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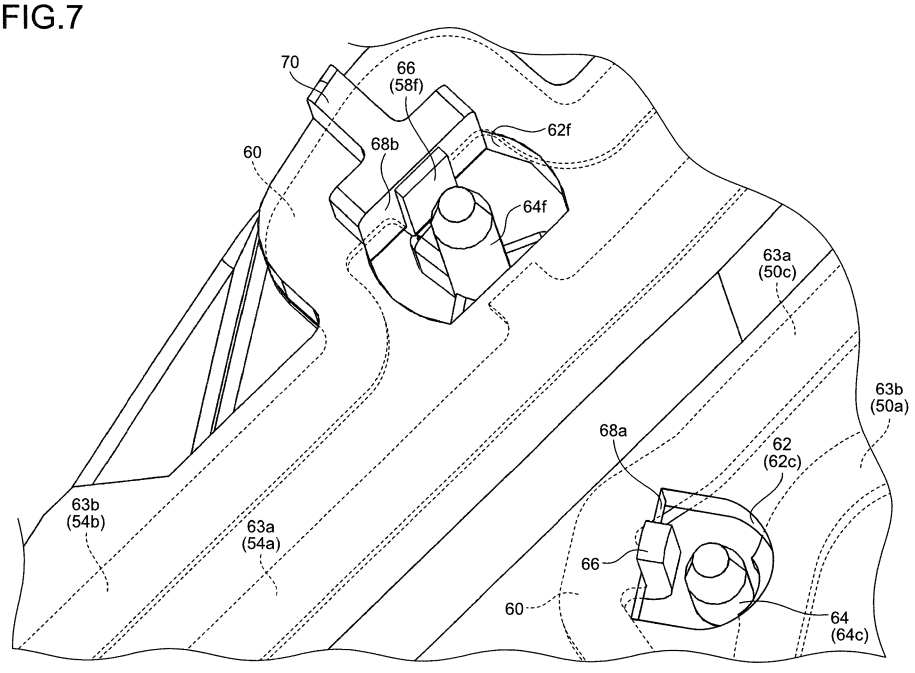
(54) DOOR LOCK DEVICE

(57) A door lock device 10 includes a casing 14, an electric components housed in the casing 14, first and second terminals 63a, 63b being electrically conductive and connected to the electric components, a plate 38 that holds the first terminal 63a and the second terminal 63b and having holes 62 formed at positions between the two terminals, bent pieces 66 that protrude from the first terminal 63a and are bent at an edge of the holes 62, and pins 64 that protrude from the casing 14, that are positioned inside of the holes 62, and are interposed between the bent piece 66 and the second terminals 63b. The bent pieces 66 are inserted into the holes 62. Each of the bent piece 66 is resultant of being cut off from the second terminal 63b, and has one cutout 61.

FIG.7



EP 3 575 525 A1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

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

2. Description of the Related Art

[0002] A door lock device for a vehicle is a device that, when the door is closed, becomes engaged with a striker on a vehicle and holds the striker, and when the door is open, releases the striker. Such a door lock device has some electric parts that are housed in a casing. For example, there is a switch for detecting the status of a locking-and-unlocking member, a switch for a room lamp, a motor for rotating levers, and conductive terminals that are connected to these electric parts. These electric parts are fixed to a plate, and the entire plate is attached to the casing.

[0003] Terminals are often provided as a pair in parallel, in a manner corresponding to a switch or a motor. In the door lock device disclosed in Japanese Patent No. 4517914, before the terminals are fixed to the plate, an integration of two terminals, integrated with several short links, is attached to the plate, and the links are then cut off so that the integration is divided into two terminals in the subsequent step. Cutouts are provided to both ends of the link. In other words, cutouts for allowing the link to be cut off easily are provided to both ends, that is, two points, of the link.

Patent Document 1: Japanese Patent No. 4517914

[0004] In the door lock device disclosed in Patent Document 1, one end of the link is cut off by pushing the link, but because the cutout is provided to the other end, too, the link cannot be bent at a sharp angle. If the link is bent at a sharp angle, the other end might also break off, and the link might get inside of the casing. Because the link cannot be bent at a sharp angle, only a short distance is ensured between the terminals near the bent piece, and the terminals may become electrically connected to each other when that part becomes wet, and a conduction failure may occur.

[0005] The present invention is made in consideration of the above, and an object of the present invention is to provide a door lock device capable of improving insulation between two terminals.

SUMMARY OF THE INVENTION

[0006] To resolve the above problems and attain the object, a door lock device according to the present invention includes a housing; electric components housed in the housing; first and second terminals, each of which being electrically conductive and connected to the electric components; a plate that holds the first terminal and the second terminal and having holes formed at positions corresponding to positions between the first terminal and the second terminal; bent pieces that protrudes from the first terminal and are bent at edges of the holes; and insulating pins that protrude from the housing, are positioned inside of the respective holes, and are interposed between the respective bent pieces and the second terminal.

[0007] The bent pieces may be inserted into the respective holes.

[0008] The bent pieces may be resultant of being cut off from the second terminal along respective cutouts, and have respective cut off portions.

[0009] The first terminal may have curved portions projecting in a direction moving away from the second terminal, and the bent pieces may protrude from the respective curved portions.

[0010] the plate may have a bumper that protrudes, and the bumper that is being elastically deformed may be kept in abutment with the housing.

[0011] In the door lock device according to the present invention, because the bent piece on the first terminal is bent at the edge of the hole, and the pin is interposed between the bent piece and the second terminal, the insulation between the two terminals can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG. 1 is a perspective view of a door lock device according to an embodiment;
FIG. 2 is a side view of the door lock device seen from inside of a cabin, with a cover and a waterproofing cover removed;
FIG. 3 is a side view of the door lock device seen from outside of the cabin, with a casing and the waterproofing cover removed;
FIG. 4 is an exploded perspective view of a plate and a terminal attached to the plate;
FIG. 5 is a partially enlarged perspective view of inside of the casing;
FIG. 6A is a perspective view of a hole, a link, and the surroundings before the link is cut off at a cutout;
FIG. 6B is a perspective view after the link is cut off at the cutout;
FIG. 7 is a first partially enlarged perspective view of the plate attached to the casing;
FIG. 8 is a sectional view of the hole, the bent piece, and the pin;
FIG. 9 is a second partially enlarged perspective view of the plate attached to the casing;
FIG. 10 is a perspective view illustrating an assembly process for attaching the plate to the casing;
FIG. 11 is a perspective view of the casing with the plate and other parts assembled thereto; and

FIG. 12 is a perspective view of a bumper provided to the plate and the surroundings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] A door lock device according to an embodiment of the present invention will be explained in detail with reference to the accompanying drawings. Note that the present invention, however, is not limited to the scope of the embodiment.

[0014] FIG. 1 is a perspective view of a door lock device 10 according to an embodiment of the present invention. The door lock device 10 is to be mounted inside of a vehicle door (e.g., a front side door), and includes a door latch device 12, a casing 14, and a cover 16. In this example, the casing 14 and the cover 16 have different names, but both of these elements are housings that are assembled into one unit to cover internal parts. The casing 14 may be referred to as an outer housing. The cover 16 may be referred to as an inner housing. The door lock device 10 illustrated in FIG. 1 is an example in which the door lock device 10 is used in the right side door of a vehicle, but it is also possible to achieve a door lock device 10 to be used in the left side door by a symmetrical structure.

[0015] The door lock device 10 includes a coupler 18 to be electrically connected with an external device, a waterproofing cover 20, waterproofing seals 22 and 24, and a cable cover 26. The waterproofing cover 20 covers the boundary between the casing 14 and the cover 16, on the top surface and the front surface of the door lock device 10. The waterproofing seal 22 covers the circumference of the coupler 18. The waterproofing seal 24 covers the upper side and both sides of the door latch device 12, and covers a part of the inner side, up to a position reaching the cable cover 26. The cover 16 has a bulged portion 16a extending along a vertical direction.

[0016] The door latch device 12 is a device that closes the door of the vehicle and that makes the door ready to be open, by becoming engaged with and removed from a striker that is provided to the vehicle body. The door latch device 12 is fixed to the casing 14 on the rear side of the vehicle, and is supported by the casing 14 in this orientation. Such a door latch device 12 includes a body 12a, a cover plate 12b, and a latch mechanism 12c. The latch mechanism 12c is provided to the body 12a, and covered by the cover plate 12b. The cover plate 12b has an entry groove 12d, and is attached to the body 12a in such a manner that the entry groove 12d communicates with the latch mechanism 12c in an in-and-out direction of the vehicle. The entry groove 12d is a groove where the striker on the vehicle enters when the door of the vehicle is closed.

