(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 788 172 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
23.05.2007 Bulletin 2007/21

(51) Int Cl.:
E05B 65/12 *(2006.01)* *E05B 65/20* *(2006.01)*

(21) Application number: **06255871.3**

(22) Date of filing: **16.11.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **17.11.2005 JP 2005333329**

(71) Applicants:
- **AISIN SEIKI KABUSHIKI KAISHA**
  Kariya-shi, Aichi-ken 448-8650 (JP)
- **Aisin Kiko Co., Ltd**
  Hazu-gun,
  Aichi 444-0504 (JP)

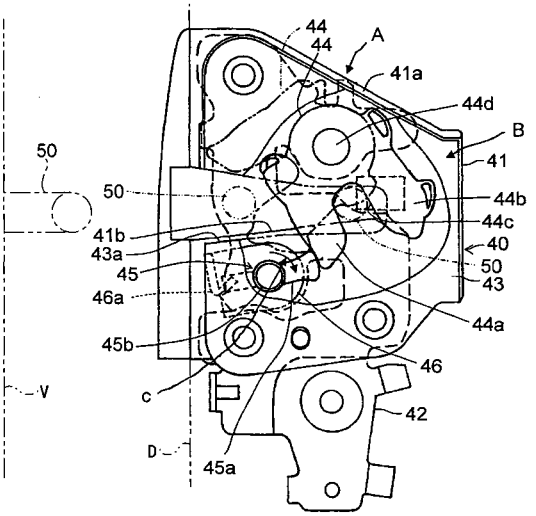
(72) Inventors:
- **Hayakawa, Shigeru,**
  c/o Intellectual Property Dept.
  Kariya-shi
  Aichi-ken 448-8650 (JP)
- **Akizuki, Ryujiro,**
  c/o Intellectual Property Dept.
  Kariya-shi
  Aichi-ken 448-8650 (JP)
- **Katsurayama, Atsushi,**
  c/o Aisin Kiko Co., Ltd.
  Hazu-gun
  Aichi-ken 444-0504 (JP)
- **Sono, Yasuhiko,**
  c/o Aisin Kiko Co., Ltd.
  Hazu-gun
  Aichi-ken 444-0504 (JP)
- **Suzuki, Satoshi,**
  c/o Aisin Kiko Co., Ltd.
  Hazu-gun
  Aichi-ken 444-0504 (JP)
- **Torii, Eiji,**
  c/o Aisin Kiko Co., Ltd.
  Hazu-gun
  Aichi-ken 444-0504 (JP)
- **Kitamura, Toshihiro,**
  c/o Aisin Kiko Co., Ltd.
  Hazu-gun
  Aichi-ken 444-0504 (JP)

(74) Representative: **Albutt, Anthony John et al**
D Young & Co
120 Holborn
London EC1N 2DY (GB)

(54) **Doorlock device for vehicle**

(57) A door lock device for a vehicle includes an operating mechanism (B) which selectively performs a locked state in which a latching means (50) and a latched means (44) are unreleasable and an unlocked state in which the latching means and the latched means are releasable. The operating mechanism includes an active lever (24) selectively rotating to a locked position and to an unlocked position, an idle lever (29) operating the active lever to the locked position and the unlocked position in accordance with an operation of a key cylinder (K), and a connection member (1) connected to a lock knob (L) selectively operating the active lever to the locked position and to the unlocked position. The door lock device is characterized in that the active lever includes an arm portion connecting to the key cylinder (24c), which is operatively connecting to the idle lever, and an arm portion connecting to the lock knob (24b) which is directly connected to the connection member.

F I G. 4



EP 1 788 172 A2

Description

FIELD OF THE INVENTION

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

BACKGROUND

[0002] A known door lock device for a vehicle described in JP2001-262903A (See paragraphs 0024-0027, Fig. 1) includes an operating mechanism which selectively achieves a locked state where a latched state between a latching means (i.e., a striker 45) provided at a body of the vehicle and a latched means (i.e., latch 41 and pawl 42 or the like) provided at a door cannot be released, and an unlocked state where the latched state is releasable.

[0003] With the construction of the known door lock device of this kind, the locked state where the latched state between the latch and the striker cannot be released can be achieved by operating a lock knob in the vehicle, and the locked state or the unlocked state of the door lock device is selectively switched by a rotational operation of a key cylinder by means of a keyblade at outside of the vehicle or by a remote controlled operation of a lock/unlock switch provided at the keyblade at the outside of the vehicle. When the door lock device is at the unlocked state, the door can be opened by operating an inside handle at the vehicle inside or by operating an outside handle at an outside of the vehicle. When the door lock device is at the locked state, the locked state is maintained not to open the door even if the inside handle and/or the outside handle is operated.

[0004] With the construction of the known door lock device described in JP2001-262903A, an active lever serving as a switching member for a locking system is arranged at an upper position, an open link serving as a transmitting member for an opening operation system is positioned at a lower position, and the active lever and the open link are engaged by means of an elongated bore and an engaging pin around the center of the door lock device. At positions corresponding to a position of the active lever, a first operational mechanism which operates the active lever to be in a locked position or in an unlocked position by a rotational operation of a key cylinder by a keyblade from an outside of a vehicle, and a second operational mechanism including an electric motor which operates the active lever to be in the locked position or in the unlocked position by a remote control by means of a lock/unlock switch provided at the keyblade at the outside of the vehicle. In the meantime, as shown in Fig. 2 of JP2001-262903A, because a cable (53) which transmits a lock knob operation in a vehicle compartment is positioned at a bottom portion of the door lock device, a distance between the cable and the active lever is considerable. With this construction, directly transmitting a motion of the cable (53) to the active lever is difficult, and a locking lever (24) is additionally required in order to transmit the motion of the cable (53) to the active lever, which increases the number of parts. Thus, according to the construction of the known door lock device described in JP2001-262903A, parts and assembling costs rises and the size of the door lock device increases.

[0005] A need thus exists for a door lock device, which directly connects an active lever to a connection member connected to a lock knob.

SUMMARY OF THE INVENTION

[0006] In light of the foregoing, the present invention provides a door lock device for a vehicle, which includes an operating mechanism which selectively performs a locked state in which a latching means provided at a vehicle body and a latched means provided at a door are unreleasable and an unlocked state in which the latching means and the latched means are releasable. The operating mechanism includes an active lever selectively rotating to a locked position at which the latching means and the latched means are unreleasable and to an unlocked position at which the latching means and the latched means are releasable, an idle lever operating the active lever to the locked position and the unlocked position in accordance with an operation of a key cylinder, and a connection member connected to a lock knob provided at the door and selectively operating the active lever to the locked position and to the unlocked position. The door lock device for the vehicle is characterized in that the active lever includes an arm portion connecting to the key cylinder, which is operatively connecting to the idle lever, and an arm portion connecting to the lock knob which is directly connected to the connection member.

[0007] According to the present invention, the active lever which is selectively rotatable to the locked position where the latched means and the latching means cannot be released, and the unlocked position where the latched means and the latching means can be released, includes the arm portion connecting to the key cylinder which is operatively connecting to the idle lever and the arm portion operatively connecting to the lock knob which is directly connected to the connection member. With the foregoing construction, there is no need to include the locking lever, and thus the number of parts can be reduced. Accordingly, by the reduction of the number of the parts, costs for the parts and assembling can be reduced and the door lock device can be downsized to improve the mountability of the door lock device on a vehicle. Further, because the construction for connecting the lock knob and the active lever is simplified, the door lock device which maintains a stable operation for a long term can be achieved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The foregoing and additional features and char-

acteristics of the present invention will become more apparent from the following detailed description considered with reference to the accompanying drawings, wherein:

[0009] Fig. 1 is a left lateral view showing a housing body unit of a door lock device for a vehicle according to an embodiment of the present invention.

[0010] Fig. 2 is a right lateral view showing a cover unit of the door lock device for the vehicle according to the embodiment of the present invention.

[0011] Fig. 3 is a front view showing a housing unit of the door lock device for the vehicle according to the embodiment of the present invention.

[0012] Fig. 4 is a front view showing a sub-base unit of the door lock device for the vehicle according to the embodiment of the present invention.

[0013] Fig. 5 is a rear view showing the sub-base unit of the door lock device for the vehicle according to the embodiment of the present invention.

[0014] Fig. 6 is a lateral view showing an operational state of members at an unlocked state of the door lock device for the vehicle according to the embodiment of the present invention.

[0015] Fig. 7 is a lateral view showing an operational state of the members by operating an inside handle at an unlocked state of the door lock device for the vehicle according to the embodiment of the present invention.

[0016] Fig. 8 is a lateral view showing an operational state of the members at a locked state of the door lock device for the vehicle according to the embodiment of the present invention.

[0017] Fig. 9 is a lateral view showing an operational state of the members when operating an inside handle at a locked state of the door lock device for the vehicle according to the embodiment of the present invention.

DETAILED DESCRIPTION

[0018] One embodiment of the present invention will be explained with reference to illustrations of drawing figures as follows.

[0019] A door lock device for a vehicle is provided at the inside of a door D, and includes a housing unit 10 and a sub-base unit 40. The housing unit 10 includes a housing body unit 20 and a cover unit 30.

