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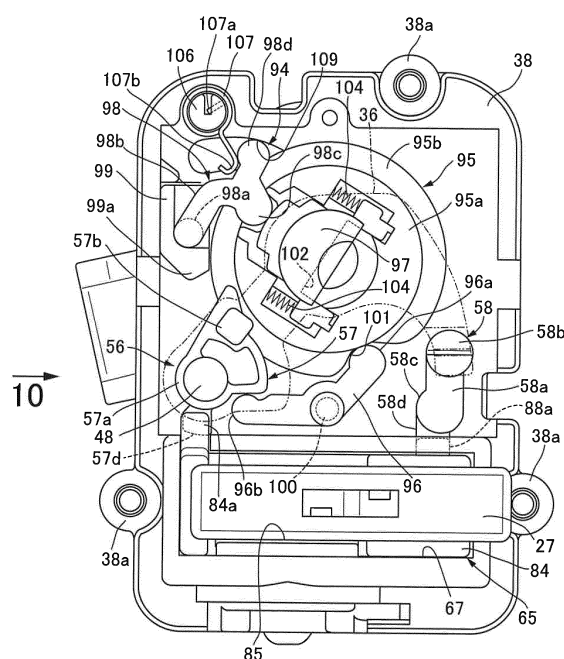
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(54) **CYLINDER LOCK PROTECTION DEVICE**

(57) A cylinder lock protection device is provided in which a shutter plate is housed in a casing having a mechanical key insertion hole, the shutter plate being capable of opening and closing the mechanical key insertion hole, wherein when restricted state release means (65) releases the restricted state due to closed position restriction means (56), the shutter plate (36) is automatically operated from the closed position to the open position by urging force applied from open direction urging means. In a state in which the shutter plate (36) is at the open position, when the mechanical key inserted into the cylinder lock side from the mechanical key insertion hole is pulled out of the mechanical key insertion hole at a predetermined pivoting position, closed position side urging force control means (94) allows closed direction urging means, which exhibits urging force that is larger than that of open direction urging means, to make the urging force act on the shutter plate (36), the urging force from the closed direction urging means thereby acts on the shutter plate (36) and the shutter plate (36) automatically operates to the closed position. Thus, the shutter plate automatically moves between the closed position and the open position, thereby enhancing the ease of operation.

FIG.8



Description

TECHNICAL FIELD

[0001] The present invention relates to a cylinder lock protection device in which a shutter plate is housed in a casing having a mechanical key insertion hole for a mechanical key to be inserted into a cylinder lock so that the shutter plate is capable of moving between a closed position in which the mechanical key insertion hole is closed and an open position in which the mechanical key insertion hole is opened.

BACKGROUND ART

[0002] Such a cylinder lock protection device is known from Patent Document 1, for example.

RELATED ART DOCUMENTS

PATENT DOCUMENTS

[0003] Patent Document 1: Japanese Patent No. 3914043

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0004] However, in the arrangement disclosed in Patent Document 1, the shutter plate is moved from the closed position to the open position by pivoting the magnet key in a state in which the magnet key is fitted into the magnet lock and it is unlocked; opening of the shutter plate is carried by a manual operation. In order to automatically open the shutter plate, the shutter plate could be spring-biased toward the open position side, but if the shutter plate were only spring-biased toward the open position side, it would be necessary to employ a manual operation for moving the shutter plate toward the closed position side, and it cannot be stated that the ease of operation would be excellent.

[0005] The present invention has been accomplished in light of such circumstances, and it is an object thereof to provide a protection device for a cylinder lock that enables a shutter plate to move automatically between a closed position and an open position, thus enhancing the ease of operation.

MEANS FOR SOLVING THE PROBLEMS

[0006] In order to attain the above object, according to a first aspect of the present invention, there is provided a cylinder lock protection device in which a shutter plate is housed in a casing having a mechanical key insertion hole for a mechanical key to be inserted into a cylinder lock so that the shutter plate is capable of moving between a closed position in which the mechanical key in-

sertion hole is closed and an open position in which the mechanical key insertion hole is opened, characterized in that the device comprises closed position restriction means that can switch over between a restricted state in which the shutter plate is restricted to the closed position and a restriction release state in which operation of the shutter plate to the open position is allowed, restricted state release means that can release the restricted state of the closed position restriction means so as to attain the restriction release state, open direction urging means that urges the shutter plate toward the open position side, closed direction urging means that can apply an urging force that is larger than an urging force of the open direction urging means to the shutter plate toward the closed position side, and closed position side urging force control means that controls transmission of the urging force from the closed direction urging means to the shutter plate so that a function of the closed direction urging means is stopped at least when the shutter plate is operated from the closed position to the open position and the urging force acts on the shutter plate from the closed direction urging means in response to the mechanical key being pulled out of the mechanical key insertion hole at a predetermined pivoting position.

[0007] Further, according to a second aspect of the present invention, in addition to the first aspect, the restricted state release means comprises a magnet lock that is unlocked by the magnet key, and the restricted state release means is arranged so as to release the restricted state of the closed position restriction means by operating in response to a predetermined operation of the magnet key in an unlocked state.

EFFECTS OF THE INVENTION

[0008] In accordance with the first aspect of the present invention, when the restricted state release means releases the restricted state due to the closed position restriction means, since the function of the closed direction urging means is stopped by the closed position side urging force control means when the shutter plate operates from the closed position to the open position, the shutter plate is automatically operated from the closed position to the open position by means of the urging force applied from the open direction urging means. Furthermore, in a state in which the shutter plate is at the open position, when the mechanical key inserted into the cylinder lock side from the mechanical key insertion hole is pulled out of the mechanical key insertion hole at a predetermined pivoting position, the closed position side urging force control means allows the closed direction urging means, which exhibits a urging force that is larger than that of the open direction urging means, to make the urging force act on the shutter plate, the urging force from the closed direction urging means thereby acts on the shutter plate and the shutter plate automatically operates to the closed position, and the shutter plate thus automatically moves between the closed position and the open position, there-

by enhancing the ease of operation.

[0009] Furthermore, in accordance with the second aspect of the present invention, since the restricted state of the closed position restriction means is released by a predetermined operation of the magnet key for unlocking the magnet lock contained in the restricted state release means in a state in which the magnet key has unlocked the magnet lock, it is possible to release the restricted state of the closed position restriction means with a simple operation using the magnet key.

BRIEF DESCRIPTION OF DRAWINGS

[0010]

[FIG. 1] FIG. 1 is a perspective view of a cylinder lock and a protection device. (first embodiment)

[FIG. 2] FIG. 2 is an exploded perspective view of a mechanical key and a magnet key. (first embodiment)

[FIG. 3] FIG. 3 is an exploded perspective view of the protection device. (first embodiment)

[FIG. 4] FIG. 4 is a front view of the protection device showing a state in which a shutter plate is at an open position and a cover member is omitted. (first embodiment)

[FIG. 5] FIG. 5 is a front view in a state in which the shutter plate is removed from FIG. 4. (first embodiment)

[FIG. 6] FIG. 6 is a front view in a state in which an inner cover plate is removed from FIG. 5. (first embodiment)

[FIG. 7] FIG. 7 is a perspective view of the shutter plate when viewed from the side opposite to the cover member. (first embodiment)

[FIG. 8] FIG. 8 is a front view of the protection device showing a state in which the shutter plate is at a closed position and a casing is omitted. (first embodiment)

[FIG. 9] FIG. 9 is a perspective view of the protection device showing a state in which the shutter plate is at the closed position and the casing is omitted. (first embodiment)

[FIG. 10] FIG. 10 is a view in the direction of arrow 10 in Fig. 8. (first embodiment)

[FIG. 11] FIG. 11 is a perspective view showing an arrangement in which a magnet lock, a slide case, and a second restricting member are linked. (first embodiment)

[FIG. 12] FIG. 12 is a side view when a body of the casing is viewed from the direction of arrow 12 in FIG. 6. (first embodiment)

[FIG. 13] FIG. 13 is an exploded perspective view of a follower and a slide member. (first embodiment)

[FIG. 14] FIG. 14 is a front view of the protection device, corresponding to FIG. 8, in a state in which a mechanical key is inserted at a LOCK position. (first embodiment)

[FIG. 15] FIG. 15 is a front view, corresponding to FIG. 8, in a state in which the mechanical key is pivoted to an OFF position. (first embodiment)

[FIG. 16] FIG. 16 is a view in the direction of arrow 16 in Fig. 15 in a state in which the casing is omitted. (first embodiment)

[FIG. 17] FIG. 17 is a front view, corresponding to FIG. 8, in a state in which the mechanical key is pivoted to an ON position. (first embodiment)

[FIG. 18] FIG. 18 is a front view, corresponding to FIG. 8, in a state in which the mechanical key is pulled out at the LOCK position. (first embodiment)

EXPLANATION OF REFERENCE NUMERALS AND SYMBOLS

[0011]

22 Cylinder lock

24 Protection device

25 Mechanical key

27 Magnet key

35 Casing

36 Shutter plate

37 Mechanical key insertion hole

56 Closed position restriction means

62 First torsion spring, which is open direction urging means

63 Second torsion spring, which is closed direction urging means

65 Restricted state release means

66 Magnet lock

94 Closed position side urging force control means

MODE FOR CARRYING OUT THE INVENTION

[0012] An embodiment of the present invention is explained below by reference to the attached FIG. 1 to FIG. 18.

FIRST EMBODIMENT

[0013] First, in FIG. 1, a protection device 24 is mounted on a cylinder body 23 of a cylinder lock 22 used in a vehicle such as for example a two-wheeled motor vehicle so that it can carry out switching of the switching mode of an ignition switch 21 and switching of steering between a locked state and an unlocked state.

[0014] In FIG. 2, a mechanical key 25 for unlocking the cylinder lock 22 is supported on one end part of a linearly extending portable case 26 having a rectangular cross-sectional shape so as to switch between a state in which it is housed in the portable case 26 and a state in which it projects from the portable case 26 as shown in FIG. 2, and a magnet key 27 is provided on the other end part of the portable case 26.

[0015] Formed on a side face of the other end part of

the portable case 26 are a square-shaped recess 28, a circular projection 29 disposed in a central part of the recess 28, and four housing recesses 30 disposed on the periphery of the circular projection 29 within the recess 28. In a state in which a magnet 31 is housed in each of three housing recesses 30 selected from the four housing recesses 30, a lid member 33 having in a central part a circular hole 32 into which the circular projection 29 is fitted is fitted into and adhered to the recess 28, thus forming the magnet key 27. Moreover, the magnet 31 is housed in the housing recess 30 so that either one of the N pole and the S pole faces the outer end side of the housing recess 30.

[0016] Referring in addition to FIG. 3 to FIG. 6, the protection device 24 includes a casing 35 covering one end part of the cylinder body 23 and a shutter plate 36 housed within the casing 35.

[0017] The casing 35, which has a mechanical key insertion hole 37 for the mechanical key 25 to be inserted into the cylinder lock 22, is formed from a body 38 to which the cylinder body 23 is joined, a cover member 39 secured to the body 38 so as to cover the body 38 from the side opposite to the cylinder body 23, and an inner cover plate 40 secured to the body 38 so as to be covered with the cover member 39.

[0018] The mechanical key 25 inserted into the cylinder lock 22 can pivot from a LOCK (LOCK) position in which a steering handle, which is not illustrated, is put into a locked state to an ON (ON) position via an OFF (OFF) position, and an engine, which is not illustrated, can be fired up by making the ignition switch 21 conduct at the ON position. Furthermore, the mechanical key 25 can be inserted into or removed from the cylinder lock 22 at either the LOCK position or the OFF position.

[0019] A cover sheet 41 is adhered to the surface of the cover member 39, the cover sheet 41 having an opening 42 corresponding to the mechanical key insertion hole 37, and the cover sheet 41 displaying LOCK, OFF, and ON positions so as to be disposed around the opening 42.

[0020] The shutter plate 36 is housed in the casing 35 so as to be capable of operating between a closed position in which the mechanical key insertion hole 37 is closed and an open position (the position shown in FIG. 4) in which the mechanical key insertion hole 37 is open, this shutter plate 36 being disposed between the cover member 39 and the inner cover plate 40.

[0021] The cover member 39 covers the body 38 so that part, on the side opposite to the cylinder lock 22, of the body 38 is fitted thereto, and is formed into a substantially rectangular box-shaped bowl shape. A boss portion 39a is integrally formed at a plurality of, for example three, locations of the peripheral edge of the cover member 39 so as to be spaced in the peripheral direction. On the other hand, a plurality of, for example three, support portions 38a abutting against the respective boss portions 39a are formed integrally with the body 38, and screwing a screw member 43 inserted into the support portion 38a from the cylinder lock 22 side into the boss

portion 39a secures the cover member 39 to the body 38.

[0022] The inner cover plate 40 is fixed to the body 38 so that the shutter plate 36 is in sliding contact therewith, and the inner cover plate 40 positioned and engaged with the body 38 at a plurality of locations is secured to the body 38 by means of one screw member 44.

[0023] The mechanical key insertion hole 37 is formed from a circular first hole 45 provided in the inner cover plate 40 and a circular second hole 46 provided in the cover member 39 so as to correspond to the first hole 45, and the shutter plate 36 closes the mechanical key insertion hole 37 by being present between the first hole 45 and the second hole 46.

[0024] Referring to FIG. 7, the shutter plate 36 is formed into a fan shape so as to integrally have a pivoting base portion 36a having a circular support hole 47 at a position corresponding to the main part of the fan, a link arm portion 36b extending from the pivoting base portion 36a along the radial direction of the support hole 47, a lid portion 36c connectedly provided on the link arm portion 36b while having a shape that can close the mechanical key insertion hole 37, and a restricting arm portion 36d extending from the lid portion 36c so as to sandwich the mechanical key insertion hole 37 between itself and the pivoting base portion 36a when the lid portion 36c is in a state in which the mechanical key insertion hole 37 is open.