[0017] FIG. 2 is a side view of the door lock device 10 seen from the inside of the cabin, with the cover 16 and the waterproofing cover 20 removed, and FIG. 3 is a side view of the door lock device 10 seen from the outside of the cabin, with the casing 14 and the waterproofing cover 20 removed. To avoid complexity, some of the elements are omitted in FIGS. 2 and 3. As illustrated in FIGS. 2 and 3, the door lock device 10 includes, as electric parts, two motors 28a and 28b and three switches 30a, 30b, and 30c inside the door lock device 10. Rotational axes 32a, 32b of the motors 28a, 28b are provided with worm gears 34a, 34b, and are engaged with wheel gears that are not illustrated. It is preferable for the worm gears 34a, 34b to be slidable in the axial direction for a purpose of ensuring the engagement with the wheel gears, and these worm gears 34a, 34b are not fixed to the rotational axes 32a, 32b.

[0018] The motors 28a, 28b and the switches 30a, 30b, 30c are fixed to a plate 38. The plate 38 fixes together and electrically connects the electric parts of the door lock device 10 to the others. The plate 38 extends along the waterproofing cover 20, across the top to the front surfaces in the door lock device 10, and is provided immediately below the waterproofing cover 20. The switch 30a is held at a rear upper end of the plate 38. A coupler pin 18a of the coupler 18 is held at a bottom front end, and the switch 30c is held near the coupler pin 18a. The switch 30b is held substantially at the center of the plate 38, and the motors 28a, 28b are held above and below the switch 30b, respectively, with the switch 30b interposed therebetween. A bumper 48a diagonally protruding toward the rear side is provided near the front bottom end of the plate 38, and a bumper 48b diagonally protruding toward the front side is provided near the rear upper end of the plate 38. The bumpers 48a, 48b have appropriate lengths and flexibility. Ribs 49a, 49b are provided upright to the cover 16, at positions facing the ends of the bumper 48a, 48b, respectively, and the bumper 48a, 48b are pressed against the ribs 49a, 49b, while being slightly elastically deformed.

[0019] Pairs of right and left engaging claws 40a, 40b hold the motors 28a, 28b, respectively, on the plate 38. The motors 28a, 28b are also aligned by front walls 42a, 42b and rear walls 44a, 44b, respectively, (see FIG. 2) provided upright from the casing 14. The rotational axes 32a, 32b are somewhat orientated diagonally downwards, but worm gears 34a, 34b do not fall because these gears are surrounded by side walls 46a, 46b, (see FIG. 2) provided upright on the casing 14. The side wall 46a and the front wall 42a are connected at their ends, and the side wall 46b and front wall 42b are connected at their ends.

[0020] As illustrated in FIG. 2, the plate 38 is provided with terminals that serve as power lines or signal lines to the electric components. The side of the plate 38 exposed in FIG. 2 will be referred to as a rear side, and the opposite side will be referred to as a front side. The terminals include signal line terminals 50a, 50b, 50c, 52 that are connected to the switches 30a, 30b, 30c, and power line terminal 54a, 54b, 56a, 56b that are connected to the motors 28a, 28b. Each end of those terminals is provided with the coupler pin 18a. Each of these terminals is po-

sitioned and fixed along a plate groove 38a that is provided on the plate 38. The signal line terminal 50a is a ground wire. The signal line terminals 50a, 50b, 50c, 52 and the power line terminals 54a, 54b are fixed to the rear side of the plate 38. The power line terminals 56a, 56b are fixed to the front side of the plate 38. The signal line terminal 50a intersects with the signal line terminal 52 in a non-contact fashion.

[0021] The signal line terminal 50b has a short length. The signal line terminals 50a, 50c have long lengths, and extend in parallel at positions near to each other. The signal line terminal 52 and the power line terminals 54a, 54c, 56a, 56b have somewhat long lengths. The power line terminals 54a, 54c extend in parallel at positions adjacent to each other.

[0022] At a stage prior to the assembly of the door lock device 10, the signal line terminal 50a and the signal line terminal 50b are connected to each other via a link 58a. Similarly, the signal line terminal 50a and the signal line terminal 50c are connected to each other via links 58b, 58c, 58d. In this way, the signal line terminals 50a to 50c are integrated as a terminal body 50. The power line terminal 54a and the power line terminal 54b are connected to each other via links 58e, 58f, and are integrated as a terminal body 54. The power line terminal 56a and the power line terminal 56b are connected to each other via links 58g, 58h, and are integrated as a terminal body 56. The signal line terminal 52 is provided as a single body. To make it possible to have certain lengths of the links 58a to 58h, a curved portion 60 is provided, which projects in a direction moving away from one of the terminals toward the other. The curved portion 60 may be provided to either one of the terminals extending in parallel, and as an example, the curved portions 60 of the links 58b, 58c are provided to the signal line terminal 50c, and the curved portion 60 of the link 58d is provided to the signal line terminal 50a. By forming the curved portion 60 where the distance between the terminals is short, not only the appropriate lengths of the links 58b, 58c, 58d, 58f, 58g can be ensured, so that these links to be easily cut off, but also pins 64, which will be described later, can be inserted easily, so that higher insulation can be ensured.

[0023] Holes 62a, 62b, 62c, 62d, 62e, 62f, 62g, 62h are provided, in the order listed herein, to the plate 38, at the position facing the links 58a, 58b, 58c, 58d, 58e, 58f, 58g, 58h, respectively.

[0024] To each of the links 58a to 58h, one cutout 61 is provided (see FIG. 6A). For explanation purposes, hereinafter, the link 58a to 58h may be collectively referred to as a link 58, and the holes 62a to 62h may be collectively referred to as a hole 62. Furthermore, among the two terminals extending in parallel, the terminal further away from the cutout 61 may be referred to as a first terminal 63a, and the terminal on the side provided with the cutout 61 may be referred to as a second terminal 63b. In the door lock device 10, the curved portion 60 is basically formed on the side of the first terminal 63a, but may alternatively be formed on the side of the second terminal 63b.

[0025] The cutout 61 may be provided either on the front side or on the rear side of the link 58, or may be provided to both of the surface positions facing each other. Otherwise, the cutout 61 may be provided as a neck portion with a smaller width. Each of these examples of the cutout 61 can substantially be considered as a single cutout. In the link 58 where the curved portion 60 is formed, the cutout 61 is provided, in a manner crossing the link 58, on the side which is further away from the curved portion 60. That is, the cutout 61 is formed at the end on the side where the link 58 is connected to the second terminal 63b. The hole 62 (see FIG. 6A) is provided immediately below the link 58 in a manner covering almost the entire length of the link 58. An edge of the hole 62 on the side of the first terminal 63a extends along a line that is perpendicular to the direction in which the link 58 extends, and has a beveled portion 68a. A hole wall 68b extending from the beveled portion 68a in a depth direction is a plane that is perpendicular to the front surface of the plate 38. As will be described later, the link 58 will be cut and bent at the cutout 61, in the assembling process, and each of the terminals comes to serve as independent conductive body that is insulated from the other. In other words, the cutout 61 may be considered as a vulnerable portion that is to be cut across easily.

[0026] As illustrated in FIGS. 2 and 5, the casing 14 is provided with pins 64a, 64b, 64c, 64d, 64e, 64f, 64g, 64h. Some of these pins have their base portions reinforced with ribs 65. The pins 64a to 64h may be collectively referred to as a pin 64. The pin 64 is provided at a position and with a height to be inserted into the hole 62. The pin 64 has a columnar shape, and its tip has a spindle-like shape to facilitate insertion into the hole 62. The pin 64 has a moderate level of strength that is enough to not deform or not to break off even when a bent piece 66 is brought into contact therewith.

[0027] The assembling process of the plate 38 and electric components in the door lock device 10 will now be explained.

[0028] To being with, the plate 38 is placed with the rear side thereof facing upwards (see FIG. 4), and the terminal bodies 50, 54 and the signal line terminal 52 are inserted into the corresponding plate grooves 38a, from the rear side of (above) the plate 38. The terminal bodies 50, 54 and the signal line terminal 52 are fitted in the plate grooves 38a, and stabilize with appropriate frictions. The terminal body 56 is then inserted into the plate groove 38a from the front side of (below) the plate 38. Because the terminal body 56 is fitted in the plate groove 38a and subjected to appropriate friction, the terminal body 56 does not fall unless an excessive force or vibration is applied thereto. Because, at this point in time, a worker only needs to attach only four parts, including the terminal bodies 50, 54, 56 and the signal line terminal 52, to the plate 38, excellent workability is achieved. Furthermore, the terminal bodies 50, 54, 56 are not exces-

sively small and can be handled easily, and the positions at which these terminals are to be attached can be easily found. For example, the signal line terminal 50a and 50c have similar shapes, but because these terminals are integrated as the terminal body 50, these terminals are not easily inserted to wrong places.

[0029] As illustrated in FIGS. 4 and 6A, the links 58a to 58f are positioned immediately above the holes 62. The links 58g, 58h of the terminal body 56 are, by contrast, positioned immediately below the holes 62.