[0020] As shown in Figs. 1 and 3, the housing body unit 20 includes a housing body 21. The housing body 21 forms a housing A of the door lock device together with a cover 31 of the cover unit 30 and a sub-base housing 41 of the sub-base unit 40. The housing A is sealed to isolate an operating mechanism B, which is housed therein, from the outside. The operating mechanism B selectively perform a locked state where a latched state of a latch 44 provided at the door D and a striker 50 (i.e., serving as a latching means) provided at a vehicle body V cannot be released and an unlocked state where the latched state of the latch 44 can be released. The operating mechanism B includes an open lever 22, a torsion spring 23, an active lever 24, a torsion spring 25, an open link 26, an electric motor 27, a wheel gear 28, an idle lever 29, a cancel lever 32, a torsion spring 33, an inside lever 34, a sub-base plate 42, a base plate 43, a latch 44, a pawl 45, a lift lever 46, and a torsion spring 47.

[0021] The housing body 21 includes a disc-shaped first case portion 21a which is extended in a front-back direction (i.e., right, left direction in Fig. 1) of the door D and opens to the inside of the door D (i.e., perpendicular direction in Fig. 1), and a disc-shaped second case portion 21b which is orthogonal to the first case portion 21a and opens to a rear side (i.e., to the right in Fig. 1) of the door D. As shown in Fig. 2, the cover 31 is attached at an opening portion of the first case portion 2 1 a and the sub-base housing 41 (shown in Fig. 4) is attached at an opening portion of the second case portion 21b. Thus, the opening portion of the first case portion 21 a is closed by the cover 31 and the opening portion of the second case portion 21b is closed by the sub-base housing 41. The sub-base housing 41 also covers an opening at rear side of the cover 31.

[0022] The housing body unit 20 includes the open lever 22, the torsion spring 23, the active lever 24, the torsion spring 25, the open link 26, the electric motor 27, the wheel gear 28, and the idle lever 29, which are provided at the housing body 21.

[0023] As primarily shown in Figs. 1 and 3, the open lever 22 is rotatably supported by a stepped boss 21c which is integrally formed to be convex on an internal wall surface of the second case 21 b of the housing body 21. The stepped boss 21 c is coaxially formed with a large diameter portion 21c1, a small diameter portion 21 c2, and an engaging pin 21 c3 in order from a base to a tip end. The small diameter 21 c2 fits into a through-hole 22a of the open lever 22. Thus, the open lever 22 is pivotally rotatable about the stepped boss 21c as a rotational shaft (fulcrum). A height of the small diameter portion 21c2 is determined to be slightly longer than a thickness of the open lever 22, and the open lever 22 is rotatably supported sandwiched between a step, provided between the small diameter portion 21 c2 and the large diameter portion 21c1, and the sub-base plate 42.

[0024] The open lever 22 includes a first arm 22b extended in a first direction from the through-hole 22a and a second arm 22c extended in a second direction (i.e., approximately in an opposite direction to the first arm 22b) from the through-hole 22a. An outside handle O (i.e., a door handle) is connected to a connection hole 22b1 formed at a tip end portion (i.e., first end portion) of the first arm 22b via a connection member J (e.g., a link, a cable). A contact portion 22c2 and an engagement projection 22c1 are formed on a tip end portion (i.e., second end portion) of the second arm 22c. The engagement projection 22c1 is engaged with an engagement hole 26a of the open link 26. The contact portion 22c2 is detachably in contact with a contact portion 34b2 of the inside lever 34.

[0025] The open lever 22 is biased by the torsion spring 23 provided between the housing body 21 (i.e., the sec-

ond case portion 21b) and the open lever 22. The torsion spring 23 fits to the large diameter portion 21c1 of the stepped boss 21c. A first end 23a of the torsion spring 23 is in contact with and biased against a portion 21d of an internal peripheral wall surface of the second case portion 21b and a second end 23b of the torsion spring 23 is in contact with and biased against the second arm 22c of the open lever 22. Consequently, the open lever 22 is biased counterclockwise in Fig. 3. The first arm 22b of the open lever 22 biased as foregoing manner contacts a portion 21e of the internal periphery wall surface of the second case portion 21b so that a counterclockwise rotation of the open lever 22 is restricted, and thus the position of the open lever 22 is determined and maintained at a normal position shown in Figs. 1 and 3.

[0026] Accordingly, a position of the open lever 22 is determined at the normal position by means of a biasing force of the torsion spring 23 at a normal operation during which the outside handle O (i.e., the door handle) is not operated to open the door D. On the other hand, a first end portion of the open lever 22 (i.e., a tip end portion of the first arm portion 22b) is pushed down so that the open lever 22 rotates clockwise in Fig. 3 against the biasing force of the torsion spring 23 when the outside handle O (i.e., the door handle) is operated to open the door D. Consequently, a second end portion of the open lever 22 (i.e., a tip end portion of the second arm 22c) is pushed upward to push the open link 26 upward.

[0027] The active lever 24 is rotatably supported by a stepped boss 21f which is integrally formed on an internal wall surface of the first case portion 21 a of the housing body 21 to be convex. The stepped boss 21f is coaxially formed with a large diameter portion and a small diameter portion 21f2 in order from a base to a tip end thereof. A through-hole 24a of the active lever 24 is fitted to the small diameter portion 21f2. This construction enables the active lever 24 to rotate about the stepped boss 21f as a rotational axis (fulcrum). A height of the small diameter portion 21f2 is determined to be slightly longer than a thickness of the active lever 24, and the active lever 24 is rotatably supported sandwiched between a step, provided between the small diameter portion 21f2 and the large diameter portion, and a top end of a female boss 31f which is formed on an internal wall surface of the cover 31 to be convex and to which the small diameter portion 21 f2 is fitted.

[0028] The active lever 24 includes a first arm 24b extended in a first direction outward of the first case portion 21a from the through-hole 24a, a second arm 24c extended in a second direction outward of the first case portion 21a from the through-hole 24a, and a third arm 24d extended in a third direction (i.e., approximately in an opposite direction to the first and second directions) from the through-hole 24a. A connection hole 24b1 formed at a tip end portion of the first arm 24b is connecting to a lock knob L provided at an inside of the door D via a connection member J (e.g., a cable or a link). When the locking operation is applied to the lock knob L, the active lever 24 rotates counterclockwise. On the other hand, when the unlocking operation is applied to the lock knob L, the active lever 24 rotates clockwise.

[0029] A contact portion 24c1 is formed at a tip end portion of the second arm 24c. A pair of contact walls 29b1, 29b2 provided at an idle lever portion 29b of the idle lever 29 which rotates in accordance with a rotational operation of a key cylinder K detachably contact the contact portion 24c1. When the locking operation is applied to the key cylinder K, the idle lever portion 29b is rotated clockwise thus to rotate the active lever 24 counterclockwise. On the other hand, when the unlocking operation is applied to the key cylinder K, the idle lever portion 29b is rotated counterclockwise thus to rotate the active lever 24 clockwise.

[0030] The third arm 24d is formed approximately in fan shape, and an external periphery of the third arm 24d is formed approximately in arc shape which has the center at an axial center of the through-hole 24a. An engaging recess portion 24d1 is formed at an external peripheral rim portion of the third arm 24d. The engaging recess portion 24d1 is selectively engaged with a first engaging pin 28a and a second engaging pin 28b which are provided at the wheel gear 28 which is selectively rotated in a normal direction or a reverse direction by an electric motor 27. When the locking operation is conducted by the electric motor 27, the wheel gear 28 is rotated clockwise to rotate the active lever 24 counterclockwise. On the other hand, when the unlocking operation is conducted by the electric motor 27, the wheel gear 28 is rotated counterclockwise to rotate the active lever 24 clockwise.

[0031] An elongated bore 24d2 which extends approximately in a direction of the through-hole 24a is formed at a first side of the third arm 24d. The elongated bore 24d2 is slidably engaged with an engaging pin 26b (i.e., serving as an engaging portion) of the open link 26.

[0032] A first and second engaging projections 24d3, 24d4 are provided at the third arm 24d between the through-hole 24a and an external peripheral rim portion of the third arm 24d. The first engaging projection 24d3 contacts a blocking member 21g provided on an internal wall surface of the first case portion 21 a to restrict clockwise rotation of the active lever 24. The second engaging projection 24d4 contacts the blocking member 21g to restrict counterclockwise rotation of the active lever 24.

[0033] The first arm 24b, the second arm 24c, and the third arm 24d serve as an arm portion connecting to a lock knob L, an arm portion connecting to a key cylinder K, and an arm portion connecting to a wheel gear respectively. The third arm 24d is formed to extend approximately in an opposite direction to an extended direction of the second arm 24c (i.e., the arm portion 24d connecting to the wheel gear extends in a first direction, the arm portion 24c connecting to the key cylinder K extends in a second direction which is different direction from a direction that the arm portion 24b connecting to the lock knob L extends).

[0034] The active lever 24 is biased by the torsion

spring 25 provided between the housing body 21 (i.e., the first case portion 21a) and the active lever 24. A first end 25a of the torsion spring 25 is fixed to a connection hole 21h provided at an internal wall surface of the first case portion 21a. A second end 25b of the torsion spring 25 is fixed to a connection hole 24b2 provided at the first arm 24b of the active lever 24.

