67***e* of both the rotating levers **66** and **67**, the first abutment portion **67***g* of the second rotating lever **67** protrudes from the first abutment portion **66***j* of the first rotating lever **66** toward the stopper **72**. Further, in a state where the second end portion **68***c* of the connection spring **68** is locked to the second locking portions **66***f* and **67***f* of both the rotating levers **66** and **67**, the second abutment portion **67***h* of the second rotating lever **67** protrudes from the second abutment portion **66***k* of the first rotating lever **66** toward the stopper **72**.

[0101] By setting of the angular ranges Ra**1**, Ra**2**, Rb**1**, and Rb**2**, in a state where the second rotating lever **67** rotates to the first rotation position and the second rotation position, the abutment portions **67***g* and **67***h* of the second rotating lever **67** can be pressed against the stopper **72** by the connection spring **68**.

[0102] Specifically, as illustrated in FIGS. **11**A and **11**B, in a state where the first rotating lever **66** rotates to the first working position and the second rotating lever **67** rotates to the first rotation position, the first abutment portions **66***j* and **67***g* of both of them abut on the stopper **72**. In this manner, the first end portion **68***b* of the connection spring **68** is locked only to the first locking portion **67***e* of the second rotating lever **67** and is separated from the first locking portion **66***e* of the first rotating lever **66** due to a difference in the angular ranges between the first abutment portions **66***j* and **67***g* of both of them. Further, the second end portion **68***c* of the connection spring **68** is locked only to the second locking portion **66***f* of the first rotating lever **66**, and is separated from the second locking portion **67***f* of the second rotating lever **67**. In this state, the first rotating lever **66** is held at the first working position by the holding spring **69**. Therefore, the first abutment portion **67***g* of the second rotating lever **67** is pressed against the stopper **72** by the biasing force of the connection spring **68**. Therefore, it is possible to prevent the second rotating lever **67** from rattling and generating abnormal noise in this state.

[0103] As illustrated in FIGS. **12**A and **12**B, in a state where the first rotating lever **66** rotates to the second working position and the second rotating lever **67** rotates to the second rotation position, the second abutment portions **66***k* and **67***h* of both of them abut on the stopper **72**. In this manner, the second end portion **68***c* of the connection spring **68** is locked only to the second locking portion **67***f* of the second rotating lever **67** and is separated from the second locking portion **66***f* of the first rotating lever **66** due to a difference in the angular ranges between the second abutment portions **66***k* and **67***h* of both of them. Further, the first end portion **68***b* of the connection spring **68** is locked only to the first locking portion **66***e* of the first rotating lever **66**, and is separated from the first locking portion **67***e* of the second rotating lever **67**. In this state, the first rotating lever **66** is held at the second working position by the holding spring **69**. Therefore, the second abutment portion **67***h* of the second rotating lever **67** is pressed against the stopper **72** by the biasing force of the connection spring **68**. Therefore, it is possible to prevent the second rotating lever **67** from rattling and generating abnormal noise in this state.

[0104] As described above, in the door latch device **10** of the present embodiment, even if the bush **70** interferes with the connection lever **47** during the unlocking driving and the locking driving, the sub-lock mechanism **60** can be switched by the connection spring **68** after the end of the operation of the inner handle **3**. Therefore, the safety of the door latch device **10** can be improved.

[0105] Since the holding groove **67***c* of the second rotating lever **67** and the guide groove **48***c* of the actuation lever **48** cross each other, the bush **70** can be reliably moved to the unlock position and the lock position, and the operating force of the connection lever **47** can be reliably transmitted to the actuation lever **48** via the bush **70**.

[0106] Since the rotation of the first rotating lever **66** and the rotation of the second rotating lever **67** are restricted by one of the stopper **70**, the number of components constituting the sub-lock mechanism **60** can be reduced. Further, since rattling of the second rotating lever **67** can be prevented by the stopper **70**, generation of abnormal noise due to vibration or the like during traveling can be prevented. Since the first rotating lever **66** is provided with the gear portion **66***b* that receives the driving force of the motor **61**, a gear composed of a separate component is unnecessary. Therefore, also in this respect, the number of components constituting the sub-latch mechanism **60** can be reduced.

[0107] Note that the door latch device **10** of the present invention is not limited to the configuration of the above embodiment, and various changes can be made.

[0108] For example, as shown in FIG. **13**, the joint **64** of the sub-lock mechanism **60** may be moved by the motor **61** via a ball screw mechanism. Specifically, a screw shaft **80** may be/disposed on the output shaft of the motor **61**, a nut portion **81** may be provided at the upper end of the joint **64**, and the joint **64** may be linearly moved in the vertical direction by engagement between the screw shaft **80** and the nut portion **81**. In this way, the number of components constituting the sub-latch mechanism **60** can be reduced.