[0030] Each of the links 58a to 58f is then pressed down with a pressing tool, from the rear side of the plate 38 toward the front side, and are caused to cut off at the cutout 61, to bend into the hole 62, as illustrated in FIG. 6B, and forms a bent piece 66. In this manner, the first terminal 63a and the second terminal 63b are separated from each other, and thus insulated from each other. The bent piece 66 is bent along the beveled portion 68a toward a proper direction at a proper curvature, and a part of the bent piece 66 is brought into abutment with the hole wall 68b with an appropriate friction or pressing force to be stabilized. In this manner, the terminals are fixed to the plate 38 appropriately and firmly. The inner edges of the bent piece 66 and of the curved portion 60 are kept at an appropriate distance from the cut off portion of the cutout 61 on the second terminal 63b. In the same manner, the links 58g, 58h are pressed down with a pressing tool, from the rear side toward the front side, and form bent pieces 66, but the bent pieces 66 formed with the links 58g, 58h stand upright in the opposite direction, without being inserted into the holes 62 (see FIG. 9).

[0031] After attaching the motors 28a, 28b to the plate 38, as will be described later, the plate 38 is mounted on the casing 14 (see FIG. 2). The plate 38 is oriented in such a manner that the rear side thereof faces the inner surface of the casing 14.

[0032] As illustrated in FIGS. 7 and 8, the pins 64 enter into the corresponding holes 62, and becomes interposed between the bent piece 66, which is protruding from the first terminal 63a, and the second terminal 63b. With such a structure, the presence of the curved portion 60 ensures an appropriate length of the link 58, the bent piece 66 is bent at substantially 90 degrees, and the distance between the bent piece 66 and the second terminal 63b is sufficiently long. Furthermore, because the pin 64, which is insulating, is interposed between the bent piece 66 and the second terminal 63b, the bent piece 66 and the second terminal 63b are highly insulated from each other. Therefore, even if this part gets wet, non-conduction is ensured. Furthermore, because the cutout 61 is not positioned at the root of the bent piece 66, and the beveled portion 68a ensures that the bent piece 66 is bent at an appropriate curvature, the bent piece 66 is mechanically strong, and highly vibration-resistant. Even if the bent piece 66 is vibrated, the presence of the pin 64 prevents the bent piece 66 from being brought into contact with the second terminal 63b. Therefore, the door lock device 10 having such a structure is particularly suited for applications for vehicles.

[0033] It is also possible to increase the height of the hole wall 68b by providing a support 70 to an open edge of the hole 62f, as illustrated in FIG. 7, so that the bent piece 66 is supported thereby. By providing a T-shape to the support 70, some displacements of the bent piece 66 can be permitted, and the strong force applied at the time of bending can be supported.

[0034] As illustrated in FIG. 9, because the power line terminals 56a, 56b are positioned in the front side of the plate 38, the link 58h is bent upwards in FIG. 9 at the position of the hole 62h, and the resultant bent piece 66 is not inserted in the hole 62h. However, still in this case as well, the insertion of the pin 64h in the hole 62h has an effect of ensuring insulation.

[0035] Furthermore, it is also possible to achieve two bent pieces 66 by cutting the link 58g in the middle, as illustrated at the position of the hole 62g of FIG. 9. In this case as well, the insertion of the pin 64g in the hole 62g has an effect of ensuring insulation.

[0036] A process of assembling the plate 38 onto the casing 14 will now be explained.

[0037] As illustrated in FIG. 10, before assembling the plate 38 to the casing 14, the motors 28a, 28b are attached to the plate 38. To attach, to begin with, the motor 28a is set in such an orientation that the rotational axis 32a points somewhat diagonally upwards, and the worm gear 34a is fitted to the rotational axis 32a. Because the rotational axis 32a is somewhat diagonally upward, the worm gear 34a does not fall off. The motor 28a in this orientation is then placed at a predetermined position of the plate 38, and engaged and held by using the engaging claws 40a. The plate 38 is kept somewhat inclined in a manner aligned with the orientation of the motor 28a. The same process is performed on the motor 28b and the worm gear 34b, but FIG. 10 illustrates the motor 28b as having already been attached to the plate 38.

[0038] Next, while the casing 14 is kept somewhat inclined in a manner aligned with the orientation of the plate 38 and the motors 28a, 28b, the plate 38, on which the motors 28a, 28b are mounted, is mounted on a predetermined position of the casing 14. As a result, the worm gear 34a becomes surrounded by the side wall 46a, and the worm gear 34b becomes surrounded by the side wall 46b, and therefore, these worm gears 34a and 34b do not fall off from the rotational axes 32a, 32b. The casing 14 is then horizontally placed, as illustrated in FIG. 11, and other parts are assembled thereto, and the cover 16, the waterproofing cover 20, and the waterproofing seals 22, 24 are then attached.

[0039] Once the cover 16 is attached, the end of the bumper 48a protruding from the plate 38 is brought into abutment with the rib 49a on the cover 16, by deforming elastically, as illustrated in FIG. 12. In this manner, instability of the plate 38 is prevented, and the plate 38 is stabilized. The abutment of the bumper 48b with the rib 49b (see FIG. 3) has the same effect.

[0040] The present invention is not limited to the em-

bodiment described above, and it is needless to say that the embodiment can be modified in any way within a scope not deviating from the spirit of the present invention.

Claims

1. A door lock device comprising:

a housing;
electric components housed in the housing;
first and second terminals, each of which being electrically conductive and connected to the electric components;
a plate configured to hold the first terminal and the second terminal and having holes formed at positions corresponding to positions between the first terminal and the second terminal;
bent pieces configured to protrude from the first terminal and being bent at edges of the holes; and
insulating pins configured to protrude from the housing, being positioned inside of the respective holes, and being interposed between the respective bent pieces and the second terminal.

2. The door lock device according to claim 1, wherein the bent pieces are inserted into the respective holes.

3. The door lock device according to claim 1 or 2, wherein the bent pieces are resultant of being cut off from the second terminal along respective cutouts, and have respective cut off portions.

4. The door lock device according to any one of claims 1 to 3, wherein
the first terminal has curved portions projecting in a direction moving away from the second terminal, and
the bent pieces protrude from the respective curved portions.

5. The door lock device according to any one of claims 1 to 4, wherein
the plate has a bumper that protrudes, and
the bumper that is being elastically deformed is kept in abutment with the housing.

Amended claims in accordance with Rule 137(2) EPC.

1. A door lock device comprising:

a housing (14, 16);
electric components (28a, 28b, 30a, 30b, 30c) housed in the housing (14, 16);
first and second terminals (63a, 63b), each of which being electrically conductive and connected to the electric components (28a, 28b, 30a, 30b, 30c);
a plate (38) configured to hold the first terminal (63a) and the second terminal (63b) and having holes (62) formed at positions corresponding to positions between the first terminal (63a) and the second terminal (63b);
bent pieces (66) configured to protrude from the first terminal (63a) and being bent at edges of the holes (62); **characterized in that**
the door lock device (10) further comprises insulating pins (64) configured to protrude from the housing, being positioned inside of the respective holes (62), and being interposed between the respective bent pieces (66) and the second terminal (63b).

2. The door lock device according to claim 1, wherein the bent pieces (66) are inserted into the respective holes (62) .

3. The door lock device according to claim 1 or 2, wherein the bent pieces (66) are resultant of being cut off from the second terminal (63b) along respective cutouts (61), and have respective cut off portions.

4. The door lock device according to any one of claims 1 to 3, wherein
the first terminal (63a) has curved portions projecting in a direction moving away from the second terminal (63b), and
the bent pieces (66) protrude from the respective curved portions (60).

5. The door lock device according to any one of claims 1 to 4, wherein
the plate (38) has a bumper (48a) that protrudes, and
the bumper (48a) that is being elastically deformed is kept in abutment with the housing (14, 16).