[0035] When the active lever 24 is at an unlocked position (primarily shown in Figs. 1 and 6), the active lever 24 is biased clockwise by the torsion spring 25. In those circumstances, upon contact of the first engaging projection 24d3 to the blocking member 21g to restrict the clockwise rotation thereof, the active lever 24 is positioned and maintained at the unlocked position shown in Fig. 1. When the active lever 24 is positioned at a locked position (primarily shown in Figs 8 and 9), the active lever 24 is biased counterclockwise by the torsion spring 25. In those circumstances, upon contact of the second engaging projection 24d4 to the blocking member 21 g to restrict counterclockwise rotation thereof, the position of the active lever 24 is determined and maintained at the locked position (shown in Figs. 8 and 9).

[0036] Accordingly, the active lever 24 restrictedly positioned at the unlocked position shown in Fig. 1 is rotated counterclockwise to be restrictedly positioned at the locked position shown in Fig. 8 when a locking operation is applied to the lock knob L or the key cylinder K, or when the locking operation is conducted by the electric motor 27. To the contrary, the active lever 24 which is restrictedly positioned at the locked position is rotated clockwise to be restrictedly positioned at the unlocked position when an unlocking operation is applied to the lock knob L or the key cylinder K, or when an unlocking operation is conducted by the electric motor 27.

[0037] The open link 26 is formed approximately in a bar shape and is supported at two points by the open lever 22 and the active lever 24 respectively. An engagement hole 26a is formed at a first end (i.e., a bottom end) of the open link 26. The engagement projection 22c1 of the open lever 22 is engaged with the engagement hole 26a. An engaging pin 26b (i.e., serving as an engaging portion) is formed at a second end (i.e., a top end) of the open link 26. The engaging pin 26b slidably engages with the elongated bore 24d2 of the active lever 24. The open link 26 is at an upright state (i.e., an unlocked state) when the active lever 24 is positioned at the unlocked position shown in Fig. 1. The open link 26 is at a tilted state (i.e., a locked state) when the active lever 24 is positioned at the locked position shown in Fig. 8. The open link 26 is configured not to transmit an operational force of the door handle (i.e., the outside handle O or the inside handle I), which is provided at the door D, to the pawl 45 when in the locked state. The open link 26 is configured to transmit an operational force of the door handle (i.e., the outside handle O or the inside handle I) when in the unlocked state.

[0038] A contact portion 26c is formed at the second end (i.e., the top end) of the open link 26. When the open link 26 is at the upright state, the contact portion 26c is moved upward to contact a contact portion 46a of the lift lever 46, thus to rotate the lift lever 46 (i.e., push the contact portion 46a upward). When the open link 26 is in the tilted state, the contact portion 26c does not contact the contact portion 46a of the lift lever 46 even if the open link 26 is moved upward.

[0039] The open link 26 includes a first side surface 26d to which the cancel lever 32 contacts. A contact portion 32b1 of the cancel lever 32 contacts the first side surface 26d of the open link 26 by a biasing force of the torsion spring 33. Thus, because the open link 26 is pushed towards an opposite side (i.e., to the right in Fig. 1) relative to the first side surface 26d by the cancel lever 32, the engagement hole 26a of the open link 26 engages with the engagement projection 22c1 of the open lever 22 without shakiness and the engaging pin 26b of the open link 26 engages with the elongated bore 24d2 of the active lever 24 without shakiness.

[0040] A recess portion 26e is provided at the first side surface 26d of the open link 26. As shown in Figs. 7, the recess portion 26e is formed at a portion to which the contact portion 32b1 of the cancel lever 32 contacts when in an open state of the door handle (i.e., the outside handle O or the inside handle I). In other words, when the open link 26 is pushed upward, the contact portion 32b1 of the cancel lever 32 moves (i.e., rotates) in accordance with a configuration of the first side surface 26d of the open link 26. Particularly, when the recess portion 26e of the first side surface 26d reaches the contact portion 32b1, the cancel lever 32 rotates counterclockwise and the contact portion 32c1 of the cancel lever 32 is detached from the lift lever 46. Accordingly, in those circumstances, even if the open link 26 is pushed upward, interference of the contact portion 46a of the lift lever 46 with the contact portion 32c1 of the cancel lever 32 can be prevented.

[0041] The engagement hole 26a of the open link 26 is formed in a guitar-like shape, a pair of projections 26a1, 26a1 which support the engaging projection 22c from the both sides, and the engagement hole 26a is formed slightly greater than a width of the engagement projection 22c1. With the foregoing constructions, irrespective of states of the open link 26 (i.e., either the tilted state or the upright state), a gap between the engagement hole 26a of the engagement projection 22c1 can be controlled to be as small as possible to securely support the open link 26.

[0042] The electric motor 27 is attached on an internal wall surface of the first case portion 21a of the housing body 21. The electric motor 27 includes a worm 27a at an output shaft, and the worm 27a is geared with the wheel gear 28. The wheel gear 28 is rotatably supported by a support boss 21i integrally formed on the internal wall surface of the first case portion 21a. The support boss 21i fits to a female boss 31g which is convexly provided on an internal wall surface of the cover 31 to support the wheel gear 28. The active lever 24 is arranged be-

tween the wheel gear 28 and the internal wall surface of the first case portion 21 a. The wheel gear 28 is arranged so as to overlap the active lever 24.

[0043] The first and second engaging pins 28a, 28b are convexly provided at a first side surface (i.e., a side surface which faces the internal wall surface of the first case portion 21a) of the wheel gear 28. The first and second engaging pins 28a, 28b are arranged in a point symmetrical manner relative to the rotational center of the wheel gear 28 and facing each other keeping a predetermined distance from the rotational center. One of the first and second engaging pins 28a, 28b contacts an external periphery of the third arm 24d and the other of the first and second engaging pins 28a, 28b stands by the engaging recess portion 24d1 of the active lever 24.

[0044] When the locking operation is performed by the electric motor 27, the electric motor 27 is actuated and the wheel gear 28 in a state shown in Fig. 1 is rotated clockwise. In this case, the first engaging pin 28a which stands by the engaging recess portion 24d1 enters the engaging recess portion 24d1 to be engaged therewith, and the active lever 24 is rotated counterclockwise in accordance with the rotation of the wheel gear 28. Thereafter, when the second engaging pin 28b contacts the external periphery (i.e., external periphery at the right side of the engaging recess portion 24d1) of the third arm 24d and the first engaging pin 28a is retracted from the engaging recess portion 24d1, the activation of the electric motor 27 is stopped and the actuation of the wheel gear 28 is stopped, and the active lever 24 is restrictedly positioned at the locked position. On the other hand, when the unlocking operation is performed by the electric motor 27, by reversing the steps of the foregoing locking operation, the wheel gear 28 is rotated counterclockwise to rotate the active lever 24 clockwise. Then, the wheel gear 28 is stopped at the position shown in Fig. 1 and the active lever 24 is positioned and maintained at the unlocked position.

[0045] The idle lever 29 is, as primarily shown in Fig. 3, rotatably mounted on a cylindrical supporting portion 21j vertically provided outward (i.e., in an extending direction of the second case portion 21b) from the internal wall of the first case portion 21a of the housing body 21. The idle lever 29 includes a shaft portion 29a which is pivotally supported by the supporting portion 21j, an idle lever portion 29b integrally formed with a first end of the shaft portion 29a, and a connecting lever portion 29c which is integrally formed with a second end of the shaft portion 29a.

[0046] As shown in Fig. 1, the idle lever portion 29b is configured in fan shape, and rotates about a rotational axis identical to the rotational axis of the shaft portion 29a. A pair of contact walls 29b1, 2b2 are formed at first and second ends of the idle lever portion 29b respectively. The contact portion 24c1 formed at the second arm 24c of the active lever 24 is arranged between the contact walls 29b1 and 29b2 to have a significant amount of play therebetween. The connecting lever portion 29c is configured to project vertically downward in Fig. 3 and rotates about a rotational axis identical to the rotational axis of the shaft portion 29a. A tip end portion of the connecting lever 29c is connecting to a key cylinder K provided at the door handle (i.e., the outside handle O) which is provided at the outside of the door D via the connection member J such as a link.

[0047] When the locking operation is applied to the key cylinder K, the idle lever 29 rotates clockwise to rotate the idle lever 29b in a state shown in Fig. 1 clockwise. In those circumstances, the contact wall 29b1 of the idle lever 29b contacts the contact portion 24c1 formed at the second arm 24c of the active lever 24 to rotate the active lever 24 counterclockwise. On the other hand, when the unlocking operation is applied to the key cylinder K, the idle lever portion 29b rotates counterclockwise by reversing the steps of the foregoing locking operation, and the active lever 24 rotates clockwise by the force from the contact wall 29b2 of the idle lever 29b. Accordingly, the active lever 24 is positioned and maintained at the unlocked position (i.e., the position shown in Fig. 1).

[0048] The cover unit 30, as primarily shown in Fig. 2, is provided at the cover 31. The cover unit 30 includes the cancel lever 32, the torsion spring 33, and the inside lever 34.