[0109] The configuration of the connection spring **68** that relatively rotatably connects the first rotating lever **66** and the second rotating lever **67** and the configuration of the holding spring **69** that holds the first rotating lever **66** at the first working position and the second working position can be changed as necessary. Further, the configurations of the locking portion and the abutment portion of the first rotating lever **66** and the second rotating lever **67** can also be changed as necessary.

[0110] The main lock mechanism **50** may be a lock mechanism dedicated to the outer handle **2**. That is, the configuration may be such that switching is made between the unlocked state in which the operation of the outer handle **2** is enabled and the locked state in which the operation is disabled, and the operation of the inner handle **3** is not disabled.

REFERENCE SIGNS LIST

[0111] **1**: Door, **2**: Outer handle, **3**: Inner handle, **4**: Striker, **5**: ECU, **6**: Key, **7**: Switch, **8**: Switch, **9**: Glass, **10**: Door latch device, **20**: Casing, **21**: First housing portion, **22**: Second housing portion, **22***a*: Rotation shaft, **23**: Fence block, **23***a*: Insertion groove, **24**: Cover, **24***a*: Insertion groove, **25**: Cover, **30**: Latch mechanism, **31**: Fork, **32**: Claw, **33**: Rotation shaft, **40**: Opening mechanism, **41**: Opening lever, **41***a*: Abutment portion, **42**: Link, **42***a*: Operation portion, **43**: Outer lever, **44**: Connection lever, **45**: Actuation lever, **46**: Inner lever, **47**: Connection lever, **47***a*: Mounting hole, **47***b*: Connection portion, **47***c*: Protruding portion, **47***d*: Pressing edge, **47***e*: Sliding contact edge, **48**: Actuation lever, **48***a*: Mounting hole, **48***b*: Actuating portion, **48***c*: Guide groove, **50**: Main lock mechanism (second lock mechanism), **51**: Motor (second motor), **52**: Worm, **53**: Worm wheel, **54**: Rotor, **55**: Joint, **56**: Switching lever, **57**: Emergency shaft, **57***a*: Insertion hole, **60**: Sub-lock mechanism (first lock mechanism), **61**: Motor (first motor), **62**: Worm, **63**: Worm wheel, **63***a*: Shaft portion, **63***b*: First gear portion, **63***c*: Second gear portion, **64**: Joint (transmission member), **64***a*: First gear portion, **64***b*: Second gear portion, **65**: Switching lever, **66**: First rotating lever, **66***a*: Shaft portion (rotation shaft), **66***b*: Gear portion, **66***c*: Spring arrangement portion, **66***d*: Outer peripheral wall, **66***e*: First locking portion, **66***f*: Second locking portion, **66***g*: Outer frame portion, **66***h*: Restricting portion, **66***i*: Biased portion, **66***j*: First abutment portion, **66***k*: Second abutment portion, **67**: Second rotating lever, **67***a*: Shaft portion (rotation shaft), **67***b*: Holding portion, **67***c*: Holding groove, **67***d*: Cover portion, **67***e*: First locking portion, **67***f*: Second locking portion, **67***g*: First abutment portion, **67***h*: Second abutment portion, **68**: Connection spring, **68***a*: Winding portion, **68***b*: First end portion (first end), **68***c*: Second end portion (second end), **69**: Holding spring, **69***a*: Winding portion, **69***b*: Biasing portion, **69***c*: Top portion (specific position), **70**: Bush (connection member), **70***a*: Substrate, **70***b*: Mounting portion, **70***c*: Protruding portion, Stopper, **72***a*: First end surface, **72***b*: Second end surface, **75**: Connector, **76**: Bus bar, **77**A~**77**C: Detection switch, **78**: Detection member, **80**: Screw shaft, **81**: Nut portion, X: Vehicle length direction of door, Y: Vehicle width direction of door, Z: Vehicle height direction of door

1. A door latch device comprising:

a latch mechanism that locks a striker and holds a door in a closed state;

an inner lever that releases locking of the striker by the latch mechanism; and

a first lock mechanism including a first motor for making switching between a first unlocked state in which operation of the inner lever is enabled and a first locked state in which operation of the inner lever is disabled, wherein

the inner lever includes

a connection lever that is operated by operation of an inner handle, and

an actuation lever for operating the latch mechanism, and

the first lock mechanism includes

a connection member movable to an unlock position where operation of the connection lever can be transmitted to the actuation lever and a lock position where operation of the connection lever cannot be transmitted to the actuation lever,

a first rotating lever that is rotated by driving of the first motor to a first working position for moving the connection member to the unlock position and a second working position for moving the connection member to the lock position,

a second rotating lever that has a rotation shaft located on a same axis as a rotation shaft of the first rotating lever, holds the connection member, and is rotatable between a first rotation position where the connection member is moved to the unlock position and a second rotation position where the connection member is moved to the lock position,