FIG.1

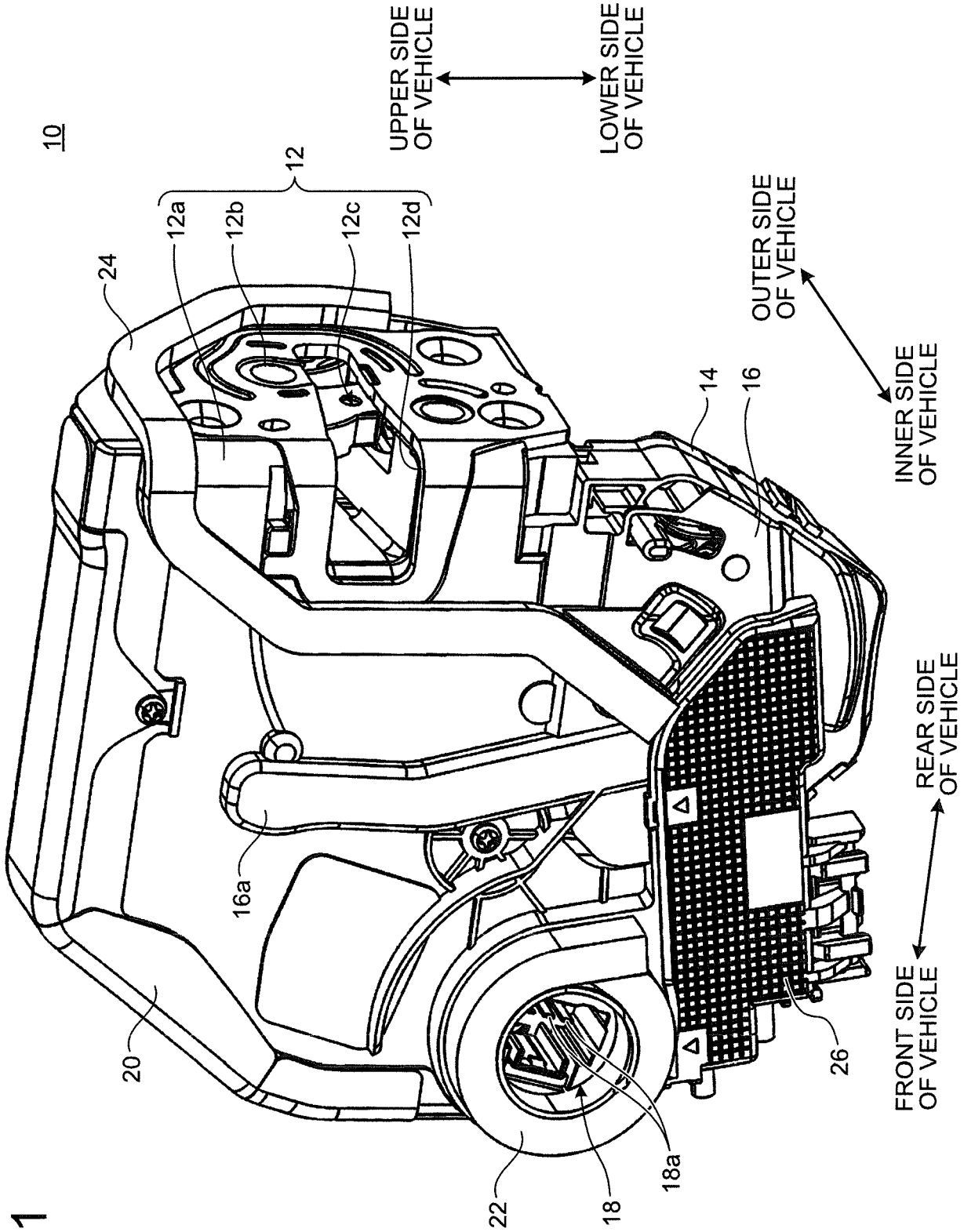
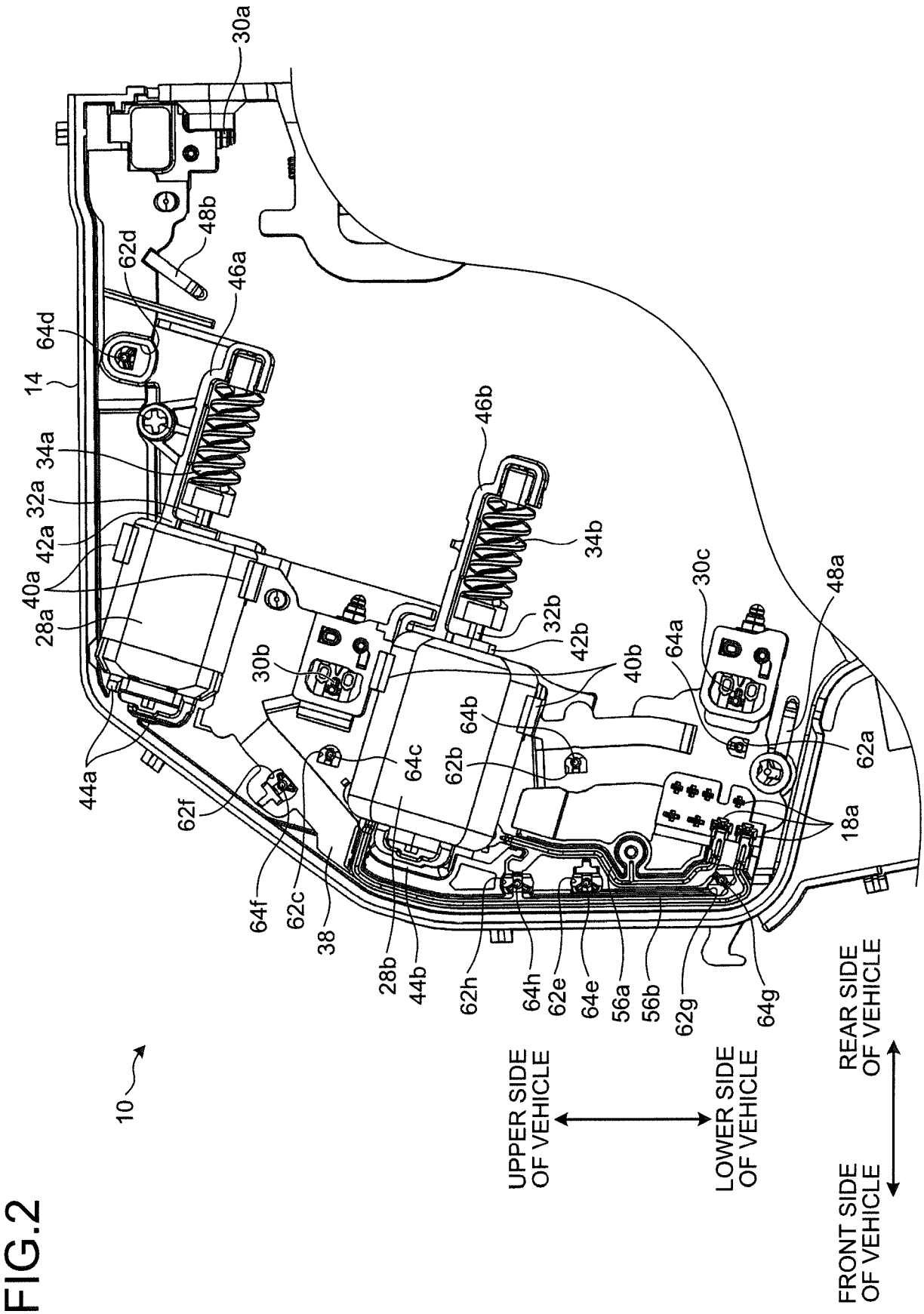

10
12
12a
12b
12c
12d
24
UPPER SIDE OF VEHICLE
LOWER SIDE OF VEHICLE
OUTER SIDE OF VEHICLE
INNER SIDE OF VEHICLE
REAR SIDE OF VEHICLE
FRONT SIDE OF VEHICLE
14
16
16a
18
18a
20
22
26