[0049] The cancel lever 32 is rotatably supported by an attaching pin 31b fitted in a through-hole of a pivotally supporting boss 31a provided at the internal wall surface of the cover 31. The cancel lever 32 is shaped in a bend form and includes a first arm 32b extended in a first direction from a through-hole 32a provided at a bent portion of the cancel lever 32 and a second arm 32c extended in a second direction from the through-hole 32a. The contact portion 32b1 and the contact portion 32c1 are formed at tip end portions of the first arm 32b and the second arm 32c respectively. The contact portion 32b1 contacts the first side surface 26d of the open link 26. The contact portion 32c1 detachably contacts the contact portion 46a of the lift lever 46. The cancel lever 32 changes a state of the open link 46 from the locked state to the unlocked state by applying an operational force from the pawl 45 (i.e., serving as a latched means) to the open link 26.

[0050] The cancel lever 32 is biased by the torsion spring 33 which is provided between the cover 31 and the cancel lever 32. The torsion spring 33 is supported by the pivotally supporting boss 31a. A first end 33a of the torsion spring 33 is fixed to a connecting pin 31c vertically provided on the internal wall surface of the cover 31, and a second end 33b of the torsion spring 33 is fixed to a connecting projection 32c2 provided at the second arm 32c of the cancel lever 32. Thus, the cancel lever 32 is biased clockwise in Fig. 2 (i.e., counterclockwise in Fig. 1), and the contact portion 32b1 of the first arm 32b of the cancel lever 32 is biased in a predetermined direction (i.e., to the left in Fig. 2, to the right in Fig. 1). Further, the contact portion 32b1 is in constant contact with the first side surface 26d of the open link 26 by the biasing force of the torsion spring 33 so that the contact portion

32b1 constantly pushes the first side surface 26d of the open link 26 in the predetermined direction.

[0051] The inside lever 34 is provided with a through-hole 34a, and the through-hole 34a is fitted to an attaching pin 31e which is fitted at a through-hole 31d provided at the internal wall of the cover 31 to rotatably support the inside lever 34. The inside lever 34 includes an arm 34b extended in a first direction from the through-hole 34a. A connecting portion 34b1 and a contact portion 34b2 are formed at a tip end portion and an intermediate portion of the arm 24b respectively. The inside handle I (i.e., the door handle) provided at interior side of the door D is connected to the connecting portion 34b1 via the connection member J such as a cable and a link. The contact portion 34b2 detachably contacts the contact portion 22c2 of the open lever 22.

[0052] A position of the inside lever 34 is determined at a normal position shown in Fig. 2 (i.e., shown with two dotted line in Fig. 1) by being connected to the connection member J in a normal state at which the inside handle I (i.e., the door handle) is not operated to open the door D. On the other hand, the inside lever 34 is rotated clockwise in Fig 1, and the contact portion 34b2 contacts the contact portion 22c2 of the open lever 22 at the operation where the inside handle I (i.e., the door handle) is operated to open the door D. Thereafter, a tip end portion of the second arm 22c of the open lever 22 is pushed upward to rotate clockwise in Fig. 3 against the biasing force of the torsion spring 23. Upon closing operation by the inside handle I (i.e., the door handle), the open lever 22 and the inside lever 34 return to the original position by the biasing force of the torsion spring 23.

[0053] The sub-base unit 40, as shown in Figs. 4 and 5, is provided at the sub-base housing 41. The sub-base unit 40 includes the sub-base plate 42, the base plate 43, the latch 44, the pawl 45, the lift lever 46, and the torsion spring 47.

[0054] The sub-base plate 42 and the base plate 43 are attached on a rear sidewall 41a of the sub-base housing 41 at the inside and the outside respectively. A groove 41b, which the striker 50 provided at the vehicle body V selectively enters into and retracts from, is formed on the sub-base housing 41. A groove 43a, which the striker 50 selectively enters into and retracted from, is formed on the base plate 43. Recess portions are formed at an outside wall of the rear sidewall 41 a of the sub-base housing 41 throughout a top portion and a bottom portion of the groove 41b respectively. The latch 44 is housed in the top recess portion, and the pawl 45 is housed in the bottom recess portion. Namely, the latch 44 and the pawl 45 are arranged between the housing 41 (i.e., rear side wall 41a) and the sub-base plate 42.

[0055] The latch 44 is formed approximately in U shape and includes a pair of projections 44a, 44b and an opening portion 44c formed between the projections 44a and 44b, and which the striker 50 selectively enters into and retracted from. The latch 44 is rotatably supported by a supporting pin 44d which is mounted on the sub-base plate 42 and the base plate 43. The supporting pin 44d penetrates through the sub-base housing 41. The latch 44 is biased clockwise in Fig. 4 by a torsion spring. When the door D is open, the latch 44 is positioned and locked at a position shown with two-dotted line in Fig. 4 by the biasing force of the torsion spring. In this case, the opening portion 44c of the latch 44 matches to the groove 41b of the base housing 41.

[0056] The pawl 45 includes a connecting portion 45a having a block shape and a shaft portion 45b which extends approximately orthogonally to the connecting portion 45a. The shaft portion 45b is rotatably provided on the sub-base plate 42 and the base plate 43 penetrating through the sub-base housing 41. A torsion spring 47 is fixed on an external periphery of the shaft portion 45b of the pawl 45 at an intermediate location between the sub-base plate 42 and the sub-base housing 41. A first end of the torsion spring 47 is fixed to the connecting portion 45a of the pawl 45, and a second end of the torsion spring 47 is fixed to the sub-base plate 42. The pawl 45 is biased counterclockwise in Fig. 4 (i.e., clockwise in Fig. 5) by the biasing force of the torsion spring 47. A counterclockwise rotation of the pawl 45 which is biased in the foregoing manner is restricted by a restricting member so as for the pawl 45 to be positioned and locked at a normal position shown in Fig. 4.

[0057] The lift lever 46 is secured to a first end of the shaft portion 45b of the pawl 45 so as to integrally rotate and the connecting portion 45a is provided at a second end of the shaft portion 45b. The contact portion 46a is formed at a tip end portion of the lift lever 46. The contact portion 46a detachably contacts the contact portion 26c of the open link 26. Because the lift lever 46 rotates integrally to the pawl 45, the lift lever 46 is biased counterclockwise in Fig. 4 (i.e., clockwise in Fig. 5) by the biasing force of the torsion spring 47. Further, a counterclockwise rotation of the lift lever 46 is restricted by a restricting member, and the lift lever 46 is positioned and locked at a normal position shown with a solid line in Fig. 5.

[0058] When the door D is open, the latch 44 is positioned and locked at a position shown with two-dotted chain line in Fig. 4 by the biasing force of the torsion spring. When closing the open door D, the striker 50 which relatively enters the opening portion 44c of the latch 44 along the groove 41b of the base housing 41 contacts an internal wall surface of the projection 44b of the latch 44, and the latch 44 rotates counterclockwise in Fig. 4 against the biasing force of the torsion spring. Meanwhile, the connecting portion 45a of the pawl 45 is pushed downward by the projection 44a or 44b, and the pawl 45 is rotated clockwise against the biasing force. Eventually, the latch 44 rotates to reach the position shown with a solid line in Fig. 4, and is positioned and locked by locking the projection 44a of the latch 44 not to turn clockwise in Fig. 4 by the connecting portion 45a of the pawl 45. Consequently, a latched state at which the striker 50 and the latch 44 are latched is maintained. The latch 44 and the pawl 45 serve as a latched means.

[0059] When the door D is operated to open in the latched state, the lift lever 46 is rotated clockwise in Fig. 4 and the pawl 45 rotates in the same direction accordingly, and the connecting portion 45a of the pawl 45 is disengaged from the projection 44a of the latch 44. In those circumstances, the latch 44 rotates to return to the position shown with the two-dotted chain line in Fig. 4 by the biasing force of the torsion spring, and the opening portion 44c of the latch 44 matches to the groove 41b of the base housing 41. In the foregoing circumstances, the striker 50 is retractable from the opening portion 44c of the latch 44 and the groove 41b of the sub-base housing 41. Accordingly, the latched state at which the striker 50 and the latch 44 are latched is released.

[0060] Referring to Figs. 6-9, an operation of a door lock device will be explained. First, a case when opening operation of the door D is performed in a non-operating state, at which the door lock device is in the unlocked state shown in Fig. 6 and opening operation of the door D is not performed, will be explained with reference to Fig. 7. With the door lock device in the non-operating state of the door D and in the unlocked state shown in Fig. 6, likewise a state shown in Fig. 1, the position of the open lever 22 is determined and maintained at a normal position, the active lever 24 is positioned and maintained at the unlocked position, and the open link 26 which is supported by the open lever 22 and the active lever 24 is positioned upright.

[0061] When the opening operation of the outside handle O (i.e., the door handle) is performed in the foregoing state, as shown in Fig. 7, the open lever 22 positioned at the normal position is rotated against the biasing force of the torsion spring 23, and the tip end portion of the second arm 22c moves upward. Accordingly, the open link 26 is pushed upward maintaining an upright state. Thereafter, the contact portion 26c of the open link 26 pushes the contact portion 46a to move the lift lever 46 positioned at the normal position, and the lift lever 46 is rotated against the biasing force of the torsions spring 47. Consequently, the connecting portion 45a of the pawl 45 positioned at the normal position is rotated. In those circumstances, in case the connecting portion 45a is engaged with the latch 44, the latch 44 will disengage from the connecting portion 45a, and the latched state at which the striker 50 and the latch 44 are latched can be released.