[0025] This shutter plate 36 is pivotably supported by a support shaft 48 inserted into the support hole 47 so that the shutter plate 36 can operate between a closed position in which the mechanical key insertion hole 37 is closed and an open position (the position shown in FIG. 4) in which the mechanical key insertion hole 37 is open.

[0026] A latching projection 49 extending in an arc shape with the central axis of the support hole 47 and the support shaft 48 as a center is projectingly provided integrally with a face, on the inner cover plate 40 side, of the pivoting base portion 36a, an operating shaft 50 is projectingly provided integrally with a face, on the cover member 39 side, of the pivoting base portion 36a, and insertion holes 51 and 52, through which the operating shaft 50 is inserted, are provided in the cover member 39 and the cover sheet 41 so as to be formed into an arc shape with the central axis of the support hole 47 and the support shaft 48 as a center.

[0027] Formed on a face, on the inner cover plate 40 side, of the extremity of the restricting arm portion 36d are a latching recess 53 and an inclined face 54 that is inclined so as to go away from the inner cover plate 40 in going from the latching recess 53 toward the extremity of the restricting arm portion 36d.

[0028] The closed position of the shutter plate 36 is restricted by closed position restriction means 56; this closed position restriction means 56 can switch between a restricted state in which the shutter plate 36 is restricted to the closed position and a restriction release state in which operation of the shutter plate 36 to the open position is allowed, and includes first and second restricting

members 57 and 58.

[0029] Referring in addition to FIG. 8 to FIG. 10, the first restricting member 57 is formed so as to have a flat-shaped pivoting plate portion 57a disposed between the body 38 and the inner cover plate 40, the support shaft 48, which is standingly provided on the pivoting plate portion 57a so as to extend through a first through hole 59 provided in the inner cover plate 40 and be inserted into the support hole 47 of the shutter plate 36, a first engagement projection portion 57b standingly provided on the pivoting plate portion 57a so as to abut against and engage with one peripheral end portion 49a of the latching projection 49 of the shutter plate 36, a cylindrical portion 57c connectedly provided on the pivoting plate portion 57a at right angles so as to be coaxial with the support shaft 48 and pivotably inserted into the body 38, and a first pressure-receiving projecting portion 57d projecting radially outward from an intermediate part in the axial direction of the cylindrical portion 57c. The inner cover plate 40 is provided with an elongated hole 60 through which the first engagement projection portion 57b is inserted so that the first engagement projection portion 57b can pivot around the central axis of the support shaft 48, the elongated hole 60 extending in an arc shape with the central axis of the support shaft 48 as a center.

[0030] Furthermore, the second restricting member 58 is formed so as to have a flat-shaped linking plate portion 58a disposed between the body 38 and the inner cover plate 40, a second engagement projection portion 58b projectingly provided on one end part of the linking plate portion 58a so as to extend through a second through hole 61 provided in the inner cover plate 40 while being capable of engaging with the latching recess 53, a rod-shaped portion 58c inserted into the body 38 via the other end part of the linking plate portion 58a so as to extend in parallel to the support shaft 48, and a second pressure-receiving projecting portion 58d projecting radially outward from the rod-shaped portion 58c.

[0031] The shutter plate 36 is urged toward the open position side by means of a coil-shaped first torsion spring 62 as open direction urging means; the first torsion spring 62 is disposed between the pivoting base portion 36a of the shutter plate 36 and the inner cover plate 40 so as to surround the support shaft 48, one end portion 62a of the first torsion spring 62 is engaged with the inner cover plate 40, and the other end portion 62b of the first torsion spring 62 abuts against and engages with the other peripheral end portion 49b of the latching projection 49 of the shutter plate 36.

[0032] Furthermore, an urging force toward the closed position side can be exerted on the shutter plate 36 by means of a coil-shaped second torsion spring 63 as closed direction urging means that exhibits an urging force larger than that of the first torsion spring 62. This second torsion spring 63 is provided between the cylindrical portion 57c and the body 38 while having part thereof inserted into the cylindrical portion 57c; one end portion

63a of the second torsion spring 63 is engaged with the body 38, and the other end portion of the second torsion spring 63 is engaged with a groove (not illustrated) formed in an inner face of the cylindrical portion 57c so as to extend in the axial direction.

[0033] In a state in which the first engagement projection portion 57b of the first restricting member 57 abuts against the one peripheral end portion 49a of the latching projection 49 of the shutter plate 36, the second torsion spring 63 exhibits a spring force that urges the shutter plate 36 toward the closed position side together with the first restricting member 57 as well as an axial spring force that urges the first restricting member 57 in a direction in which the pivoting plate portion 57a moves toward the inner cover plate 40.

[0034] Since the spring force of the second torsion spring 63 urging the shutter plate 36 toward the closed position side is larger than the spring force of the first torsion spring 62 urging the shutter plate 36 toward the open position side, in a state in which the first engagement projection portion 57b of the first restricting member 57 abuts against the one peripheral end portion 49a of the latching projection 49 of the shutter plate 36, pivoting of the shutter plate 36 at the closed position toward the open position side is restricted, and the shutter plate 36 is restricted to the closed position.

[0035] Furthermore, a first coil spring 64 is provided in a compressed state between the body 38 and the rod-shaped portion 58c of the second restricting member 58; the second restricting member 58 is urged toward the side on which the second engagement projection portion 58b projects from the inner cover plate 40 by means of the spring force exhibited by the first coil spring 64, and the shutter plate 36 is also restricted to the closed position by the second engagement projection portion 58b engaging with the latching recess 53 of the shutter plate 36.

[0036] A state in which the shutter plate 36 is restricted to the closed position by the closed position restriction means 56 can be released by restricted state release means 65; this restricted state release means 65 includes a magnet lock 66 that can be unlocked by the magnet key 27 and is arranged so as to release the restricted state of the closed position restriction means 56 by operation in response to a predetermined operation of the magnet key 27 in an unlocked state of the magnet lock 66, in this embodiment the predetermined operation of the magnet key 27 being a pushing-in operation.

[0037] The body 38 of the casing 35 is provided with a slide support hole 67 opening on the cover member 39 side in a section that is offset from the inner cover plate 40 while having a substantially rectangular box-shaped cross-sectional shape and extending in parallel with the central axis of the support shaft 48. A receiving part 68 (see FIG. 12) formed into a lattice shape in order to let out dirt or water entering the slide support hole 67 is disposed in an end part, on the side opposite to the cover member 39, of the slide support hole 67, the receiving part 68 being formed integrally with the body 38. The

cover member 39 is provided with a first magnet key insertion hole 69 formed into a substantially rectangular box shape so as to correspond to the slide support hole 67. As shown in FIG. 3, a lid member 70 for closing the first magnet key insertion hole 69 is pivotably supported on a reverse face of the cover member 39 via a pin 71, and the lid member 70 is urged toward the closed side by a spring 72.

[0038] Referring in addition to FIG. 11, this magnet lock 66 includes a rotor 74 pivotably supported by the body 38 of the casing 35. The rotor 74 is formed from a non-magnetic material so as to integrally have a disk-shaped portion 74a, a collar portion 74b protruding radially outward from one end of the disk-shaped portion 74a, a link arm portion 74c extending outward from one location in the peripheral direction of the collar portion 74b, and a third engagement projection portion 74d projecting toward the same side as the disk-shaped portion 74a from the outer end of the link arm portion 74c.

[0039] As shown in FIG. 12, provided in the body 38 of the casing 35 are a fitting recess 75, a circular fitting hole 76, and an elongated hole 77, the fitting recess 75 having the collar portion 74b and the link arm portion 74c of the rotor 74 pivotably fitted therein, the fitting hole 76 having the disk-shaped portion 74a of the rotor 74 pivotably fitted therein while having its outer end opening in the fitting recess 75 and having its inner end opening on a side face of the slide support hole 67, and the elongated hole 77 having its outer end opening in the fitting recess 75 so that the third engagement projection portion 74d is inserted therein and having its inner end opening on the side face of the slide support hole 67. The elongated hole 77 is formed into an arc shape with the pivot axis of the rotor 74 as a center so as to allow pivoting of the rotor 74 within the fitting recess 75 and the fitting hole 76.

[0040] As shown in FIG. 3, the fitting recess 75 is closed by means of a lid member 78 that integrally has a supporting projecting portion 78a fitted into the disk-shaped portion 74a of the rotor 74 and supporting pivoting of the rotor 74, and that is secured to the body 38 by means of one screw member 79, an O ring 80 being disposed between a base part of the supporting projecting portion 78a and the rotor 74.

[0041] A plurality of, for example three, pins 81, which are magnets, are slidably fitted into the extremity of the supporting projecting portion 78a so as to be capable of moving between a position in which they engage with three of four latching recesses 82 provided in one end of the disk-shaped portion 74a of the rotor 74 and a position in which engagement is released, each pin 81 being resiliently urged toward the side on which it engages with the rotor 74 by means of second coil springs 83 individually corresponding thereto.

[0042] The three pins 81 are fitted into the latching recesses 82 so as to be disposed at positions corresponding to the three magnets 31 of the magnet key 27 when the magnet key 27 opposes the other end of the disk-

shaped portion 74a of the rotor 74. Moreover, the pins 81 are disposed so that the same pole as the pole, on the magnet lock 66 side, of the magnet 31 of the magnet key 27 is disposed on the inner end side of the latching recess 82, and when a legitimate magnet key 27 is disposed at a position opposing the other end of the disk-shaped portion 74a of the rotor 74 the pin 81 can move to the side that releases engagement with the rotor 74 against the resilient urging force of the second coil spring 83, thereby allowing pivoting of the rotor 74.

[0043] A slide case 84 is slidably housed in the slide support hole 67 of the body 38 of the casing 35, the slide case 84 moving together with the magnet key 27 in response to the magnet key 27 being inserted into the casing 35.

[0044] This slide case 84 is formed into a rectangular box shape so as to have provided therein a second magnet key insertion hole 85 having a bottomed and rectangular cross-sectional shape, and the magnet key 27 is inserted together with the portable case 26 into the second magnet key insertion hole 85 of the slide case 84 via the first magnet key insertion hole 69 of the cover member 39 after opening the lid member 70.

[0045] The extremity of the portable case 26, which is inserted into the second magnet key insertion hole 85 together with the magnet key 27, abuts against a blocked end wall of the second magnet key insertion hole 85, and pushing in the magnet key 27 together with the portable case 26 makes the slide case 84 slide within the slide support hole 67. Moreover, a third coil spring 86 is provided in a compressed state between the slide case 84 and the receiving part 68 provided on an end part, on the side opposite to the cover member 39, of the slide support hole 67, the slide case 84 being spring-biased to the side on which it is moved toward the cover member 39 by means of the spring force exhibited by the third coil spring 86.

[0046] A window 87 is formed in a side wall, facing the magnet lock 66 side, of the slide case 84 in a long elliptical shape along the extending direction of the slide support hole 67, the magnet key 27 inserted into the second magnet key insertion hole 85 facing the magnet lock 66 side via the window 87. The slide case 84 moves together with the magnet key 27 in response to insertion of the magnet key 27 so as to make the magnet key 27 oppose the blocked end outer face of the rotor 74 of the magnet lock 66, thus not only enabling the magnet key 27 to be inserted into an unlocked position in which the magnet lock 66 is unlocked but also enabling the magnet key 27 to be further pushed in from the unlocked position to thus move to a pushed-in position.

[0047] Retained on the slide case 84 is a movable engagement member 88 that engages with the third engagement projection portion 74d of the rotor 74, movement of the movable engagement member 88 being restricted by the rotor 74 in a state in which the magnet lock 66 is locked. Provided between the slide case 84 and the movable engagement member 88 is a fourth coil

spring 89 exhibiting a resilient force that pushes the movable engagement member 88 toward the side that pivots the rotor 74 in response to movement of the slide case 84 toward the pushed-in position side.

[0048] The movable engagement member 88 has a substantially C-shaped form opening toward the link arm portion 74c of the rotor 74 while having a latching groove 90 with which the third engagement arm portion 74d engages. Provided in the slide case 84 is a housing hole 91 opening on the second restricting member 58 side and on the third engagement arm portion 74d side of the rotor 74 while having opposite ends in the extending direction of the slide support hole 67 blocked. The movable engagement member 88 is housed within the housing hole 91, and the fourth coil spring 89 housed within the housing hole 91 is provided in a compressed state between the slide case 84 and the movable engagement member 88.

[0049] When the magnet key 27 and the slide case 84 are further pushed in from the unlocked position, the pressing force due to movement of the slide case 84 is transmitted to the link arm portion 74c of the rotor 74 via the fourth coil spring 89 and the movable engagement member 88, and the rotor 74 in a state in which it can pivot due to the magnet lock 66 being in an unlocked state pivots in response to movement of the movable engagement member 88.

[0050] Furthermore, a first pressing projecting portion 84a is projectingly provided on the slide case 84, the first pressing projecting portion 84a being capable of engaging, from the pivoting base portion 36a side, with the first pressure-receiving projecting portion 57d provided on the cylindrical portion 57c of the first restricting member 57. When the slide case 84 having the first pressing projecting portion 84a engaged with the first pressure-receiving projecting portion 57d is further pushed in from the unlocked position in response to the slide case 84 being pushed in by the magnet key 27, the first restricting member 57 is pushed down against the axial resilient force of the second torsion spring 63, the first engagement projection portion 57b of the first restricting member 57 is thereby moved to a position where engagement with the latching projection 49 of the shutter plate 36 is released, and restriction of the shutter plate 36 to the closed position by means of the first restricting member 57 is released. In this process, the support shaft 48 of the first restricting member 57 will not be disengaged from the support hole 47 of the shutter plate 36, and support for pivoting of the shutter plate 36 by means of the support shaft 48 is maintained.