FIG.2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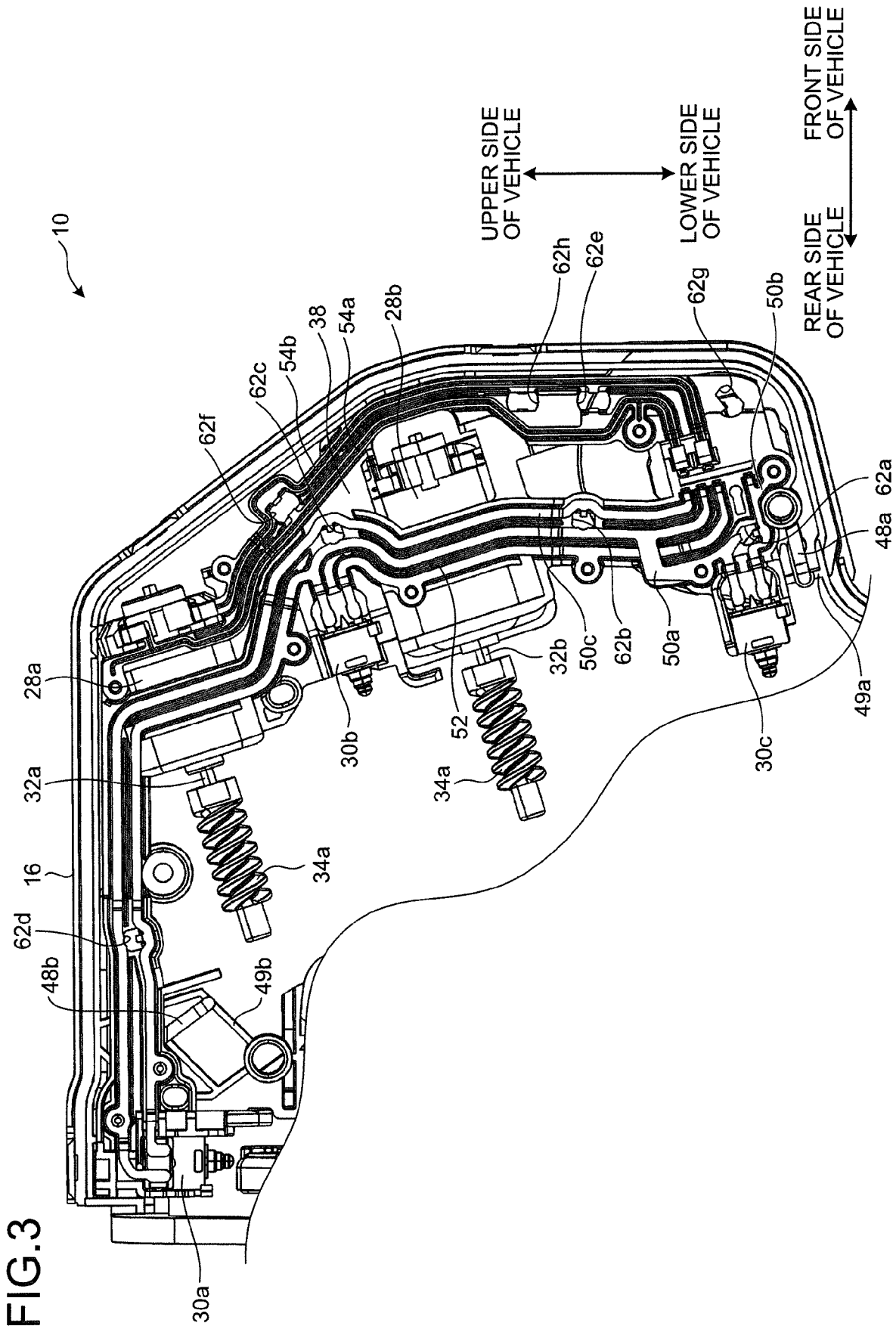
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30c
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62b
50c
32b
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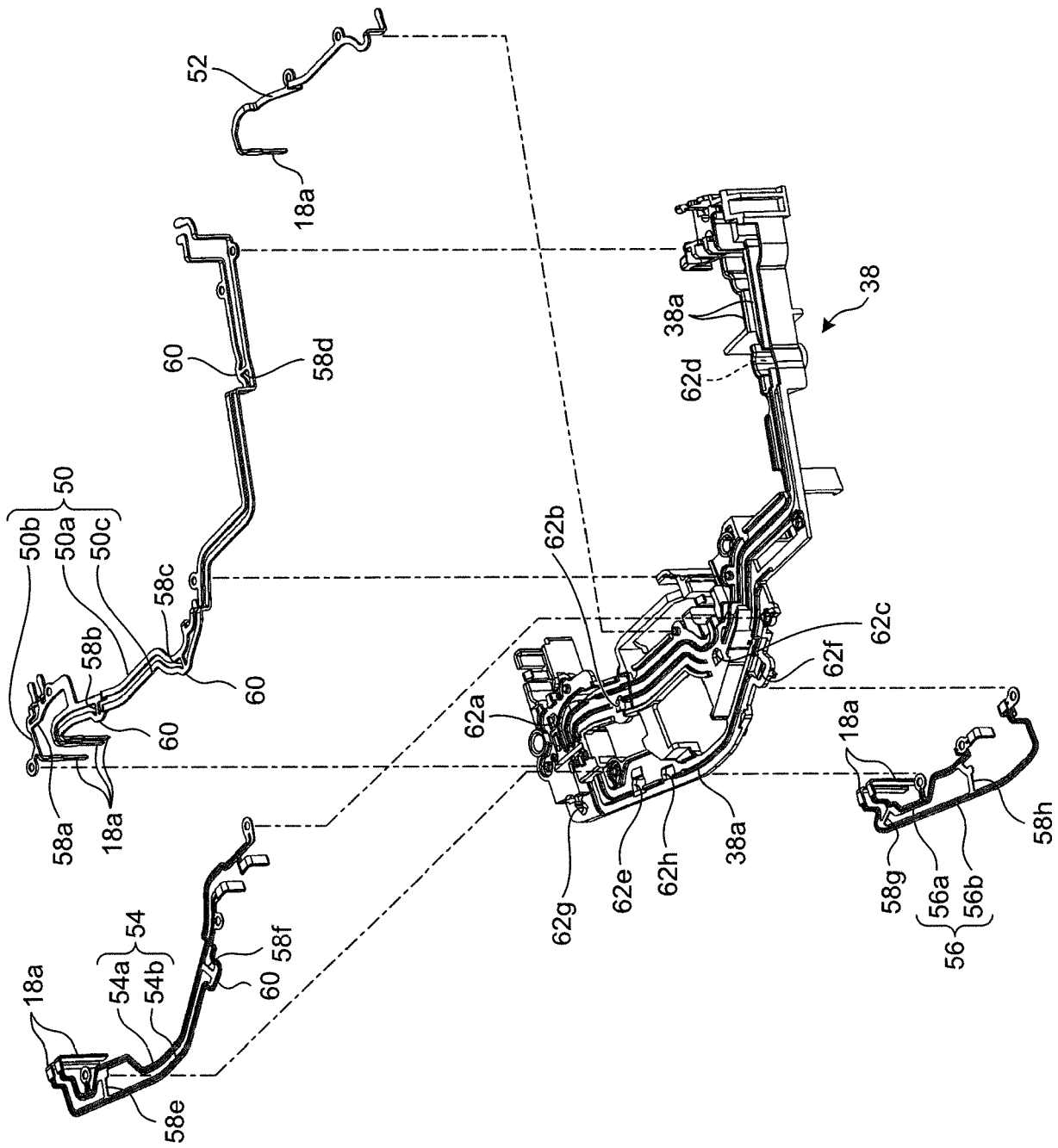
FIG.3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62g
62e
62h
38a
58h
58g
56a
56b
56
54
54a
54b
58f
60
18a
58e