[0062] When an opening operation of the inside handle I (i.e., the door handle) is performed, the inside lever 34 positioned at the normal position is rotated clockwise in Fig. 7, and the contact portion 34b2 contacts the contact portion 22c2 of the open lever 22. Then, the tip end portion of the second arm 22c of the open lever 22 is pushed upward. Thereafter, the operation likewise the opening operation of the outside handle O (i.e., the door handle) is performed.

[0063] Next, when the locking operation is applied to the door lock device which is in the unlocked state and non-operating state of the door D will be explained with reference to Fig. 8. When the locking operation is applied to the lock knob L or the key cylinder K, or when the locking operation is performed by the electric motor 27, the active lever 24 positioned and maintained at the unlocked position shown in Fig. 6 is rotated counterclockwise. Then, the second connecting projection 24d4 contacts the blocking member 21g to restrict the counterclockwise rotation so that the active lever 24 is restrictedly positioned at the locked position shown in Fig. 8. Consequently, the open link 26 changes a positional state from the upright state to the tilted state.

[0064] When the locking operation is applied to the key cylinder K, the idle lever 29 is rotated clockwise to rotate the idle lever portion 29b, which is in a state shown in Fig. 1, clockwise. Accordingly, the contact wall 29b1 of the idle lever portion 29b contacts the contact portion 24c1 formed at the second arm 24c of the active lever 24 to rotate the active lever 24 counterclockwise, and thus the position of the active lever 24 is determined at the locked position (i.e., the position shown in Fig. 8).

[0065] On the other hand, when the unlocking operation is applied to the key cylinder K, the idle lever portion 29b is rotated counterclockwise by reversing the steps of the operation of the locking operation explained above to rotate the active lever 24 clockwise by the contact wall 29b2. Thus, the position of the active lever 24 is determined at the unlocked position (i.e., the position shown in Fig. 1).

[0066] A case where an opening operation of the door D is performed with the door lock device which is in the locked state and non-operating state of door D shown in Fig. 8 will be explained with reference to Fig. 9. When an opening operation of the inside handle I (i.e., the door handle) is performed in the state shown in Fig. 8, as shown in Fig. 9, the inside lever 34 positioned at the normal position is rotated clockwise in Fig. 9 and the open lever 22 is rotated against the biasing force of the torsion spring 23, and the tip end portion of the second arm 22c moves upward. Accordingly, the open link 26 is pushed upward keeping the tilted state. In those circumstances, however, because the contact portion 26c of the open link 26, which is in the tilted state, does not contact the contact portion 46a of the lift lever 46 positioned at the normal position, the lift lever 46 is not rotated. Consequently, the connecting portion 45a of the pawl 45 does not rotate. In this case, because the connecting portion 45a is engaged with the latch 44 and will not be disengaged, the latched state at which the striker 50 and the latch 44 are latched cannot be released.

[0067] Further, when an opening operation of the outside handle O (i.e., the door handle) is performed, the open lever 22 positioned at the normal position is rotated against a biasing force of the torsion spring 23, and the tip end portion of the second arm 22c moves upward. Thereafter, an operation likewise the opening operation of the inside handle I (i.e., the door handle) is performed.

[0068] When the lock knob L or the key cylinder K is operated to unlock the door D at the locked state shown

in Fig. 8, or when the unlocking operation is performed by the electric motor 27, the active lever 24 is rotated clockwise in Fig. 8, and the position of the active lever 24 is determined at the unlocked position shown in Fig. 6 again. Accordingly, by an opening operation of the door handle (i.e., the outside or the inside handle I), the latched state between the striker 50 and the latch 44 becomes releasable.

[0069] In case the open door D is closed without performing an opening operation by the outside handle O (i.e., the door handle) in the locked state of the door lock device, the active lever 24 is rotated clockwise by the canceling operation by the cancel lever 32 to be changed to the unlocked state. Namely, during the canceling operation, when the striker 50 and the latch 44 are latched, the pawl 45 is rotated clockwise in Fig. 4 by the latch 44, and the lift lever 46 is rotated in the same direction (i.e., in the direction of arrow C in Fig. 4). In those circumstances, because the contact portion 32c1 of the cancel lever 32 is positioned to be close to the contact portion 46a of the lift lever 46, the contact portion 46a of the lift lever 46 contacts the contact portion 32c1 of the cancel lever 32 to push the open link 26 to the right in Fig. 9. Accordingly, the state of the open link 26 is changed from the tilted state to the upright state, and the active lever 24 is rotated to be the unlocked position.

[0070] According to the embodiment of the present invention, because the active lever 24 and the idle lever 29 are arranged at a bottom portion of the operating mechanism B and the electric motor 27 and the wheel gear 28 actuated by the electric motor 27 are positioned at an upper position of the patting mechanism B, the active lever 24 can be directly connected to the connection member J which is connected to the lock knob L through the arm portion 24b connecting to the lock knob L. Accordingly, there is no need to apply the locking lever to the door lock device according to the embodiment of the present invention, which the locking lever is applied in the known door lock device.

[0071] Further, because the idle lever 29 which is operated by the operation of the key cylinder K is operatively connecting to the active lever 24 through the arm portion 24c operatively connecting to the key cylinder K and the wheel gear 28 which is actuated by the electric motor 27 is operatively connecting to the active lever 24 through the arm portion 24d connecting to the wheel gear, the active lever 24 can be operated to the locked position and the unlocked position by the locking and unlocking operation by means of the lock knob L, the key cylinder K, or the electric motor 27.

[0072] However, operating the active lever 24 to the locked position and the unlocked position by means of the electric motor 27 is not essential to the present invention, and the door lock device according to the present invention is applicable to the construction in which an active lever is operated to be in the locked position or in the unlocked position at least by operating the key cylinder and the lock knob.

[0073] According to the embodiment of the present invention, the active lever which is selectively rotatable to the locked position where the latch and the striker cannot be released, and the unlocked position where the latch and the striker can be released, includes the arm portion connecting to the key cylinder which is operatively connecting to the idle lever and the arm portion operatively connecting to the lock knob which is directly connected to the connection member. With the foregoing construction, there is no need to include the locking lever, and thus the number of parts can be reduced. Accordingly, by the reduction of the number of the parts, costs for the parts and assembling can be reduced and the door lock device can be downsized to improve the mountability of the door lock device on a vehicle. Further, because the construction for connecting the lock knob and the active lever is simplified, the door lock device which maintains a stable operation for a long term can be achieved.

[0074] According to the embodiment of the present invention, the open link, which transmits an operational force to the latched means at the locked position and does not transmit an operational force to the latched means at the unlocked position, includes the engaging portion, and the active lever includes the elongated bore which engages with the engaging portion so as to slide. Accordingly, the door lock device can be further downsized, which further contributes to the mountability of the door lock device on the vehicle.

[0075] According to the embodiment of the present invention, because the active lever and the idle lever are positioned at the bottom portion of the operating mechanism, the connection member connected to the doorknob can be directly connected to the active lever readily.

[0076] According to the embodiment of the present invention, the electric motor activated by the remote control operation and the wheel gear are positioned at the upper position of the operating mechanism, and the arm portion connecting to the wheel gear is provided at the opposite side of the arm portion connecting to the key cylinder relative to the rotational center, the active lever is rotated between the locked position and the unlocked position by the key-less operation.

Claims

1. A door lock device for a vehicle, comprising:

an operating mechanism (B) which selectively performs a locked state in which a latching means (50) provided at a vehicle body (V) and a latched means (44) provided at a door (D) are unreleasable and an unlocked state in which the latching means and the latched means are releasable;

the operating mechanism comprising:

an active lever (24) selectively rotating to a

locked position at which the latching means and the latched means are unreleasable and to an unlocked position at which the latching means and the latched means are releasable;
an idle lever (29) operating the active lever to the locked position and the unlocked position in accordance with an operation of a key cylinder (K); and
a connection member (J) connected to a lock knob (L) provided at the door and selectively operating the active lever to the locked position and to the unlocked position;

characterized in that
the active lever includes an arm portion connecting to the key cylinder (24c), which is operatively connecting to the idle lever, and an arm portion connecting to the lock knob (24b) which is directly connected to the connection member.

2. The door lock device for the vehicle according to Claim 1, wherein the operating mechanism includes an open link (26) which prevents to transmit an operational force of a door handle (O, I) provided at the door to the latched means when the active lever is at the locked position and transmits the operational force of the door handle to the latched means when the active lever is at the unlocked position;
the open link includes an engaging portion (26b); and
the active lever includes an elongated bore (24d2) with which the engaging portion of the open link engages so as to slide therein.

3. The door lock device for the vehicle according to Claim 1, wherein the active lever and the idle lever are arranged at a bottom portion of the operating mechanism.

4. The door lock device for the vehicle according to either one of Claims 1 and 2, further comprising:

an electric motor positioned at an upper portion of the operating mechanism and activated by remote control;
a wheel gear (28) positioned at the upper portion of the operating mechanism and rotated by the electric motor; and
the active lever including an arm portion connecting to the wheel gear (24d) which is operatively connecting to the wheel gear, the arm portion connecting to the wheel gear being provided on the active lever and being extended in a first direction relative to a rotational center of the active lever whereas the arm portion connecting to the key cylinder being extended in a second direction relative to the rotational center of the active lever.