a connection spring that rotatably connects the second rotating lever to the first rotating lever, allows rotation of the second rotating lever to the second rotation position with respect to the first rotating lever at the first working position and biases the second rotating lever toward the first rotation position, and allows rotation of the second rotating lever to the first rotation position with respect to the first rotating lever at the second working position and biases the second rotating lever toward the second rotation position, and

a holding spring that has a biasing force stronger than a biasing force of the connection spring, biases the first rotating lever rotated to the first working position side beyond a specific position between the first working position and the second working position to the first working position and holds the first rotating lever, and biases the first rotating lever rotated to the second working position side beyond the specific position to the second working position and holds the first rotating lever.

2. The door latch device according to claim **1**, further comprising a second lock mechanism including a second motor for making switching between a second unlocked state in which locking of the striker by the latch mechanism can be released by operation of an outer handle and a second locked state in which the locking cannot be released by operation of the outer handle.

3. The door latch device according to claim **1**, wherein

the connection spring is a torsion spring having a first end that biases the second rotating lever toward the first rotation position side with respect to the first rotating lever and a second end that biases the second rotating lever toward the second rotation position side with respect to the first rotating lever, and

each of the first rotating lever and the second rotating lever includes a first locking portion to which the first end is locked and a second locking portion to which the second end is locked.

4. The door latch device according to claim **3**, wherein

a stopper that restricts rotation of the first rotating lever and rotation of the second rotating lever is disposed between the first locking portion and the second locking portion,

the first rotating lever includes a first abutment portion that abuts on the stopper by rotation to the first working position and a second abutment portion that abuts on the stopper by rotation to the second working position, and

the second rotating lever includes a first abutment portion that abuts on the stopper by rotation to the first rotation position and a second abutment portion that abuts on the stopper by rotation to the second rotation position.

5. The door latch device according to claim **4**, wherein the first abutment portion of the second rotating lever protrudes from the first abutment portion of the first rotating lever toward the stopper in a state where the first end of the connection spring is locked to the first locking portion of the first rotating lever and the first locking portion of the second rotating lever.

6. The door latch device according to claim **4**, wherein the second abutment portion of the second rotating lever protrudes from the second abutment portion of the first rotating lever toward the stopper in a state where the second end of the connection spring is locked to the second locking portion of the first rotating lever and the second locking portion of the second rotating lever.

7. The door latch device according claim **1**, wherein the first rotating lever is provided with a gear portion that receives a driving force of the first motor.

8. The door latch device according to claim **1**, wherein

the connection lever includes a protruding portion that protrudes toward the connection member and is capable of abutting on the connection member at the unlock position by rotation of the connection lever from a non-operation position to an operation position by the inner handle, and

the protruding portion includes a sliding contact edge facing the connection member at the lock position and allowing rotation of the connection lever from the operation position toward the non-operation position in an abutting state of the connection member.

9. The door latch device according to claim **1**, wherein the actuation lever has a guide groove that guides the connection member to the unlock position and the lock position.

10. The door latch device according to claim **9**, wherein

the second rotating lever has a holding groove that movably holds the connection member, and

the holding groove crosses the guide groove.

11. The door latch device according to claim **1**, further comprising a control unit that controls the first motor based on operation of a child lock changeover switch disposed in a vehicle.

12. The door latch device according to claim **2**, wherein

the connection spring is a torsion spring having a first end that biases the second rotating lever toward the first rotation position side with respect to the first rotating lever and a second end that biases the second rotating lever toward the second rotation position side with respect to the first rotating lever, and

each of the first rotating lever and the second rotating lever includes a first locking portion to which the first end is locked and a second locking portion to which the second end is locked.

13. The door latch device according to claim **5**, wherein the second abutment portion of the second rotating lever protrudes from the second abutment portion of the first rotating lever toward the stopper in a state where the second end of the connection spring is locked to the second locking portion of the first rotating lever and the second locking portion of the second rotating lever.

14. The door latch device according to claim **6**, wherein the first rotating lever is provided with a gear portion that receives a driving force of the first motor.

15. The door latch device according to claim **7**, wherein the connection lever includes a protruding portion that protrudes toward the connection member and is capable of abutting on the connection member at the unlock position by rotation of the connection lever from a non-operation position to an operation position by the inner handle, and

the protruding portion includes a sliding contact edge facing the connection member at the lock position and allowing rotation of the connection lever from the operation position toward the non-operation position in an abutting state of the connection member.

16. The door latch device according to claim **8**, wherein the actuation lever has a guide groove that guides the connection member to the unlock position and the lock position.

17. The door latch device according to claim **10**, further comprising a control unit that controls the first motor based on operation of a child lock changeover switch disposed in a vehicle.

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