FIG.4

FIG.5

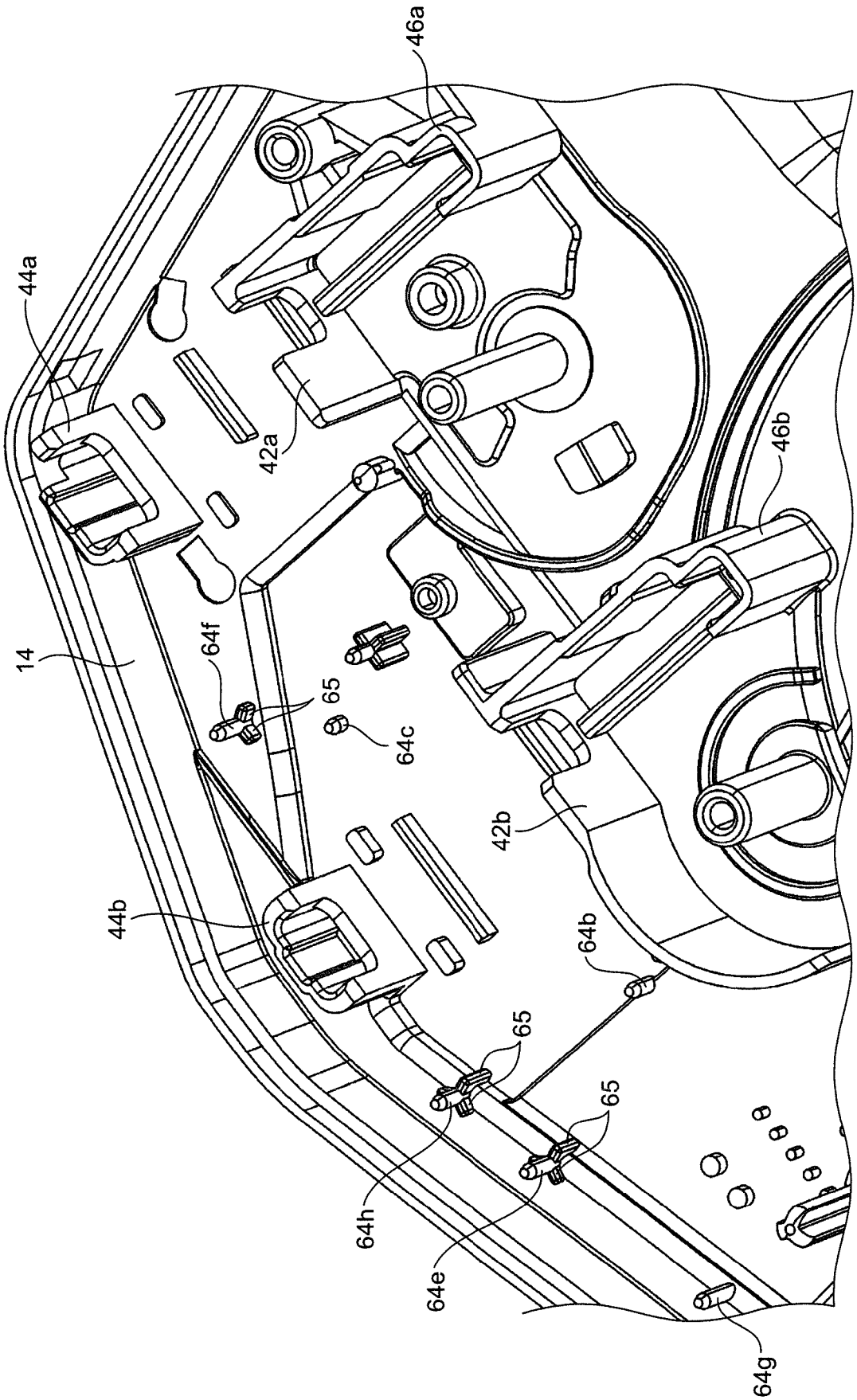


FIG.6A

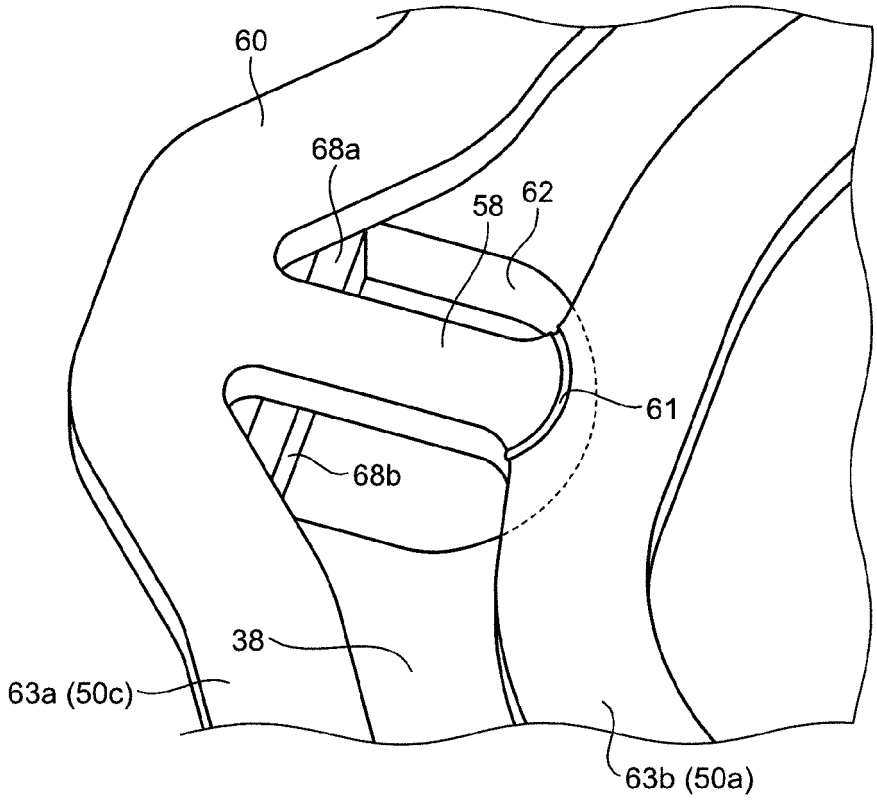

60
68a
58
62
61
68b
38
63a (50c)
63b (50a)

FIG.6B

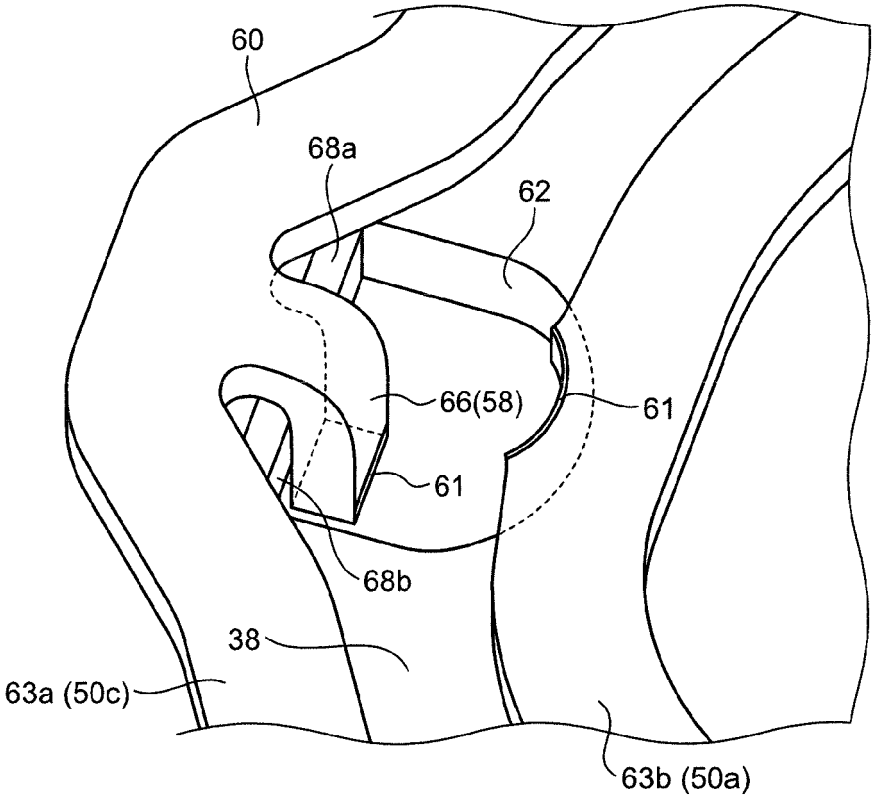

60
68a
62
66(58)
61
61
68b
38
63a (50c)
63b (50a)

FIG.7

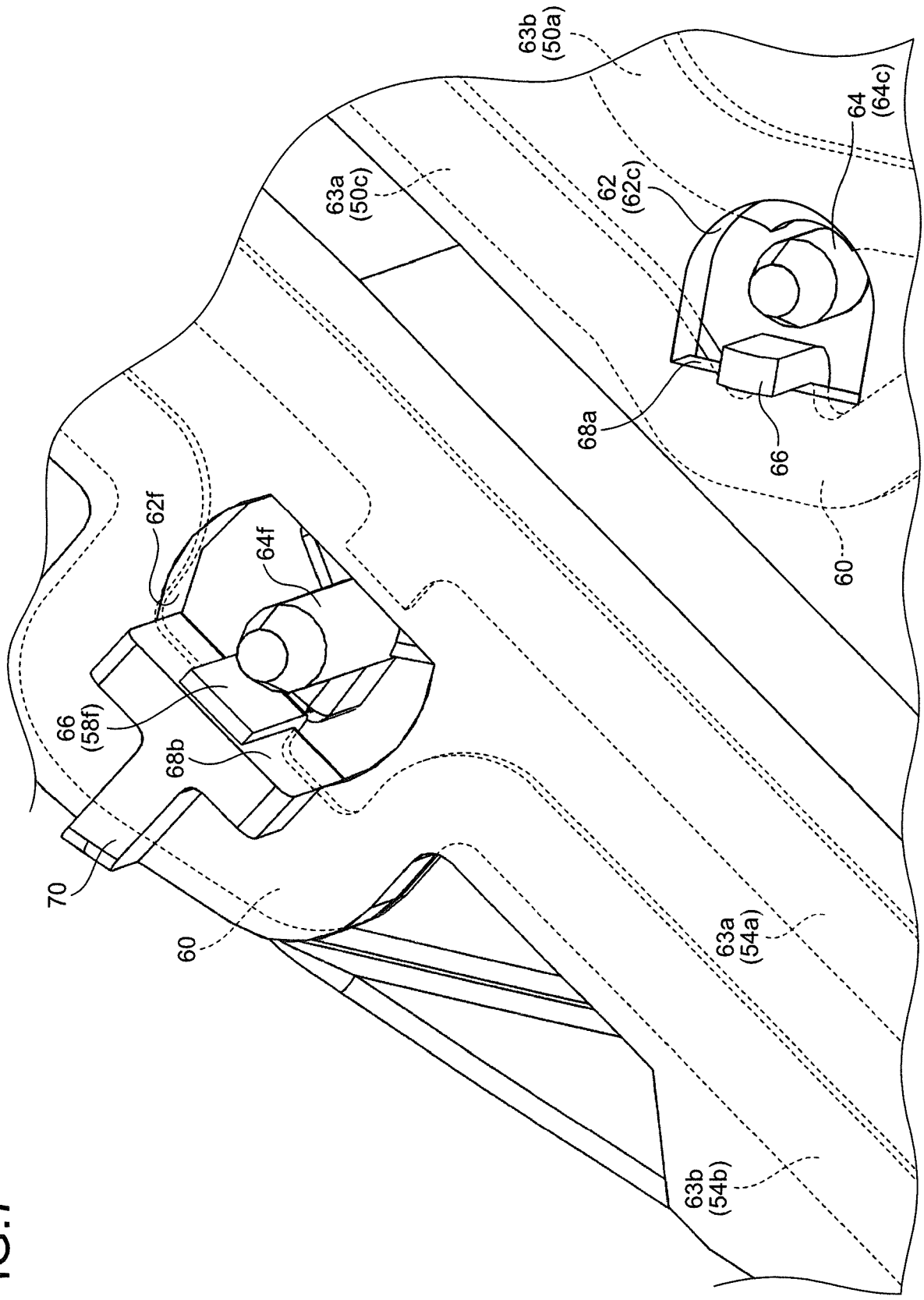
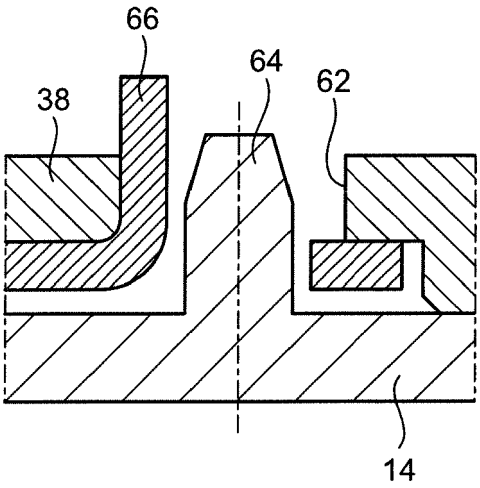