[0051] Furthermore, the movable engagement member 88 is provided with a second pressing projecting portion 88a so as to project from the movable engagement member 88 on the side opposite to the latching groove 90, the second pressing projecting portion 88a being capable of engaging, from the linking plate portion 58a side, with the second pressure-receiving projecting portion 58d provided on the rod-shaped portion 58c of the second

restricting member 58. When the slide case 84 having the second pressing projecting portion 88a engaged with the second pressure-receiving projecting portion 58d is further pushed in from the unlocked position in response to the slide case 84 being pushed in by the magnet key 27, the second engagement projection portion 58b of the second restricting member 58 moves to a position where engagement with the latching recess 53 of the shutter plate 36 is released, and restriction of the shutter plate 36 to the closed position by means of the second restricting member 58 is also released. If the slide case 84 is forcibly pushed in using a different type of key or an unauthorized member without the magnet lock 66 being unlocked, although restriction of the shutter plate 36 at the closed position by the first restricting member 57 is released in response to movement of the slide case 84, since the rotor 74 of the magnet lock 66 will not pivot and movement of the movable engagement member 88 is prevented, the slide case 84 slides while compressing the fourth coil spring 89, restriction of the shutter plate 36 at the closed position by the second restricting member 58 will not be released, and the shutter plate 36 remains restricted to the closed position.

[0052] That is, the restricted state release means 65 is formed from the magnet lock 66, the slide case 84, the movable engagement member 88, and the third and fourth coil springs 86 and 89.

[0053] In a state in which the restricted state provided by the closed position restriction means 56 in which the shutter plate 36 is restricted to the closed position is released by the restricted state release means 65, the spring force of the second torsion spring 63 does not act on the shutter plate 36, and as shown in FIG. 6 the shutter plate 36 is automatically pivoted toward the open position side by means of the spring force of the first torsion spring 62.

[0054] In this process, the latching projection 49 of the shutter plate 36 attains a position where it moves toward and opposes, in a direction along the axis of the support shaft 48, the first engagement projection portion 57b of the first restricting member 57, pulling the magnet key 27 out of the slide case 84 enables the slide case 84 to be returned to the original position by means of the spring force of the third coil spring 86, and even when the pressing force acting on the first pressure-receiving projecting portion 57d from the first pressing projecting portion 84a is thereby released, the first engagement projection portion 57b abuts against the latching projection 49 of the shutter plate 36 in the axial direction, and the first restricting member 57 remains pushed down. Furthermore, the second restricting member 58 is returned to its original position, due to release of the pressing force acting on the second pressure-receiving projecting portion 58d from the second pressing projecting portion 88a, by means of the spring force of the first coil spring 64.

[0055] Transmission of the urging force from the second torsion spring 63 to the shutter plate 36 is controlled by closed position side urging force control means 94;

this closed position side urging force control means 94 stops the function of the first torsion spring 62 when the shutter plate 36 operates from the closed position to the open position and makes the urging force of the second torsion spring 63 act on the shutter plate 36 in response to pulling out of the mechanical key 25 at a predetermined pivoting position from the mechanical key insertion hole 37 in a state in which the shutter plate 36 is at the open position.

[0056] Referring to FIG. 6, the closed position side urging force control means 94 includes a disk-shaped cam plate 95 pivotably housed between the body 38 and the inner cover plate 40, a lever member 96 disposed outside the cam plate 95 so as to be disposed between the first and second restricting members 57 and 58 in the peripheral direction of the cam plate 95, a push plate 97 fitted into the cam plate 95 so that it can slide in the radial direction of the cam plate 95, a follower 98 abutting against the push plate 97 when the cam plate 95 is at a pivoting position that corresponds to the LOCK position, and a slide member 99 linked to the follower 98.

[0057] The cam plate 95 is relatively non-pivotably linked to an inner cylinder (not illustrated) of the cylinder lock 22 and is formed so as to integrally have a disk portion 95a and a collar portion 95b protruding in the radially outward direction from an end part, on the body 38 side, of the disk portion 95a. Moreover, the pivoting plate portion 57a of the first restricting member 57 is disposed between the collar portion 95b and the inner cover plate 40.

[0058] The lever member 96 is pivotably supported on the body 38 by means of a pin 100 parallel to the support shaft 48 such that one end portion 96a can abut against the outer periphery of the collar portion 95b of the cam plate 95 and the other end portion 96b can abut against the pivoting plate portion 57a of the first restricting member 57, the pin 100 being formed integrally with the lever member 96. Formed in the outer periphery of the collar portion 95b is a recess 101 housing one end part of the lever member 96 when the cam plate 95 is at a pivoting position corresponding to the LOCK position. When the cam plate 95 pivots from the LOCK position to the OFF position or the ON position, the one end portion 96a of the lever member 96 is disengaged from the recess 101 and pivoted so as to be in sliding contact with the outer periphery of the collar portion 95b. The other end portion 96b of the lever member 96 is made to abut against the pivoting plate portion 57a of the first restricting member 57 so as to oppose the pivoting direction of the first restricting member 57 by means of the urging force of the second torsion spring 63.

[0059] A rectangular through hole 102 corresponding to the mechanical key insertion hole 37 is formed in a center part of the cam plate 95 so as to have a rectangular cross-sectional shape, and a fitting groove 103 having its inner end opening in the through hole 102 and its outer end opening on the outer periphery of the disk portion 95a is provided so as to extend in the radial direction of

the cam plate 95. The push plate 97 is slidably fitted into the fitting groove 103, and a pair of springs 104 are provided between the cam plate 95 and the push plate 97 so as to urge the push plate 97 toward the side on which it closes the through hole 102, that is, in the radially inward direction of the cam plate 95.

[0060] An inner end part of the push plate 97 is formed so that it can block the through hole 102, and an outer end part of the push plate 97 is formed into an arc shape having the same curvature as that of the outer periphery of the disk portion 95a of the cam plate 95. When the inner end part of the push plate 97 is at a position where the through hole 102 is blocked, the outer end part of the push plate 97 is present at a position further inward than the outer periphery of the disk portion 95a, and when the inner end part of the push plate 97 is at a position where the through hole 102 is opened, the outer end part of the push plate 97 is at a position where it is flush with the outer periphery of the disk portion 95a.

[0061] Referring in addition to FIG. 13, the follower 98 is disposed on the side opposite to the second restricting member 58 with respect to the cam plate 95, and integrally has a follower main portion 98b extending along the outer periphery of the cam plate 95 while having a link pin 98a in one end part and being capable of having part thereof superimposed on the collar portion 95b of the cam plate 95, a fitting portion 98c extending from the other end part of the follower main portion 98b toward the disk portion 95a of the cam plate 95, and a short columnar portion 98d linked to the other end part of the follower main portion 98b so as to be disposed on the outside of the collar portion 95b. A spring latching recess 105 is formed in a side face, on the side opposite to the fitting portion 98c, of the follower main portion 98b.

[0062] The extremity of the fitting portion 98c can abut against the outer periphery of the disk portion 95a of the cam plate 95, and when the cam plate 95 is at the LOCK position, the extremity of the fitting portion 98c abuts against the outer end part of the push plate 97.

[0063] Moreover, a third torsion spring 107 surrounds a supporting projection 106 provided on the body 38 and having a circular cross section, and has one end portion 107a engaged with the body 38 and the other end portion 107b abutting against and engaging with the short columnar portion 98d on the other end part of the follower 98 so that part of the other end portion 107b can be housed in the spring latching recess 105. The spring force exhibited by the third torsion spring 107 acts on the follower 98 in a direction in which the fitting portion 98c of the follower 98 is pushed against the outer periphery of the disk portion 95a of the cam plate 95 and a direction in which the follower 98 is pushed toward the first restricting member 57 side. In order to guide movement of the follower 98 accompanying movement of the push plate 97 and pivoting of the cam plate 95, the body 38 has a guide recess 109 formed therein, the extremity of the short columnar portion 98d of the follower 98 being fitted into the guide recess 109.

[0064] The slide member 99 is disposed between the follower 98 and the first restricting member 57 and supported on the body 38 so that it can slide in a direction in which it moves toward and away from the first restricting member 57, and a bottomed fitting hole 108 into which the link pin 98a of the follower 98 is pivotably fitted is provided in the slide member 99.

[0065] An abutment portion 99a is provided integrally with an end part, on the first restricting member 57 side, of the slide member 99 so that it can overlap the collar portion 95b of the cam plate 95 in the axial direction, the abutment portion 99a being capable of being made to abut against the pivoting plate portion 57a of the first restricting member 57 from the same direction as the pivotally urging direction of the first restricting member 57 by means of the second torsion spring 63.

[0066] As shown in FIG. 6, when the shutter plate 36 is at the open position and the cam plate 95 is at the LOCK position, the one end portion 96a of the lever member 96 is housed in the recess 101 on the outer periphery of the collar portion 95b of the cam plate 95, the follower 98 is in a state in which the fitting portion 98c abuts against the outer end part of the push plate 97 at a position where the through hole 102 is closed, and the first engagement projection portion 57b of the first restricting member 57 is in a state in which it abuts against the latching projection 49 of the shutter plate 36 in a direction along the axis of the support shaft 48. In this state, as shown in FIG. 14, when the mechanical key 25 is inserted into the mechanical key insertion hole 37 and the through hole 102, the push plate 97 and the follower 98, which has the fitting portion 98c abutting against the outer end part of the push plate 97, are pushed out in the radially outward direction of the cam plate 95 against the spring force of the spring 104 urging the push plate 97, and the slide member 99 thus slides to the side on which it moves toward the first restricting member 57.

[0067] When the mechanical key 25 is pivoted from the LOCK position to the OFF position, as shown in FIG. 15, the lever member 96 makes the one end portion 96a become disengaged from the recess 101 of the collar portion 95b of the cam plate 95 and pivots it to a position in which it is in sliding contact with the outer periphery of the collar portion 95b, and the other end portion 96b of the lever member 96 pivots the pivoting plate portion 57a of the first restricting member 57 in the counterclockwise direction in FIG. 15. The first restricting member 57 is thereby pivoted to a position where the first engagement projection portion 57b abuts against and engages with the one peripheral end portion 49a of the latching projection 49 of the shutter plate 36 and where the first pressure-receiving projecting portion 57d is displaced from the first pressing projecting portion 84a of the slide case 84 in the peripheral direction of the support shaft 48; in response to release of a state in which the first engagement projection portion 57b abuts against the latching projection 49 of the shutter plate 36 at the LOCK position, as shown in FIG. 16, the first restricting member 57

moves in a direction in which the pivoting plate portion 57a is made to move toward the shutter plate 36 by means of the axial resilient force of the second torsion spring 63, and the first engagement projection portion 57b is made to move toward and oppose the one peripheral end portion 49a of the first latching projection 49 in the peripheral direction of the support shaft 48 and, furthermore, abut against and engage with the one peripheral end part of the first latching projection 49 by means of the spring force of the second torsion spring 63.

[0068] In this arrangement, if pivoting of the first restricting member 57 is allowed, due to the spring force of the second torsion spring 63 acting on the shutter plate 36 via the first restricting member 57, the shutter plate 36 is pivotally urged toward the closed position side, but pivoting of the first restricting member 57 is prevented by the lever member 96 and the slide member 99. That is, when at the OFF position the pivoting plate portion 57a of the first restricting member 57 is pivoted in the counterclockwise direction in FIG. 15 by means of the lever member 96, the pivoting plate portion 57a pivots so that part thereof passes between the abutment portion 99a at the extremity of the slide member 99 and the collar portion 95b of the cam plate 95, the first restricting member 57 is moved by means of the axial resilient force of the second torsion spring 63 in a direction in which the pivoting plate portion 57a moves toward the shutter plate 36, as shown in FIG. 15 the abutment portion 99a is thereby made to abut against the pivoting plate portion 57a so as to oppose the pivotally urging direction of the first restricting member 57 by means of the spring force of the second torsion spring 63, and the first restricting member 57 is therefore prevented from pivoting. Furthermore, the other end portion 96b of the lever member 96 remains abutting against the pivoting plate portion 57a of the first restricting member 57, and since the one end portion 96a of the lever member 96 abuts against the outer periphery of the collar portion 95b of the cam plate 95, pivoting of the first restricting member 57 is also prevented by the lever member 96.

[0069] When the mechanical key 25 is pivoted to the ON position, the cam plate 95 pivots to the position shown in FIG. 17, but the lever member 96, the follower 98, and the slide member 99 do not change from the state at the OFF position shown in FIG. 15 and FIG. 16, and the first restricting member 57 does not pivot.

[0070] When the mechanical key 25 is returned to the LOCK position and the mechanical key 25 is pulled out, as shown in FIG. 18, the push plate 97 of the cam plate 95 returns to a position in which the through hole 102 is closed, the slide member 99 returns, via the follower 98, to a position in which engagement with the first restricting member 57 is released, and since the recess 101 on the outer periphery of the collar portion 95b of the cam plate 95 attains a position corresponding to the one end portion 96a of the lever member 96, the first restricting member 57 can pivot the lever member 96 so that the one end portion 96a is housed in the recess 101, the shutter plate

36 is thereby automatically pivoted to the closed position by means of the spring force obtained by subtracting the spring force of the first torsion spring 62 from the spring force of the second torsion spring 63, and this pivoting of the shutter plate 36 to the closed position makes the inclined face 54 at the extremity of the restricting arm portion 36d of the shutter plate 36 abut against the second engagement projection portion 58b of the second restricting member 58 to thus push down the second restricting member 58 against the urging force of the first coil spring 64, thereby engaging the second engagement projection portion 58b of the second restricting member 58 with the latching recess 53 at the extremity of the restricting arm portion 36d.