5. The door lock device for the vehicle according to Claim 1, wherein the arm portion connecting to the key cylinder is extended in a direction different from an extended direction of the arm portion connecting to the lock knob.

6. The door lock device for the vehicle according to Claim 4, wherein the arm portion connecting to the wheel gear is shaped in a fan form.

FIG. 1

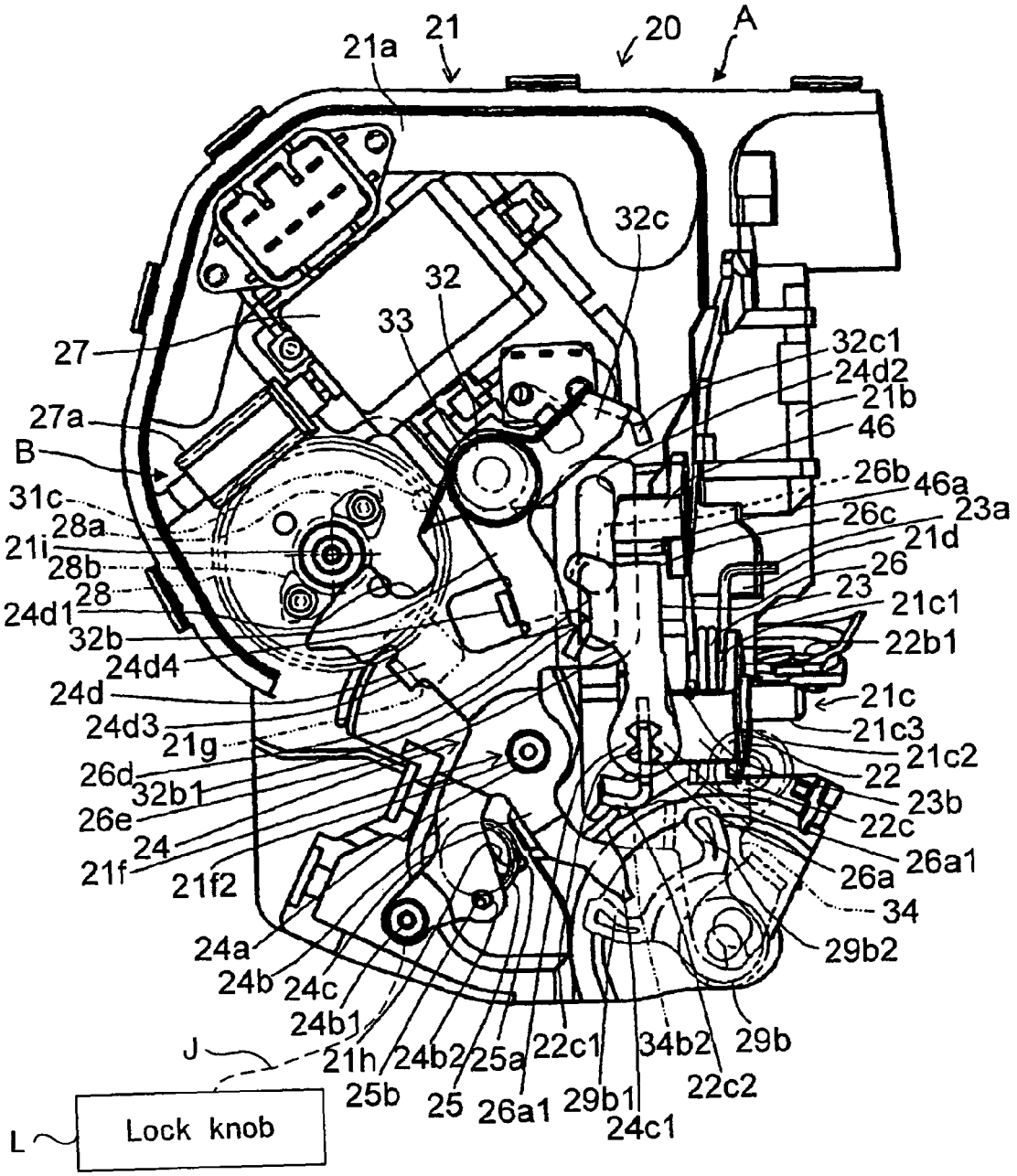

21a
21
20
A
32c
32
33
27
32c1
24d2
21b
46
27a
B
26b
46a
31c
28a
26c
23a
21i
28b
21d
26
28
23
24d1
21c1
32b
22b1
24d4
24d
21c
24d3
21c3
21g
21c2
26d
32b1
22
26e
23b
24
22c
21f
26a1
21f2
26a
34
24a
29b2
24b
24c
24b1
J
21h
24b2
25a
22c1
34b2
29b
25b
25
26a1
29b1
22c2
24c1
L
Lock knob

FIG. 2

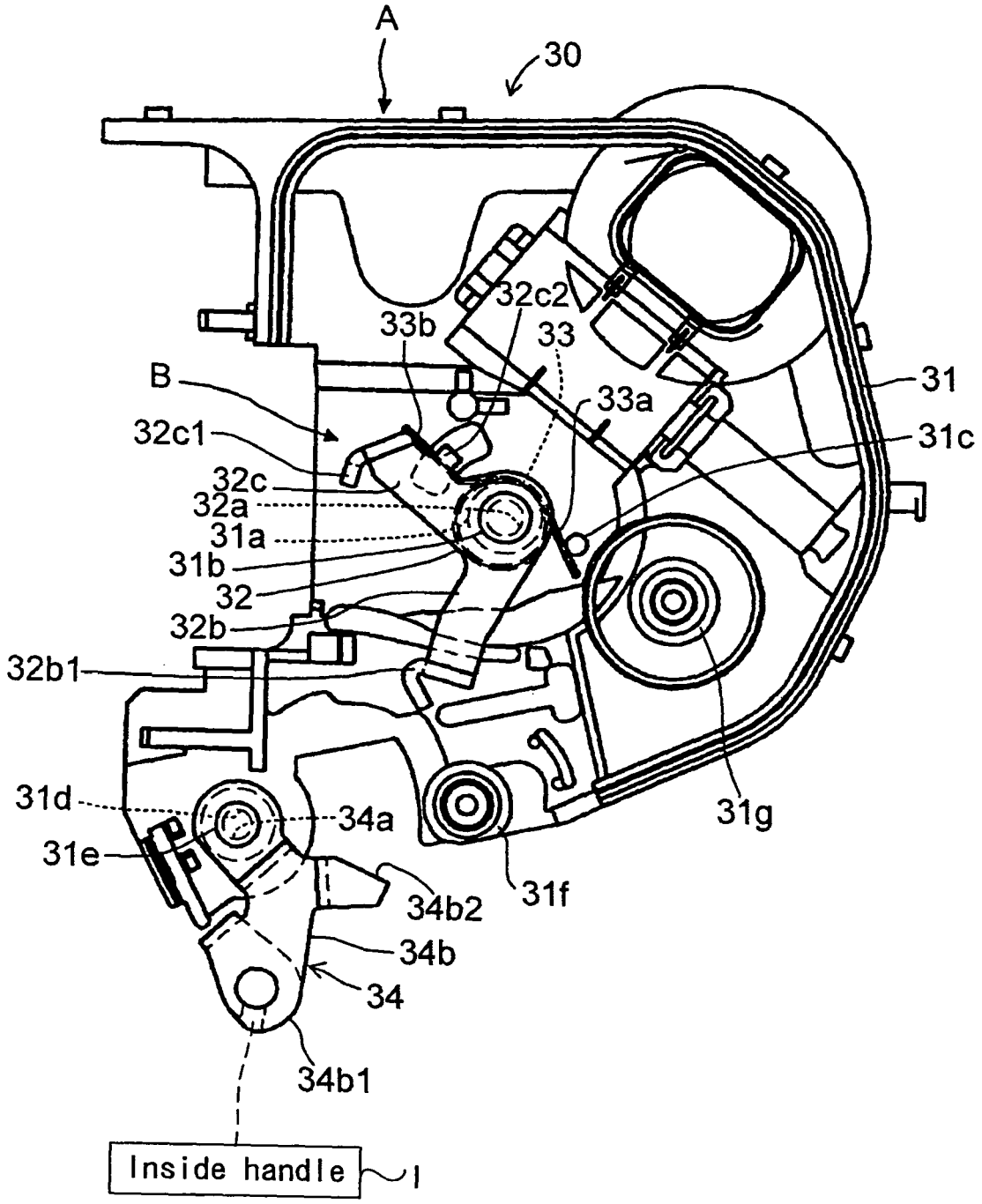

A
30
32c2
33b
33
B
31
33a
32c1
31c
32c
32a
31a
31b
32
32b
32b1
31d
34a
31g
31e
34b2
31f
34b
34
34b1
Inside handle
1