63b
(50a)
64
(64c)
63a
(50c)
62
(62c)
68a
66
60
62f
64f
66
(58f)
68b
70
60
63a
(54a)
63b
(54b)

FIG.8



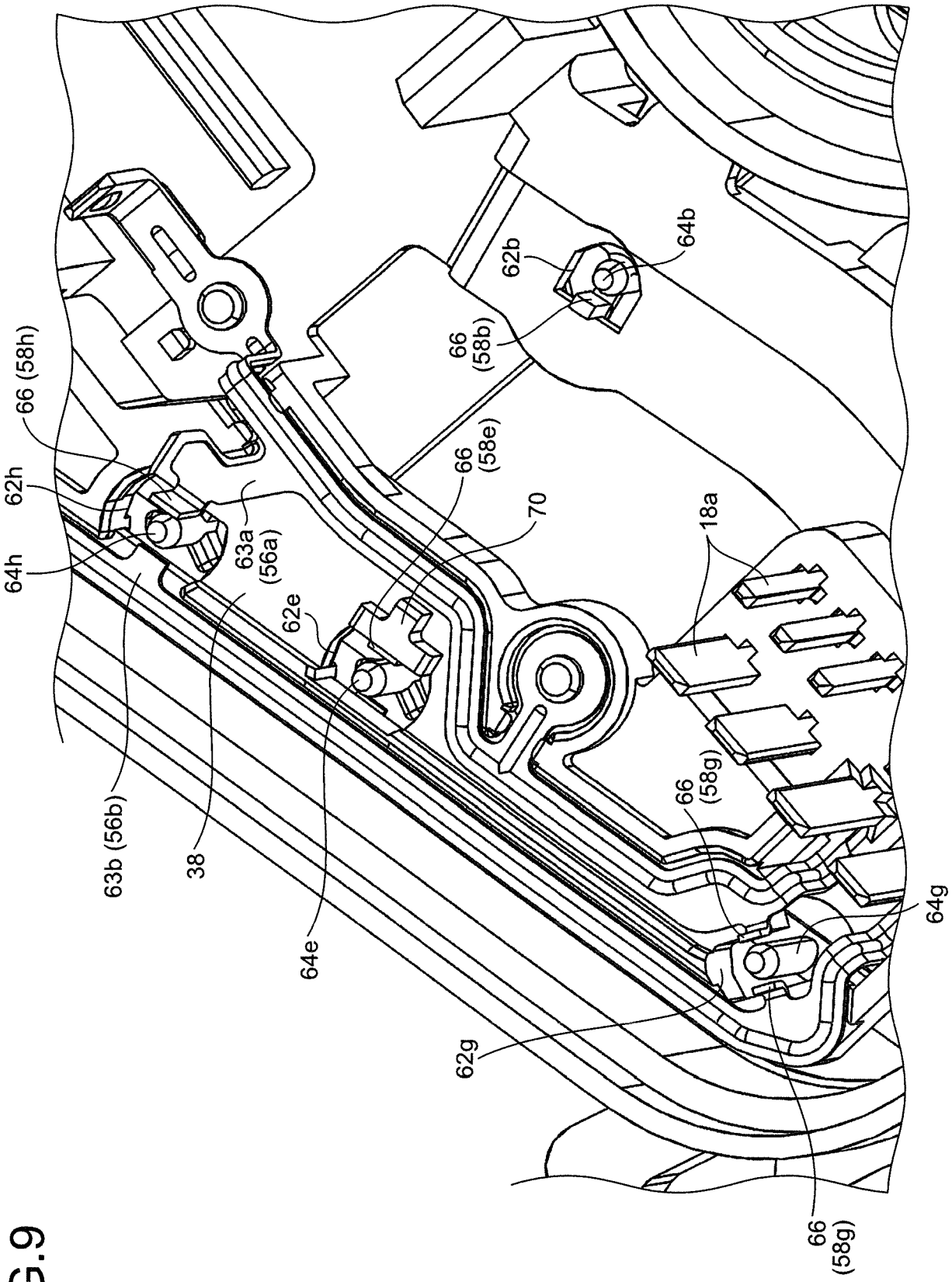

66 (58h)
62h
64h
63b (56b)
38
63a (56a)
62e
64e
62b
64b
66 (58b)
66 (58e)
70
18a
66 (58g)
64g
62g
66 (58g)