[0071] That is, the closed position side urging force control means 94 stops the function of the first torsion spring 62 when the shutter plate 36 operates from the closed position to the open position, and makes the urging force of the first torsion spring 62 act on the shutter plate 36 in response to pulling the mechanical key 25 at the LOCK position out of the mechanical key insertion hole 37 in a state in which the shutter plate 36 is at the open position,.

[0072] The mechanical key 25 at the OFF position could be pulled out of the mechanical key insertion hole 37, and in this case since the closed position side urging force control means 94 does not make the urging force of the second torsion spring 63 act on the shutter plate 36, at the OFF position the shutter plate 36 does not automatically pivot to the closed position side. Pivoting the part of the operating shaft 50 projecting from the casing 35 enables the shutter plate 36 to be pivoted to the closed position, but in this process since the first restricting member 57 is in a state in which pivoting is prevented by means of the slide member 99 and the lever member 96, the shutter plate 36 pivots while leaving behind the first restricting member 57, and the closed position of the shutter plate 36 is restricted by the second engagement projection portion 58b of the second restricting member 58 engaging with the latching recess 53. Furthermore, when opening the shutter plate 36, the magnet key 27 may be inserted into the slide case 84 and pushed down, and due to the second restricting member 58 being pushed down the second engagement projection portion 58b is disengaged from the latching recess 53, restriction of the closed position of the shutter plate 36 by means of the second restricting member 58 is released, and since the spring force of the second torsion spring 63 is not acting on the shutter plate 36, the shutter plate 36 is automatically pivoted to the open position by means of the spring force of the first torsion spring 62.

[0073] The operation of this embodiment is now explained; the protection device 24 mounted on the cylinder body 23 of the cylinder lock 22 includes the closed position restriction means 56, which can switch between the restricted state in which the shutter plate 36 is restricted to the closed position and the restriction release state in which operation of the shutter plate 36 to the open posi-

tion is allowed, the restricted state release means 65, which can release the restricted state of the closed position restriction means 56 to thus put it into the restriction release state, the first torsion spring 62, which urges the shutter plate 36 toward the open position side, the second torsion spring 63, which can urge the shutter plate 36 toward the closed position side with an urging force that is larger than that of the first torsion spring 62, and the closed position side urging force control means 94, which controls transmission of the urging force from the second torsion spring 63 to the shutter plate 36 so that the function of the second torsion spring 63 is stopped at least when the shutter plate 36 operates from the closed position to the open position and the urging force acts on the shutter plate 36 from the second torsion spring 63 in response to pulling of the mechanical key 25 out of the mechanical key insertion hole 37 at a predetermined pivoting position (LOCK position).

[0074] Therefore, when the restricted state release means 65 releases the restricted state due to the closed position restriction means 56, the function of the second torsion spring 63 is stopped by the closed position side urging force control means 94 when the shutter plate 36 operates from the closed position to the open position, and the shutter plate 36 is thereby automatically pivoted from the closed position to the open position by means of the urging force applied from the first torsion spring 62. Furthermore, in a state in which the shutter plate 36 is at the open position, when the mechanical key 25 inserted into the cylinder lock 22 side from the mechanical key insertion hole 37 is pulled out of the mechanical key insertion hole 37 at the LOCK position, the closed position side urging force control means 94 allows the second torsion spring 63, which exhibits a spring-biasing force that is larger than that of the first torsion spring 62, to make the urging force act on the shutter plate 36, the urging force from the second torsion spring 63 thereby acts on the shutter plate 36 and the shutter plate 36 automatically pivots to the closed position, and the shutter plate 36 thus automatically moves between the closed position and the open position, thereby enhancing the ease of operation.

[0075] Moreover, since the restricted state release means 65 includes the magnet lock 66, which is unlocked by the magnet key 27, and is arranged so as to operate in response to a predetermined operation (pushing-in operation) of the magnet key 27 in the unlocked state and release the restricted state of the closed position restriction means 56, it is possible to release the restricted state of the closed position restriction means 56 with a simple operation using the magnet key 27.

[0076] An embodiment of the present invention is explained above, but the present invention is not limited to the above embodiment and may be modified in a variety of ways as long as the modifications do not depart from the spirit and scope thereof.

Claims

1. A cylinder lock protection device in which a shutter plate (36) is housed in a casing (35) having a mechanical key insertion hole (37) for a mechanical key (25) to be inserted into a cylinder lock (22) so that the shutter plate (36) is capable of moving between a closed position in which the mechanical key insertion hole (37) is closed and an open position in which the mechanical key insertion hole (37) is opened, **characterized in that** the device comprises closed position restriction means (56) that can switch over between a restricted state in which the shutter plate (36) is restricted to the closed position and a restriction release state in which operation of the shutter plate (36) to the open position is allowed, restricted state release means (65) that can release the restricted state of the closed position restriction means (56) so as to attain the restriction release state, open direction urging means (62) that urges the shutter plate (36) toward the open position side, closed direction urging means (63) that can apply an urging force that is larger than an urging force of the open direction urging means (62) to the shutter plate (36) toward the closed position side, and closed position side urging force control means (94) that controls transmission of the urging force from the closed direction urging means (63) to the shutter plate (36) so that a function of the closed direction urging means (63) is stopped at least when the shutter plate (36) is operated from the closed position to the open position and the urging force acts on the shutter plate (36) from the closed direction urging means (63) in response to the mechanical key (25) being pulled out of the mechanical key insertion hole (37) at a predetermined pivoting position.

2. The cylinder lock protection device according to Claim 1, wherein the restricted state release means (65) comprises a magnet lock (66) that is unlocked by the magnet key (27), and the restricted state release means (65) is arranged so as to release the restricted state of the closed position restriction means (56) by operating in response to a predetermined operation of the magnet key (27) in an unlocked state.

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FIG.1

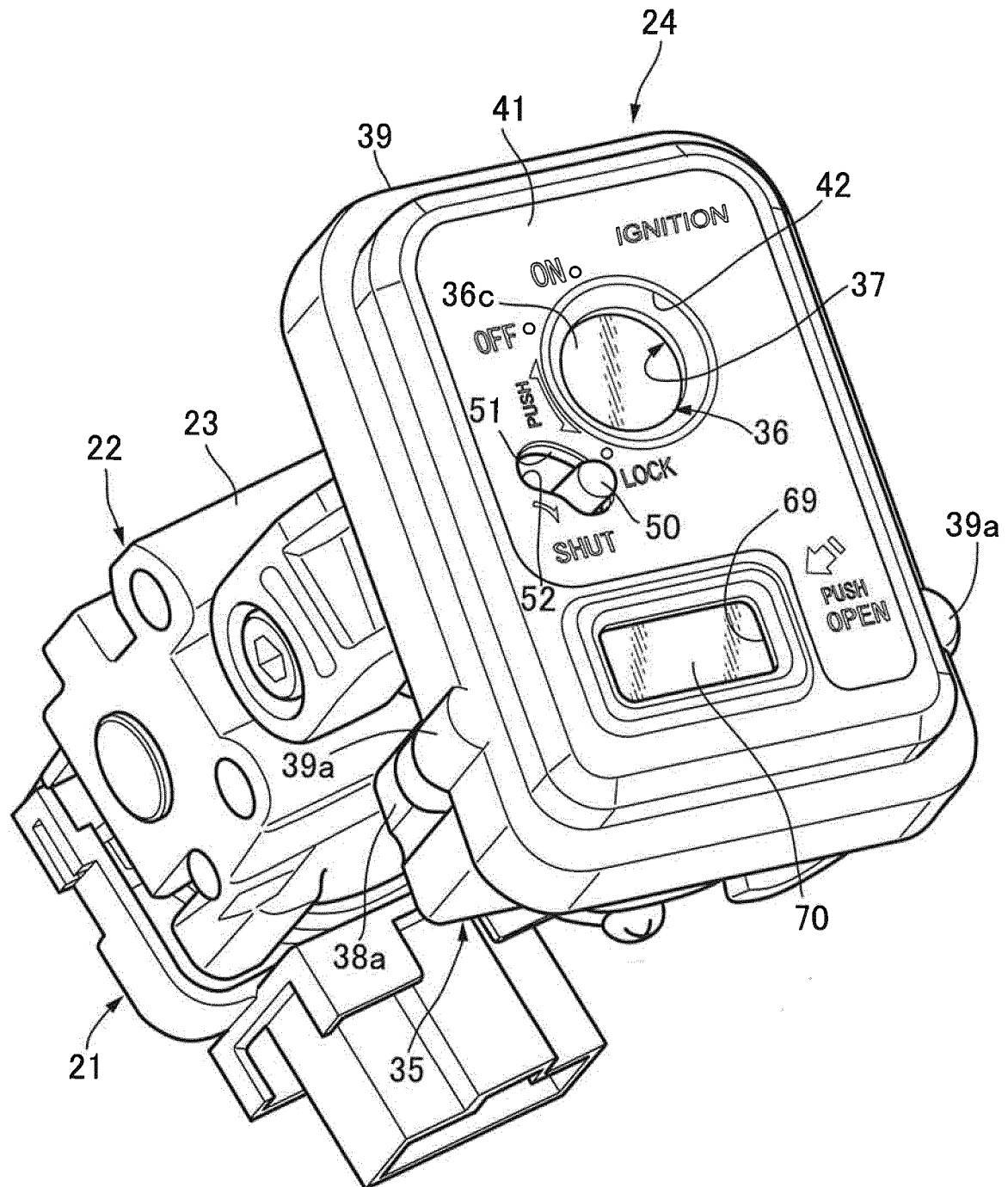


FIG.2

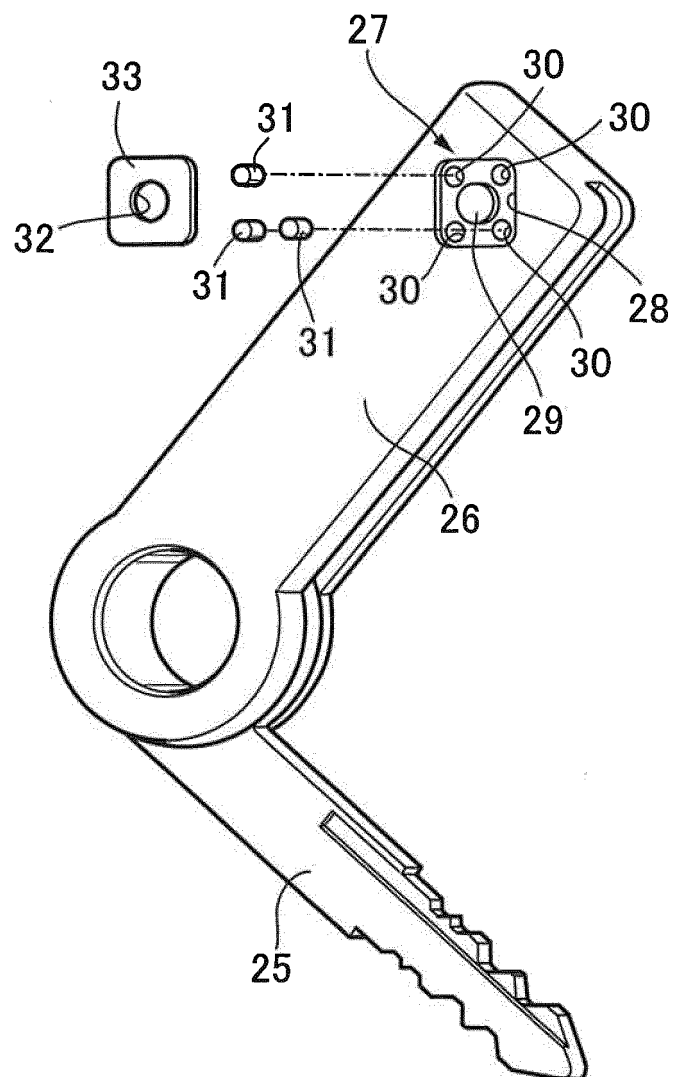


FIG. 3.