FIG. 3

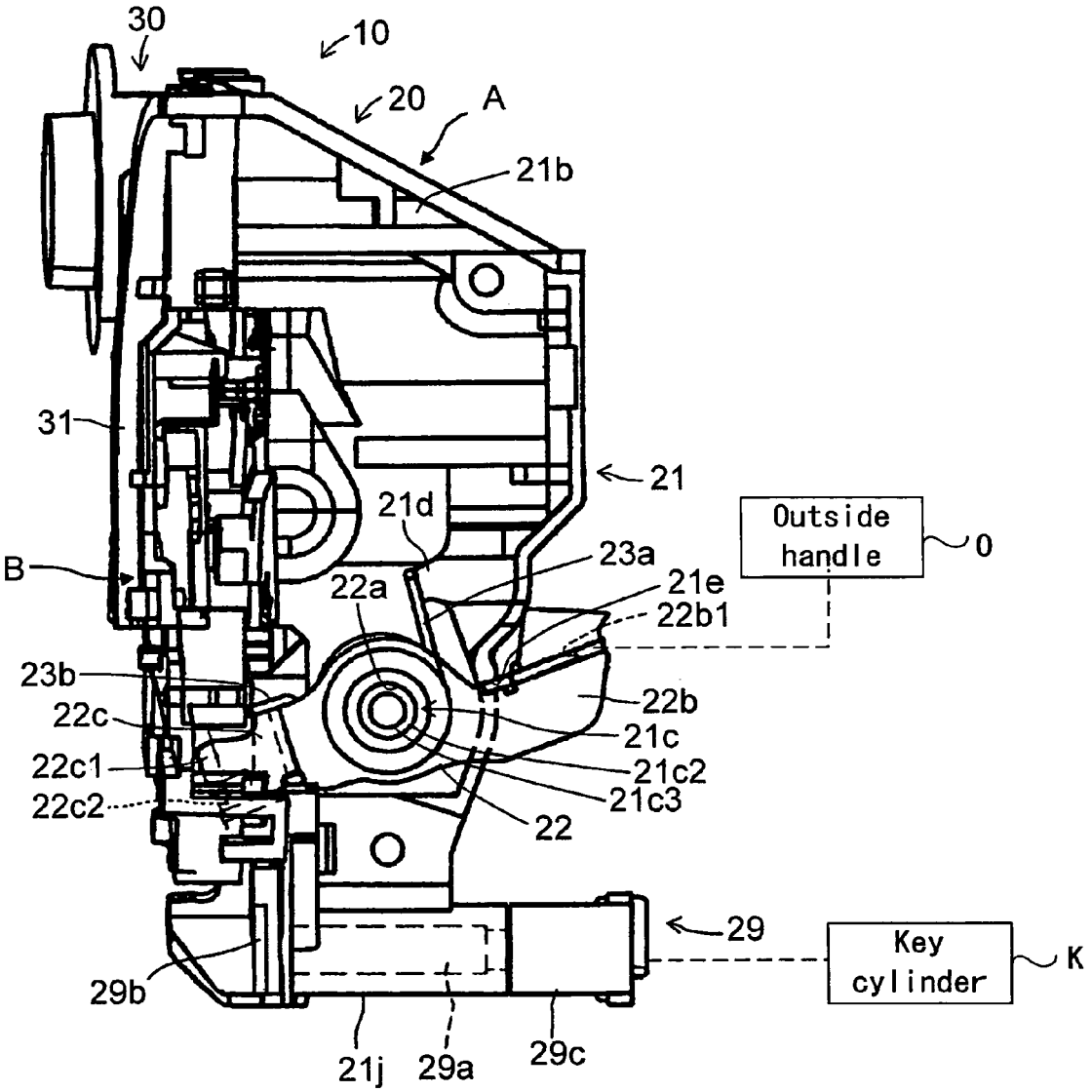

30
10
20
A
21b
31
21
21d
Outside handle
0
B
23a
21e
22a
22b1
23b
22b
22c
21c
22c1
21c2
21c3
22c2
22
29
Key cylinder
K
29b
21j
29a
29c

FIG. 4

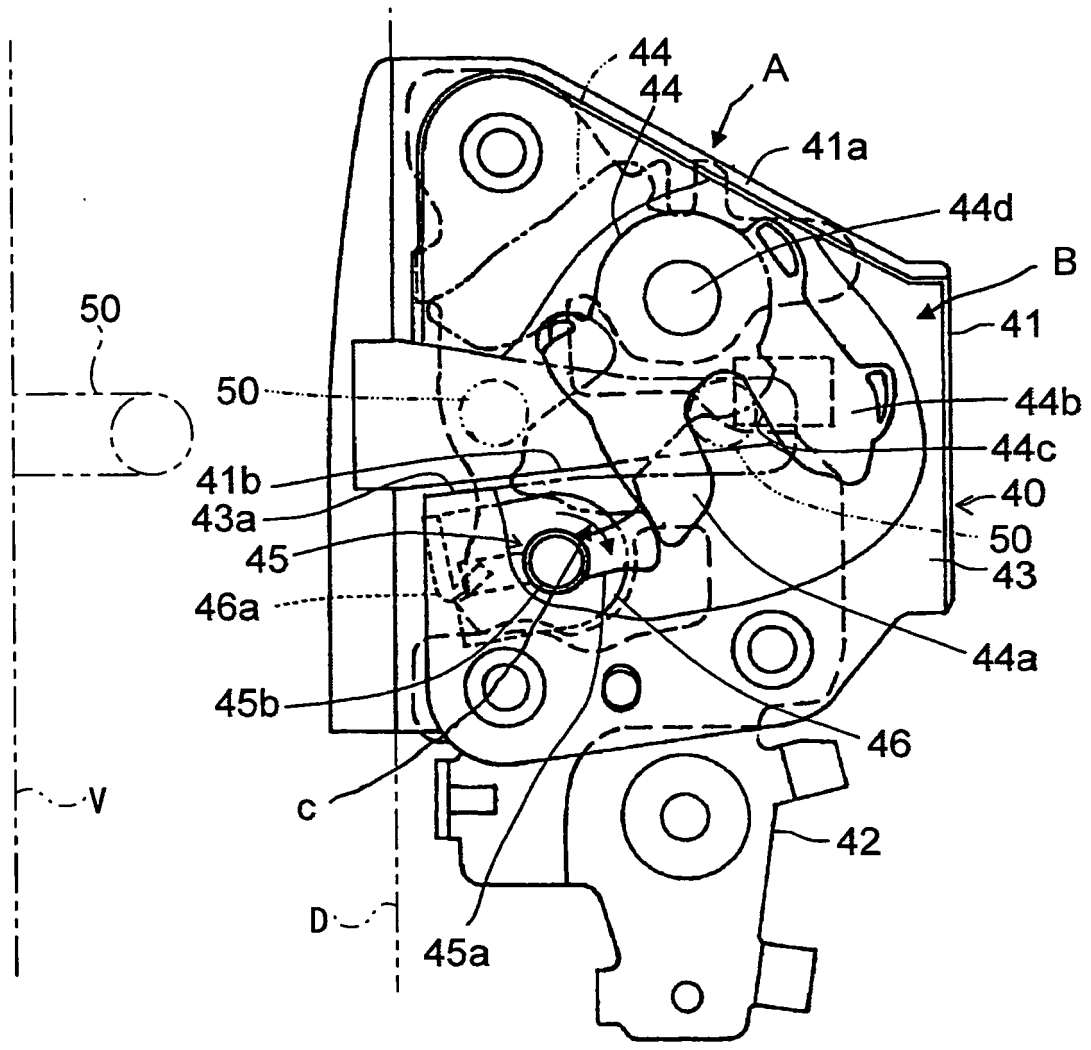

44
44
A
41a
44d
B
41
50
50
44b
44c
41b
40
43a
50
45
43
46a
44a
45b
46
V
c
42
D
45a