FIG.9

FIG.10

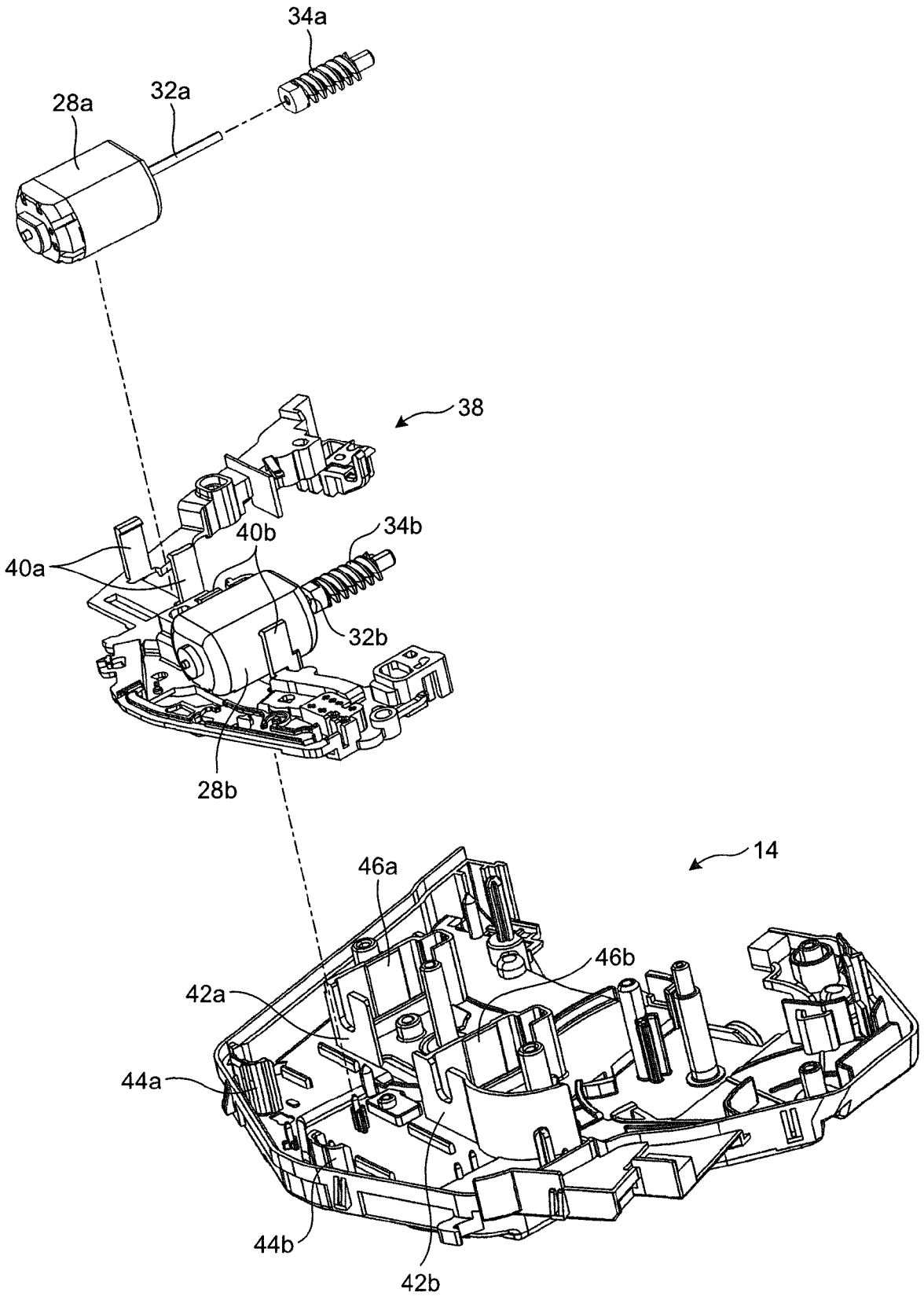


FIG.11

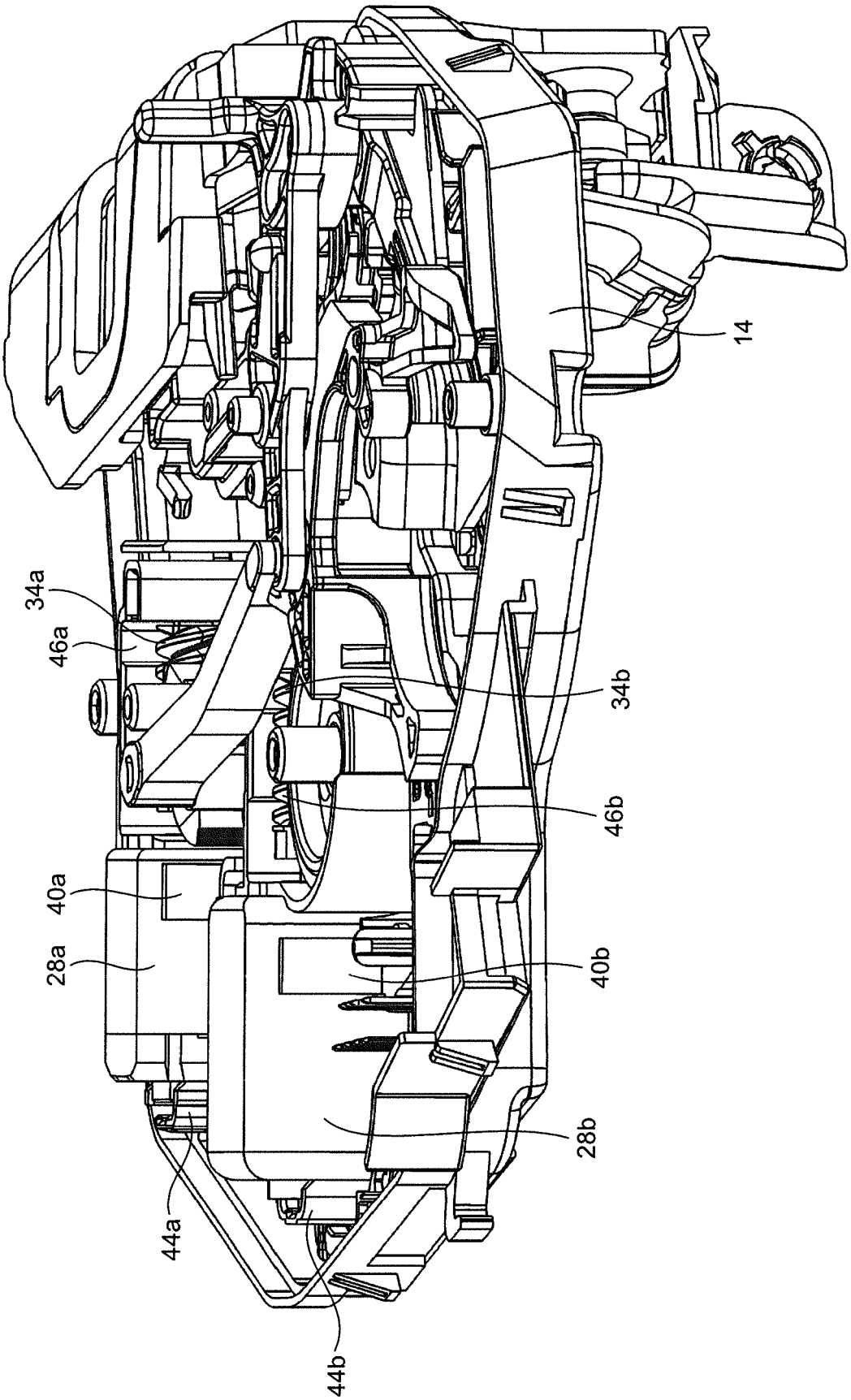
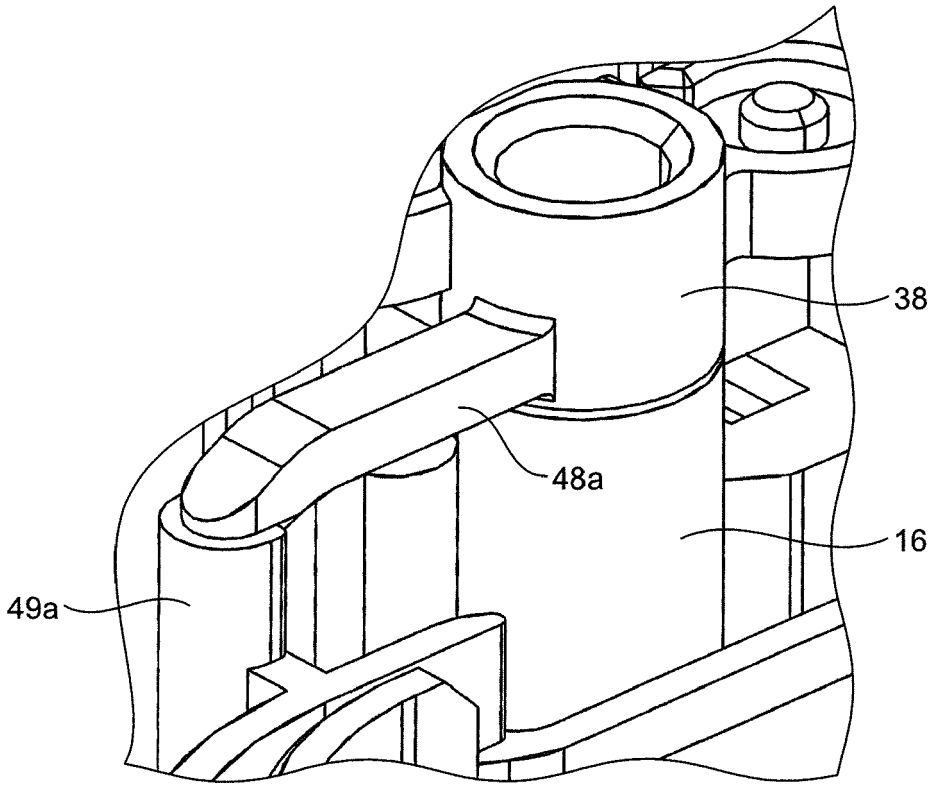


FIG.12



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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2015/204113 A1 (MACHIDA TOSHIO [JP] ET AL) 23 July 2015 (2015-07-23) * paragraph [0051] - paragraph [0193]; figures 3, 9A-12 *	1-5	INV. E05B85/02 E05B81/54
A,D	JP 4 517914 B2 (AISIN SEIKI) 4 August 2010 (2010-08-04) * the whole document *	1-5	
A	WO 2016/103822 A1 (AISIN SEIKI [JP]) 30 June 2016 (2016-06-30) * page 5, line 1 - page 15, line 35; figures 1-15 *	1-5	
A	JP H10 196182 A (DENSO CORP) 28 July 1998 (1998-07-28) * the whole document *	1-5	
			TECHNICAL FIELDS SEARCHED (IPC) E05B

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2015204113 A1	23-07-2015	CN 104662243 A	27-05-2015
		US 2015204113 A1	23-07-2015
		WO 2014050617 A1	03-04-2014
JP 4517914 B2	04-08-2010	JP 4517914 B2	04-08-2010
		JP 2006266027 A	05-10-2006
WO 2016103822 A1	30-06-2016	JP 6331025 B2	30-05-2018
		JP 2016120840 A	07-07-2016
		WO 2016103822 A1	30-06-2016
JP H10196182 A	28-07-1998	NONE	

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Patent documents cited in the description

- JP 4517914 B **[0003]**