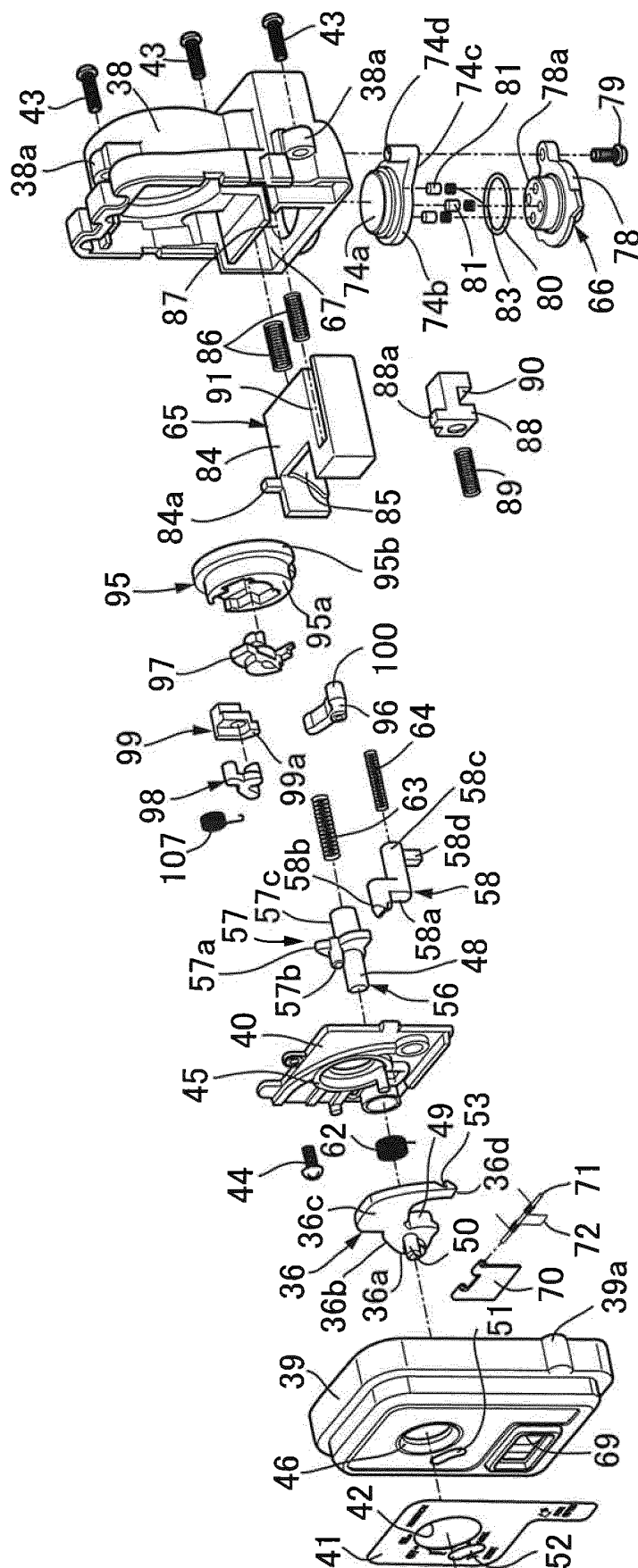


FIG.4

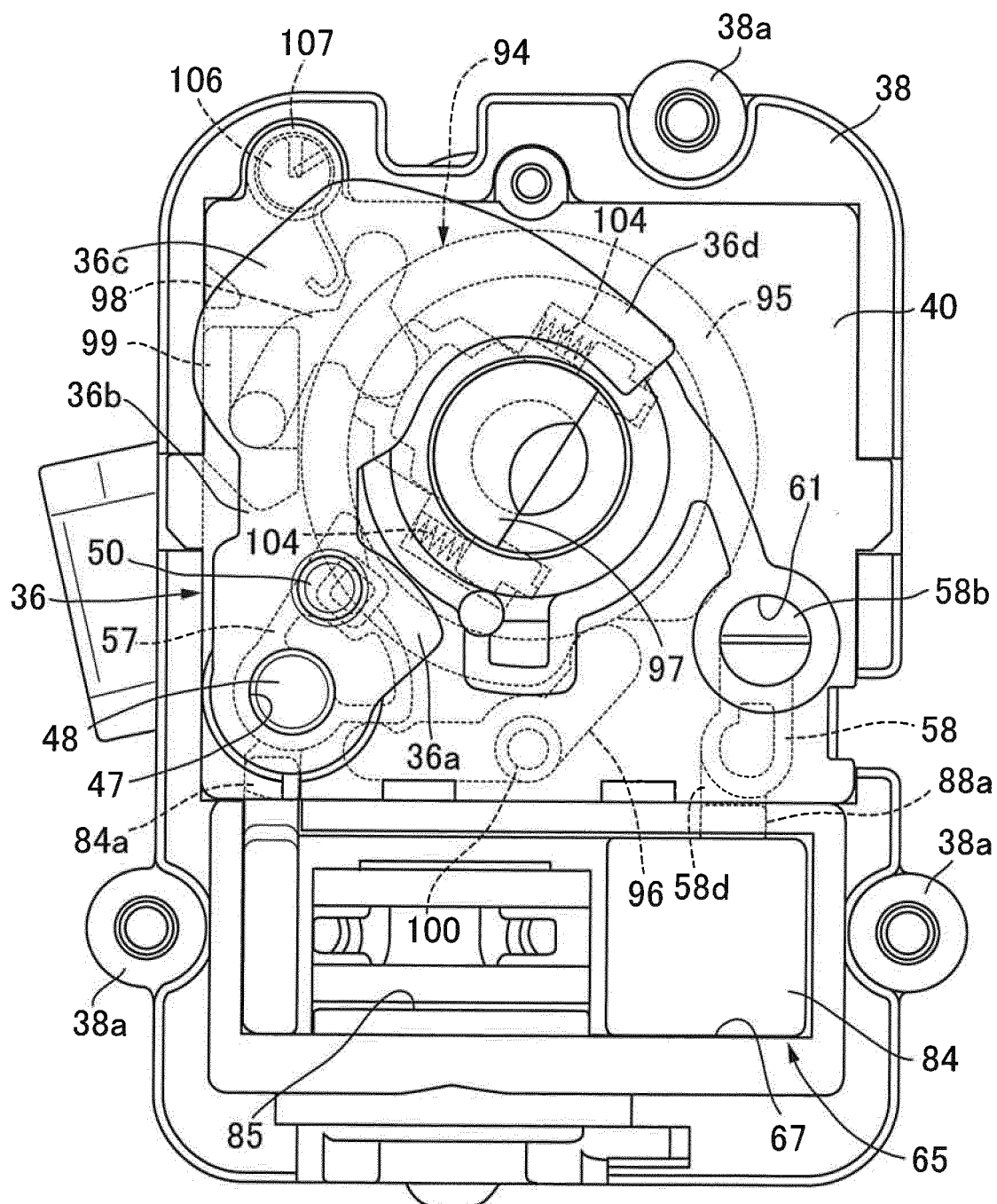


FIG.5

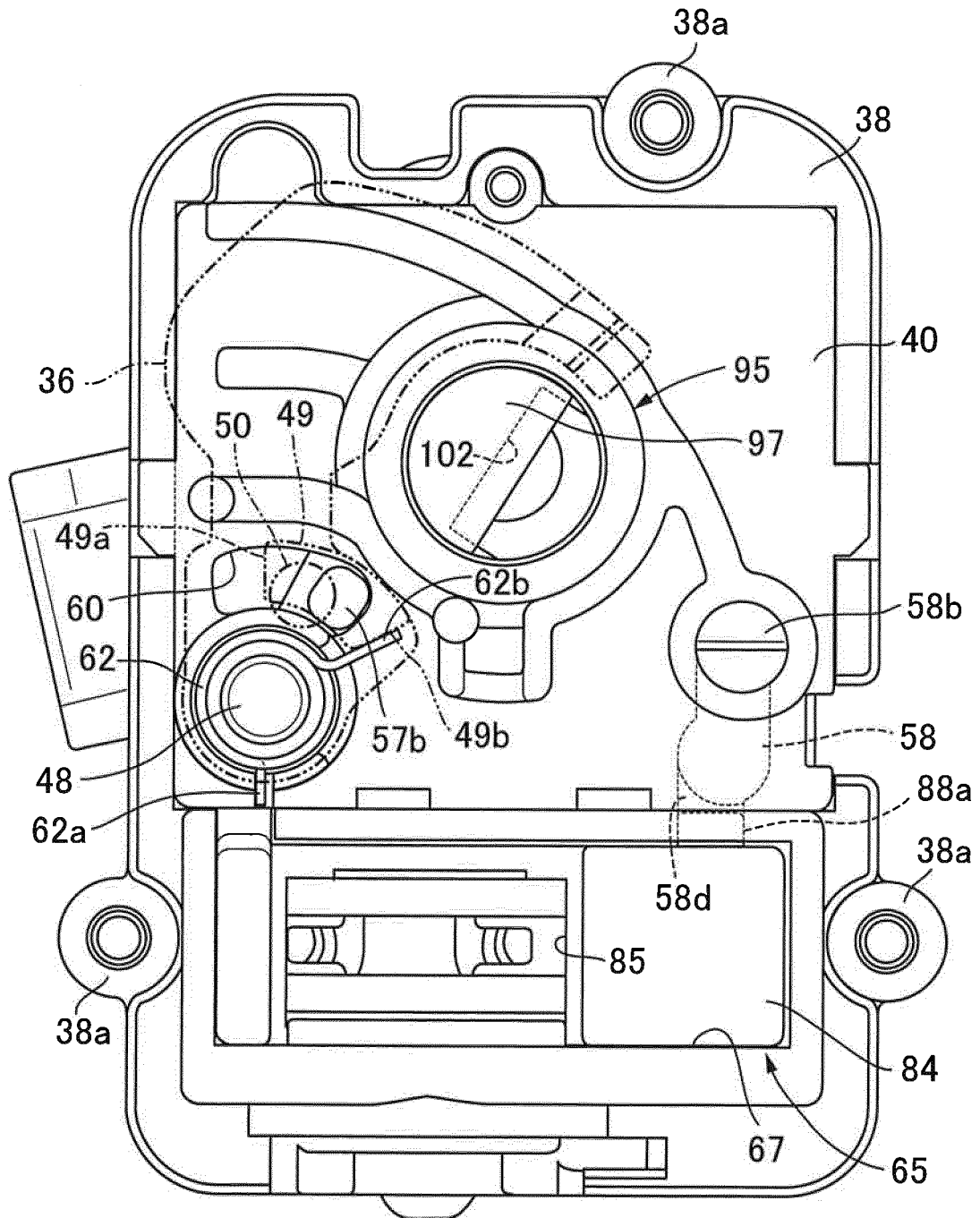


FIG.6

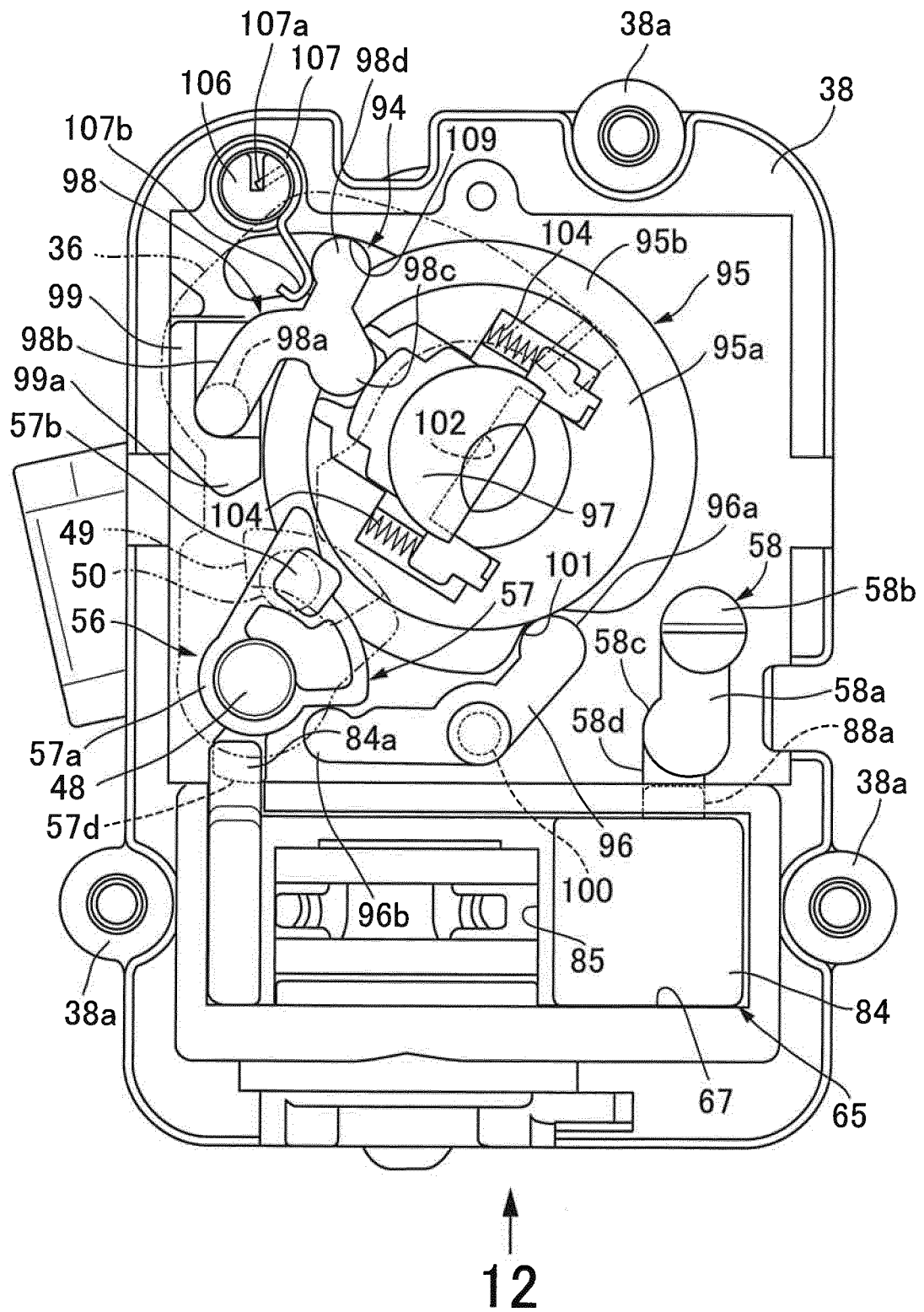


FIG.7

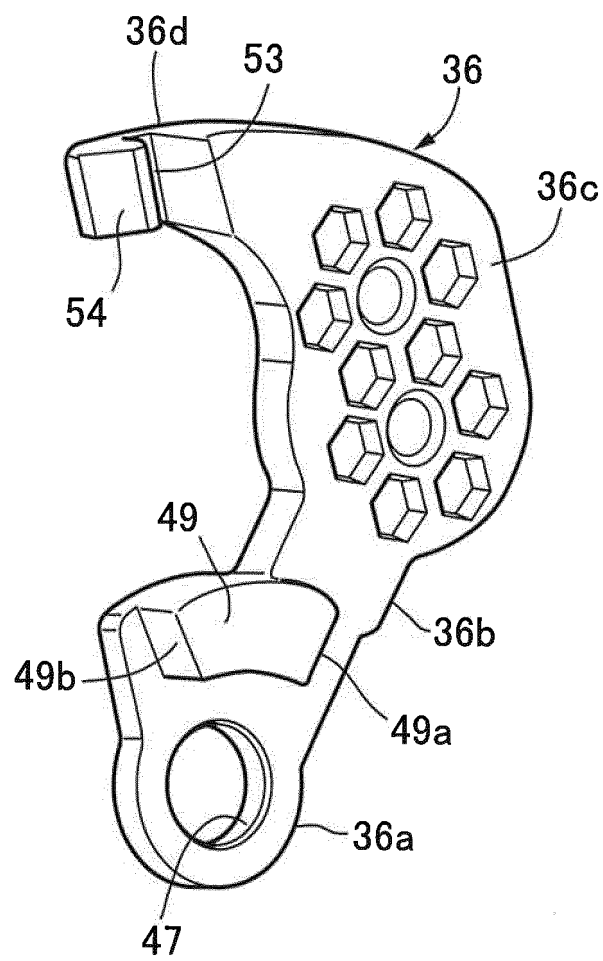
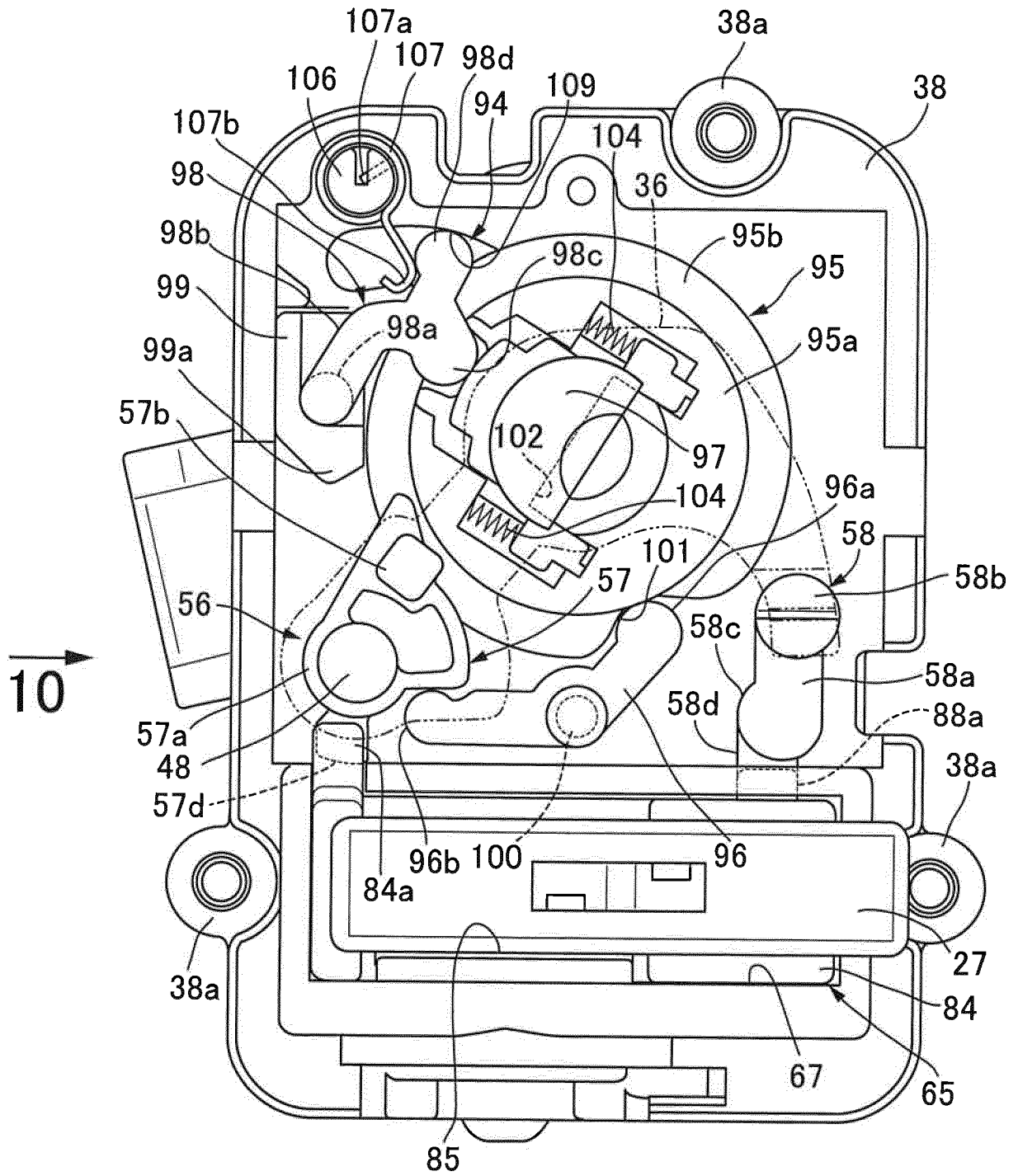