FIG. 5

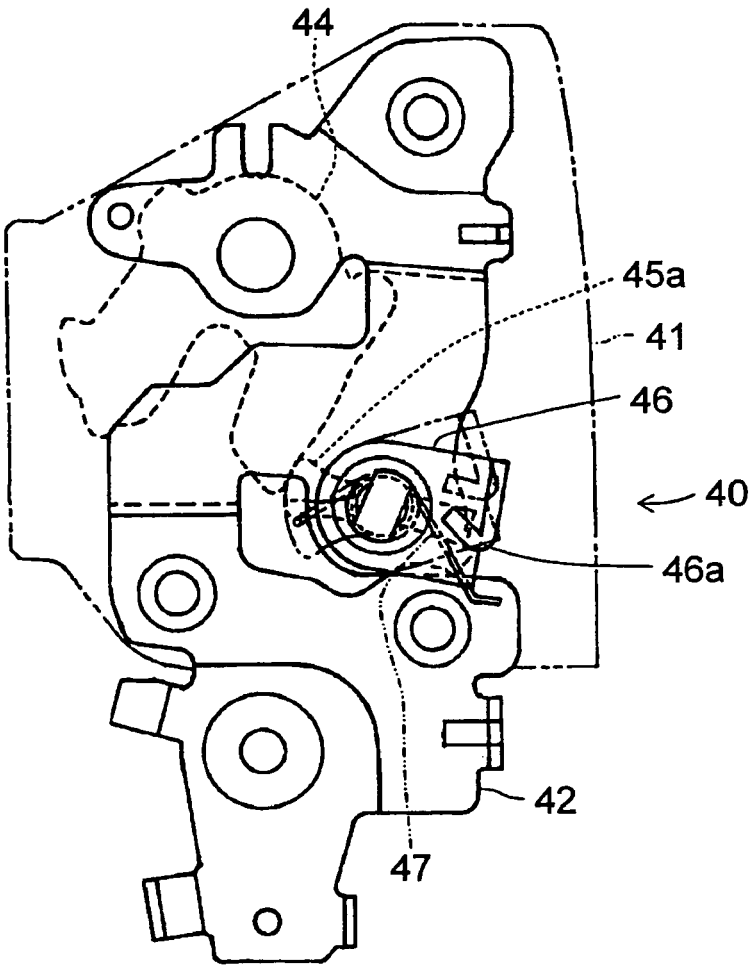


FIG. 6

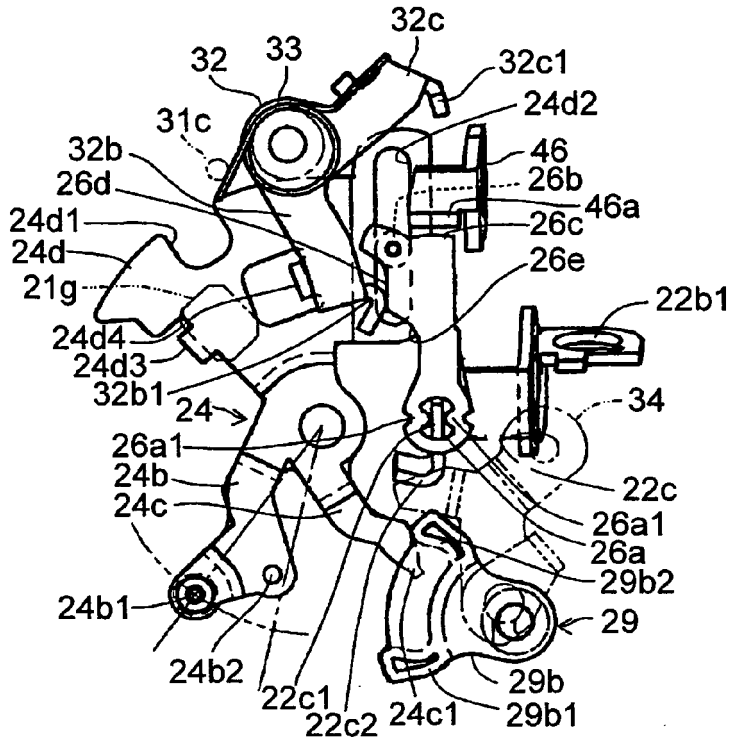

32c
32
33
32c1
24d2
31c
46
32b
26b
26d
46a
24d1
26c
24d
26e
21g
22b1
24d4
24d3
34
32b1
24
26a1
24b
22c
24c
26a1
26a
29b2
24b1
29
24b2
29b
22c1
24c1
29b1
22c2

FIG. 7

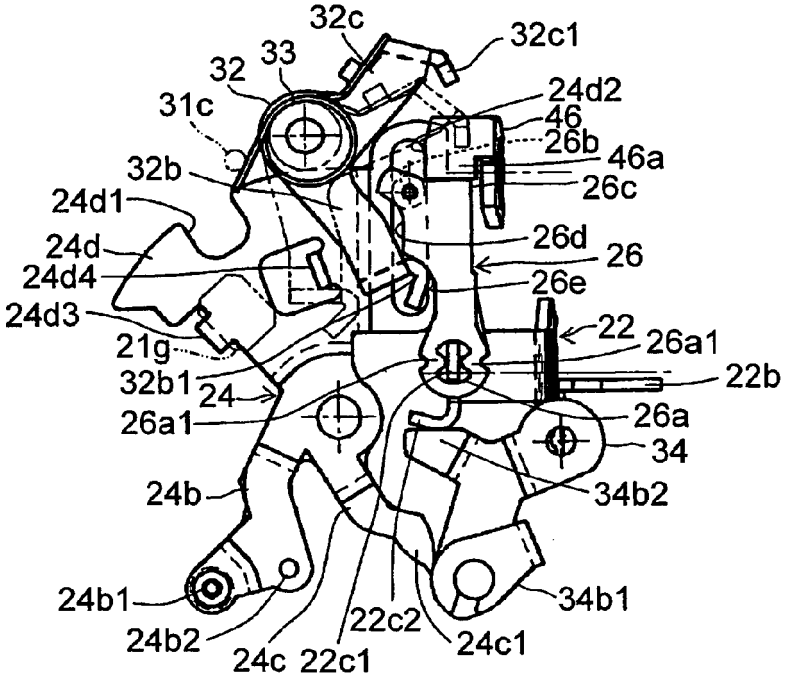

32c
32c1
33
32
24d2
31c
46
26b
32b
46a
26c
24d1
26d
24d
26
24d4
26e
24d3
22
26a1
21g
22b
32b1
24
26a1
26a
34
24b
34b2
24b1
34b1
22c2
24b2
24c1
24c
22c1

FIG. 8

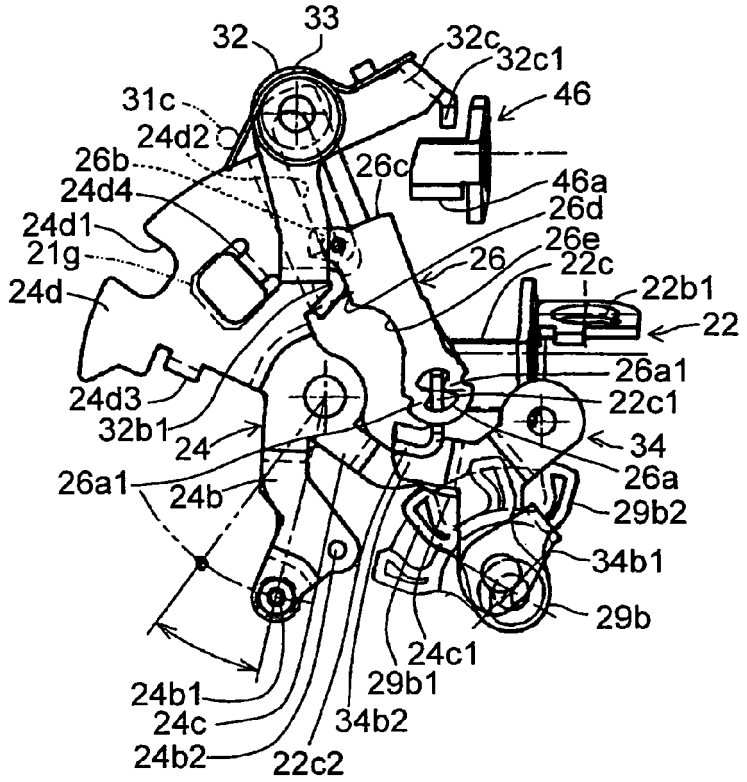
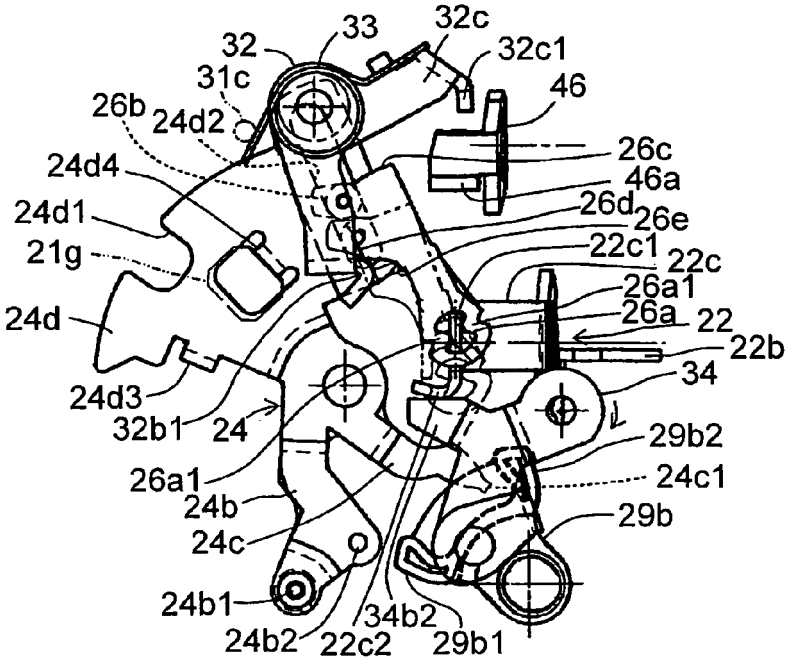

32
33
32c
32c1
46
31c
24d2
26b
26c
46a
24d4
26d
24d1
26e
21g
26
22c
22b1
24d
22
26a1
24d3
22c1
32b1
24
34
26a1
24b
26a
29b2
34b1
29b
24c1
24b1
29b1
24c
34b2
24b2
22c2

FIG. 9


32
33
32c
32c1
31c
46
26b
24d2
26c
24d4
46a
26d
24d1
26e
21g
22c1
22c
26a1
24d
26a
22
22b
24d3
34
32b1
24
29b2
26a1
24c1
24b
29b
24c
24b1
34b2
24b2
22c2
29b1

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2001262903 A **[0002] [0004] [0004] [0004]**