FIG.8



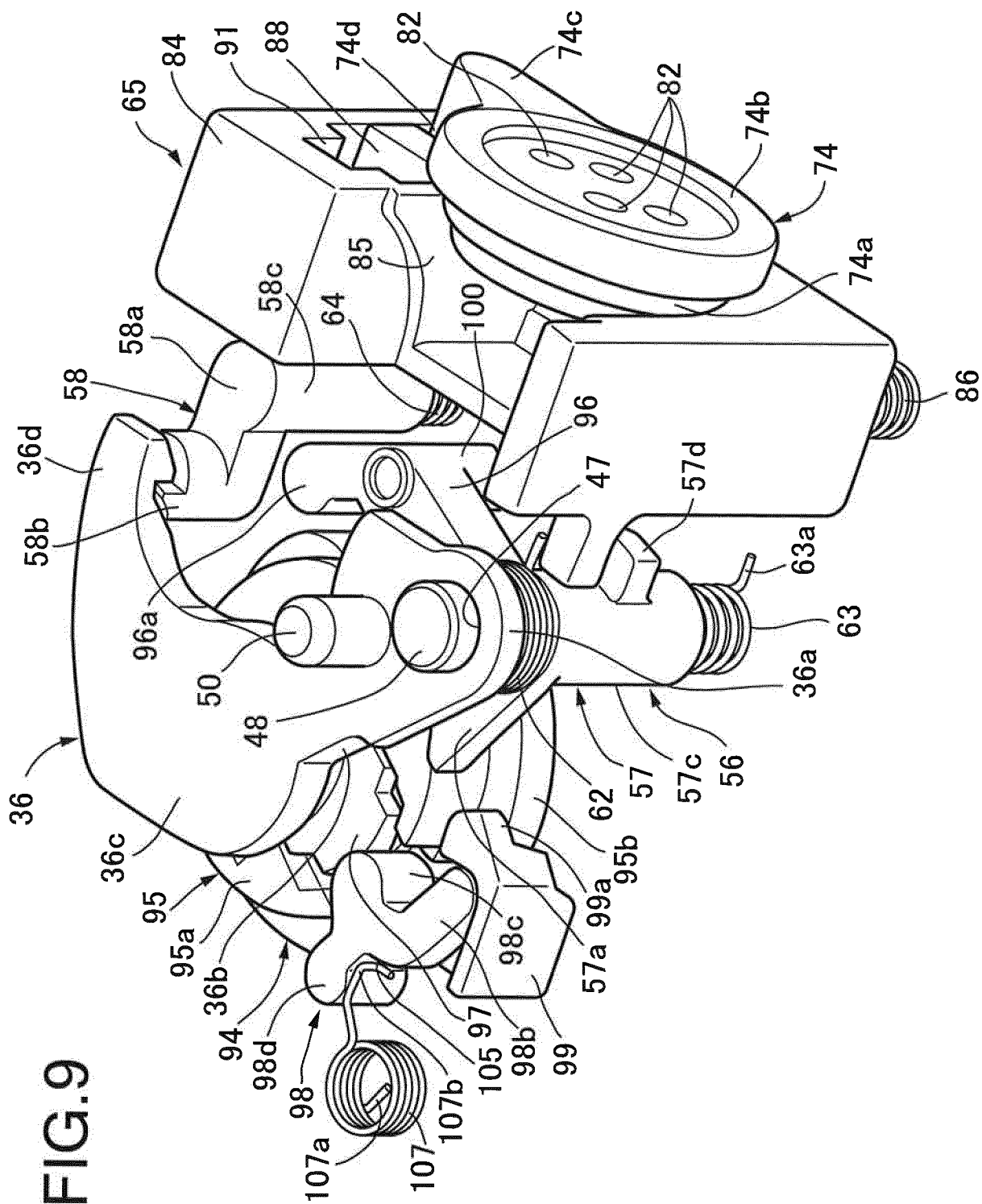


FIG.10

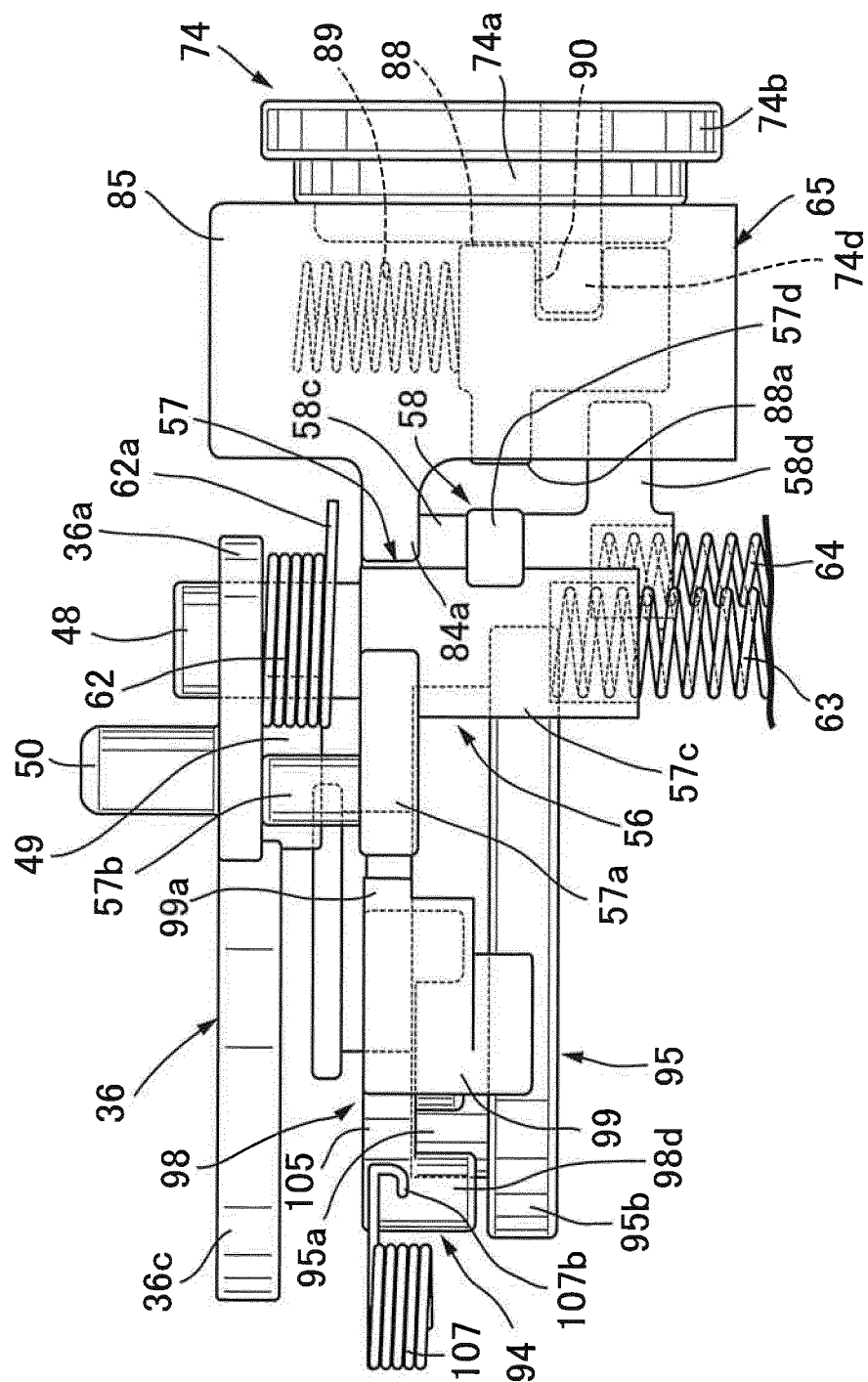


FIG.11

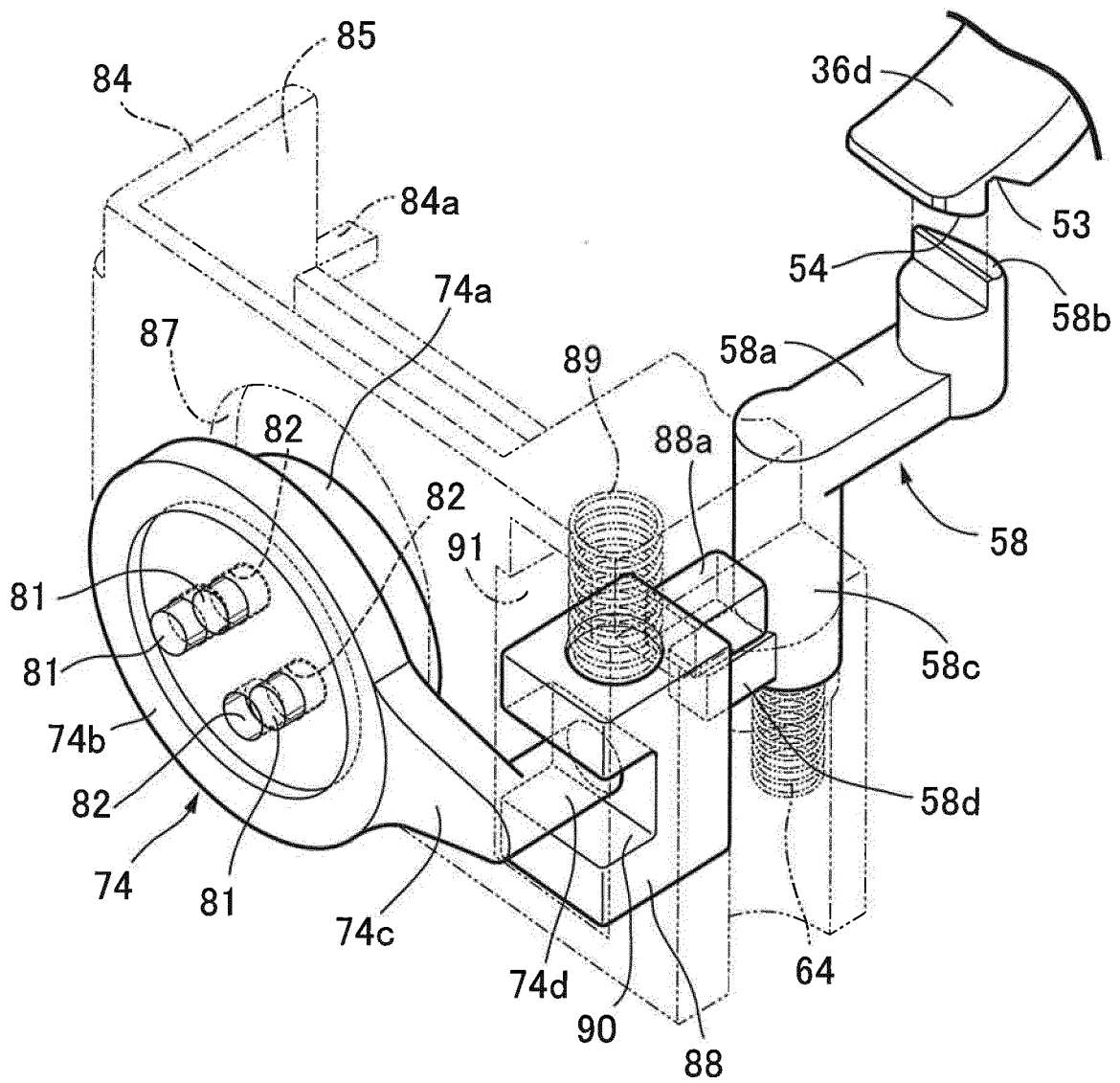


FIG.12

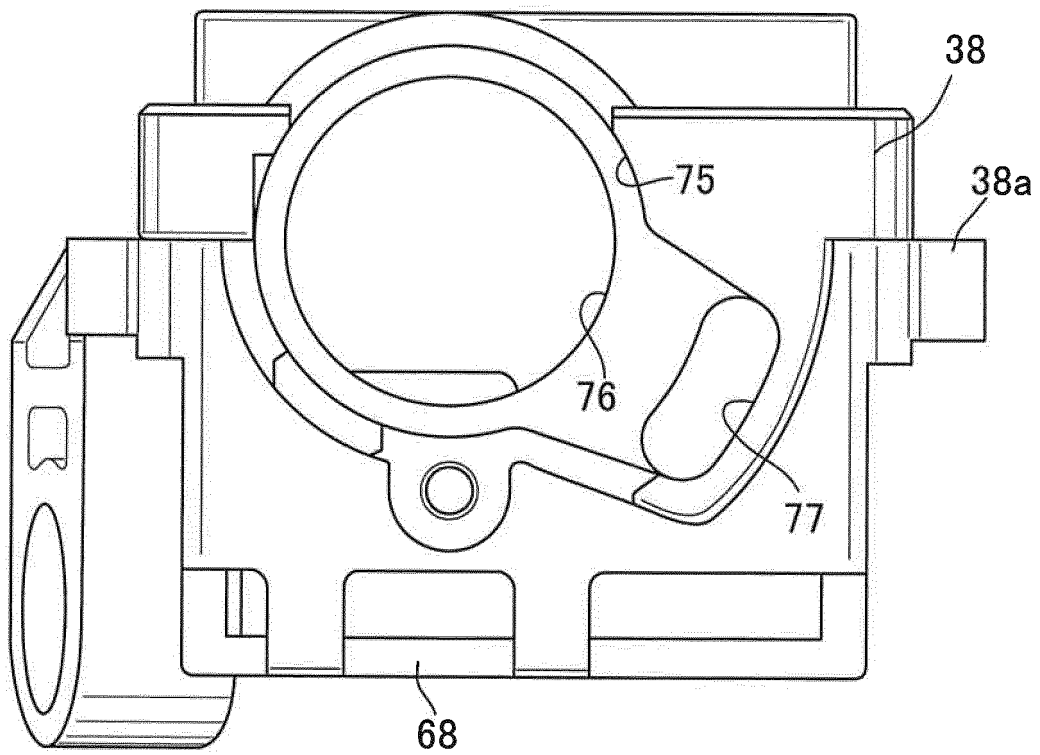


FIG.13

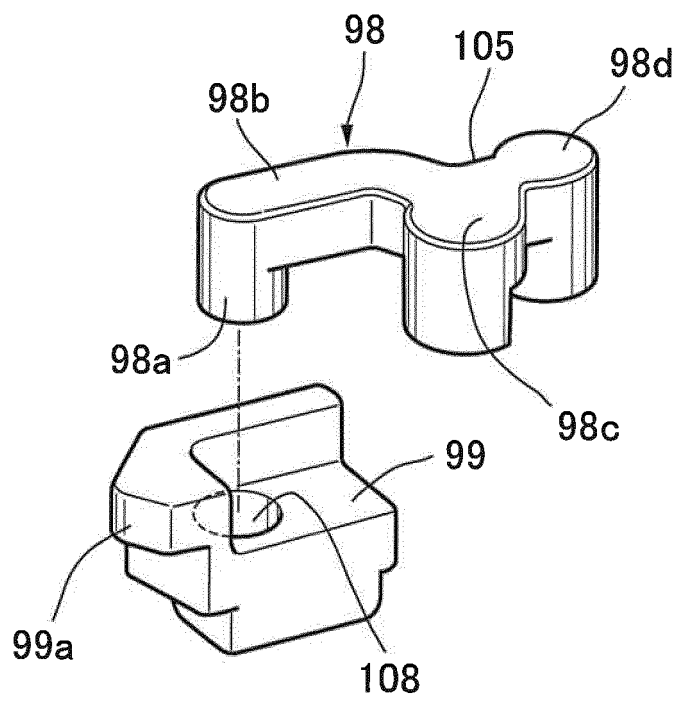


FIG. 14

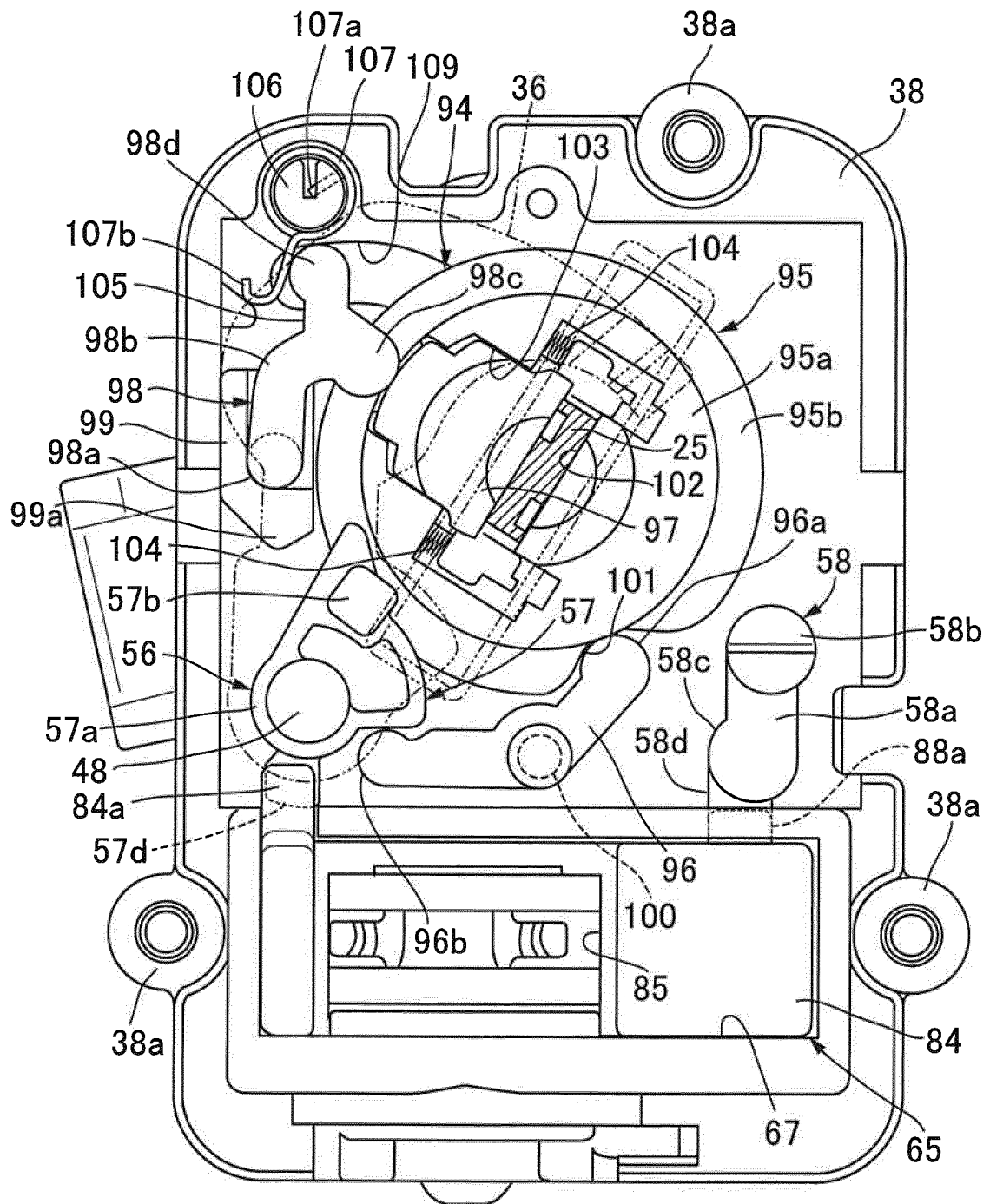


FIG. 15

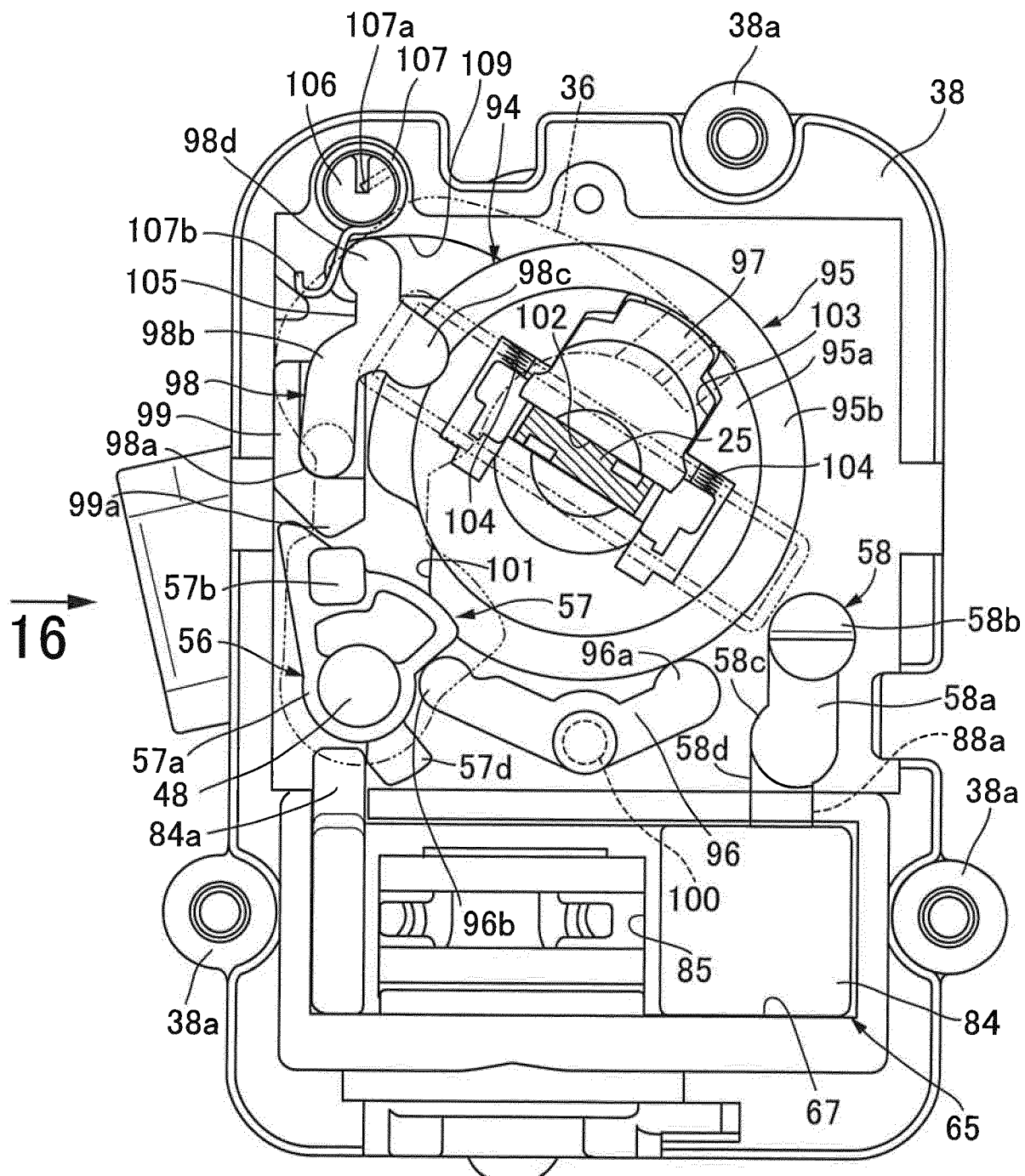


FIG.16

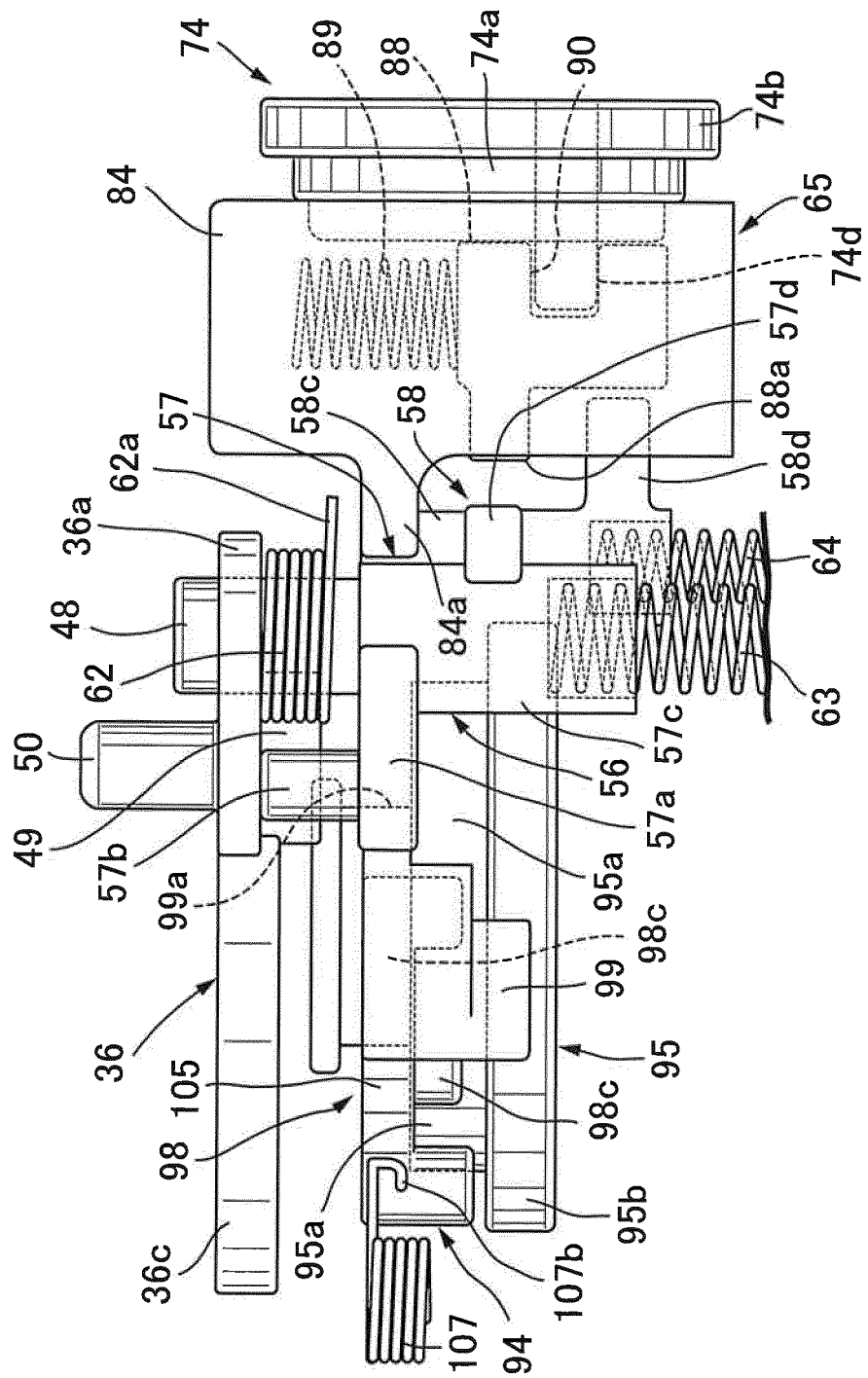


FIG. 17

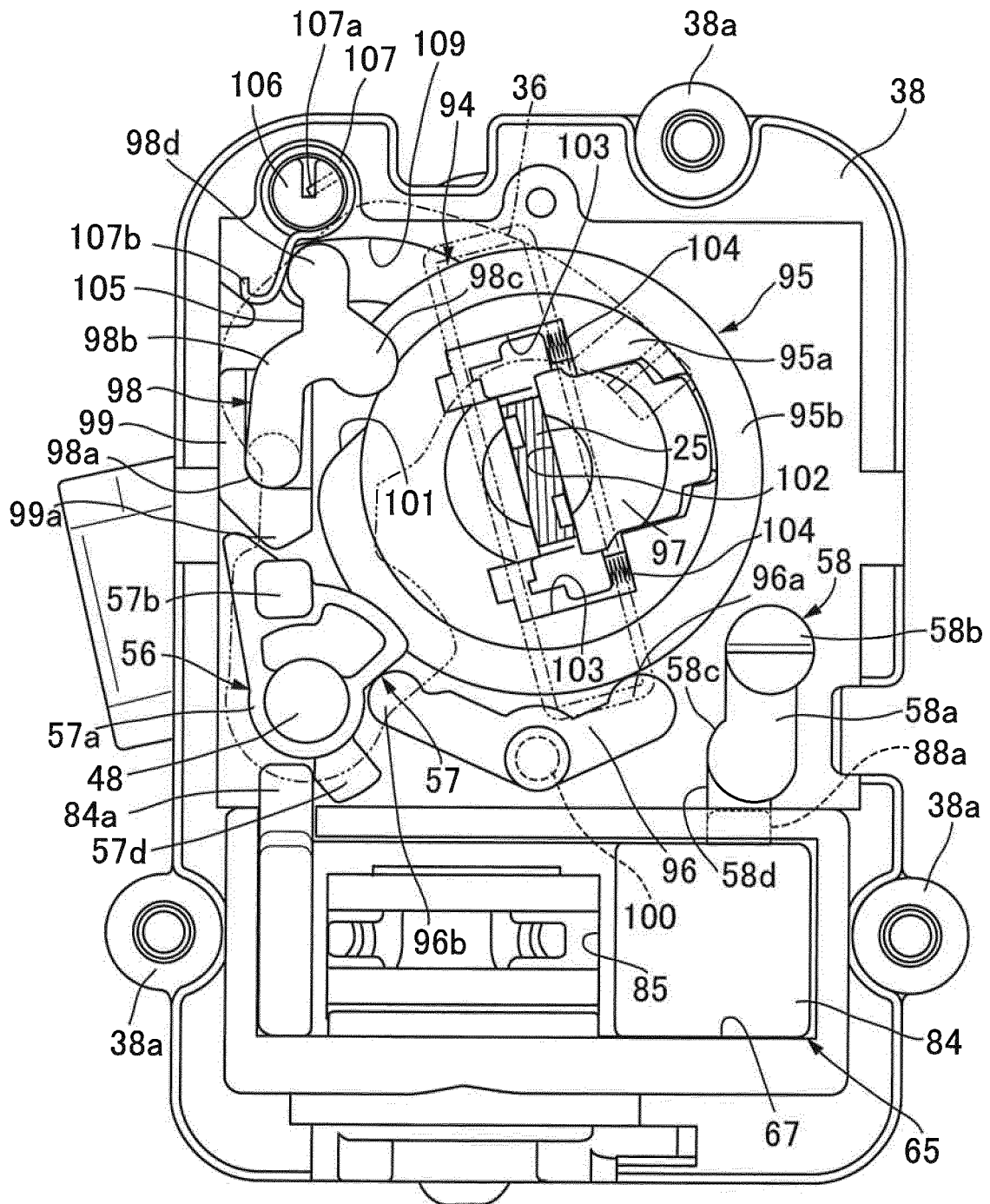
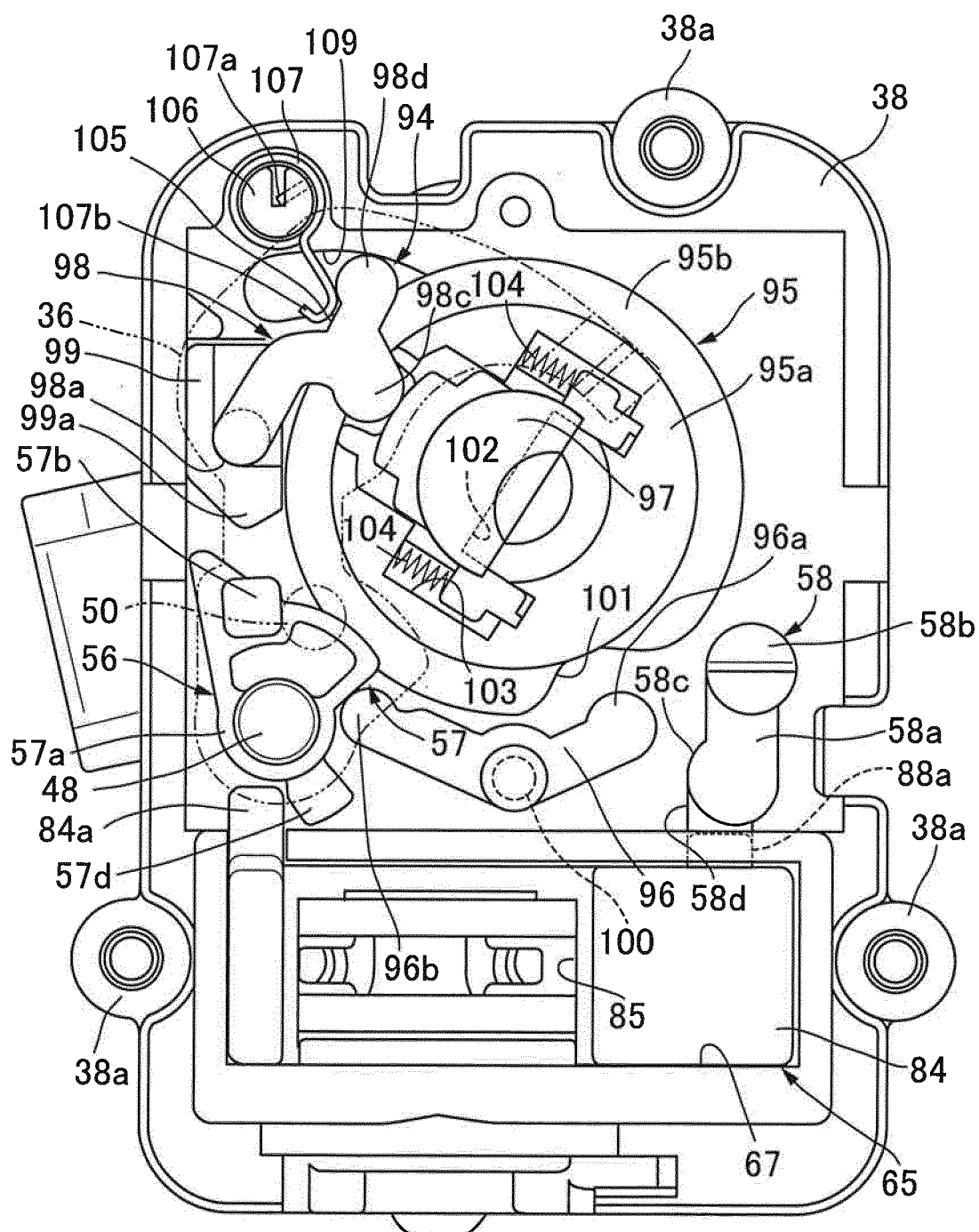


FIG.18



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/081983

A. CLASSIFICATION OF SUBJECT MATTER

E05B17/18(2006.01)i, E05B47/00(2006.01)i, E05B83/00(2014.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E05B17/18, E05B47/00, E05B83/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2015

Kokai Jitsuyo Shinan Koho 1971-2015 Toroku Jitsuyo Shinan Koho 1994-2015

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2010-168882 A (Asahi Denso Co., Ltd.), 05 August 2010 (05.08.2010), entire text; all drawings & CN 101660371 A & TW 201014954 A	1, 2
A	JP 2003-239581 A (Asahi Denso Co., Ltd.), 27 August 2003 (27.08.2003), entire text; all drawings (Family: none)	1, 2

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
16 February 2015 (16.02.15)Date of mailing of the international search report
03 March 2015 (03.03.15)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 3914043 B [0003]