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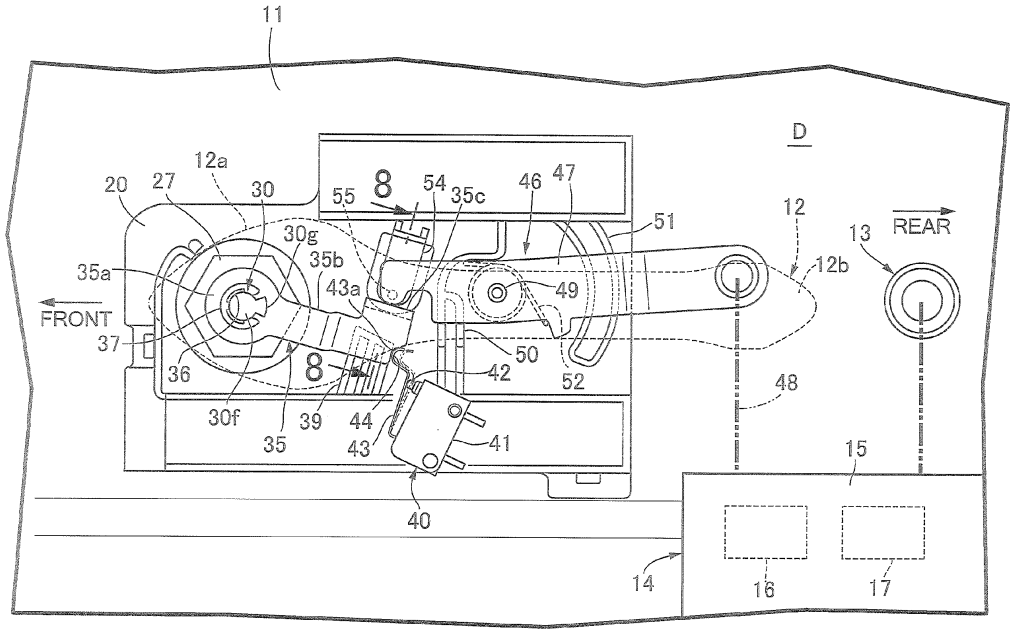
(54) Unlatching device for vehicle door

(57) An unlatching device for a vehicle door comprises: electrically-operated unlatching means capable of exerting unlatching power; emergency unlatching means capable of transmitting mechanical unlatching power in response to an operation by a vehicle driver; and a latch mechanism configured to enable switching between an unlocked state and a locked state and to release a latched state of a door in response to an operation of any one of the electrically-operated unlatching means and the emergency unlatching means in the unlocked state. A door handle is provided on the door in such a manner as to operate the electrically-operated unlatching means in response to a first operation and to operate the emergency unlatching means in response to a second operation being different from the first operation. Accordingly, it is possible to facilitate an emergency operation in case it is unable to electrically release a latched state of a door due to a malfunction such as a dead battery.

FIG.3



EP 2 664 734 A2

Description

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0001] The present invention relates to an unlatching device for a vehicle door, comprising: electrically-operated unlatching means capable of exerting unlatching power; emergency unlatching means capable of transmitting mechanical unlatching power in response to an operation by a vehicle driver; and a latch mechanism configured to enable switching between an unlocked state and a locked state and to release a latched state of a door in response to an operation of any one of the electrically-operated unlatching means and the emergency unlatching means in the unlocked state.

DESCRIPTION OF THE RELATED ART

[0002] Japanese Patent No. 4598668 makes known an unlatching device for a vehicle door configured to electrically unlatch a door by an operation of a door switch, which is designed to be capable of releasing a latched state of the door also with mechanical operational force by an operation of a vehicle driver in a case where the latched state of the door cannot be electrically released due to a malfunction such as a dead battery.

[0003] However, in the device disclosed in Japanese Patent No. 4598668, an outside handle is provided on a door in such a manner as to be operable by putting a hand into a recess provided on the vehicle body side, and an emergency operating member is arranged in such a manner as to be hidden from the outside by the outside handle. For its operation, the emergency operating member has to be operated by putting the hand deep inside the outside handle. Hence, it can not be said that the operability of the emergency operating member is good.

SUMMARY OF THE INVENTION

[0004] The present invention has been made in view of the aforementioned circumstances. An object of at least the preferred embodiments of the present invention is to provide an unlatching device for a vehicle door which facilitates an emergency operation in case it is unable to electrically release a latched state of a door due to a malfunction such as a dead battery.

[0005] According to a first feature of the present invention, there is provided an unlatching device for a vehicle door, comprising: electrically-operated unlatching means capable of exerting unlatching power; emergency unlatching means capable of transmitting mechanical unlatching power in response to an operation by a vehicle driver; and a latch mechanism configured to enable switching between an unlocked state and a locked state and to release a latched state of a door in response to an operation of any one of the electrically-operated unlatching means and the emergency unlatching means in the unlocked state, **characterized in that** a door handle is provided on the door in such a manner as to operate the electrically-operated unlatching means in response to a first operation and to operate the emergency unlatching means in response to a second operation being different from the first operation.

[0006] With the first feature of the present invention, it is possible to perform both of the first operation in a normal state where the electrically-operated unlatching means operates normally and the second operation in an emergency state where the operation of the electrically-operated unlatching means is disabled by using the same door handle. Thus, the emergency operation is facilitated when the latched state of the door is not electrically releasable.

[0007] Further, according to the second feature of the present invention, in addition to the first feature, the door handle is turnably attached to the door via a single support shaft in such a manner as to enable switching between the first operation to turn the door handle in one of upward and downward directions from a neutral position and the second operation to turn the door handle in another one of the upward and downward directions from the neutral position, and biasing means for turning and biasing the door handle in a direction back to the neutral position side is provided between the door handle and the door.

[0008] With the second feature of the present invention, the door handle is turnably attached to the door via the single support shaft and is biased to the neutral position by the biasing means. Thus, the structure of the handle which facilitates switching between the first and second operation can be simplified.

[0009] An outside handle of an embodiment may correspond to the door handle of the present invention. An unlatching electric motor of an embodiment may correspond to the electrically-operated unlatching means of the present invention. A front side door of an embodiment may correspond to the door of the present invention.

[0010] The above and other objects, characteristics and advantages of the present invention will be clear from detailed descriptions of the preferred embodiment which will be provided below, by way of example only, while referring to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a side view showing a part of a vehicle door; FIG. 2 is a sectional view taken along a line 2-2 in FIG. 1; FIG. 3 is a view seen from a direction of an arrow 3 in FIG. 2 in a non-operating state; FIG. 4 is an exploded perspective view showing a part of the configuration of an unlatching device; FIG. 5 is a sectional view taken along a line 5-5 in FIG. 2; FIG. 6 is a view corresponding to FIG. 3 in a normal operation state; FIG. 7 is a view corresponding to FIG. 3 in an emergency operation state; FIG. 8 is a sectional view taken along a line 8-8 in FIG.

3; and FIG. 9 is a sectional view taken along a line 9-9 in FIG. 2.

DESCRIPTION OF PREFERRED EMBODIMENT

[0012] An embodiment of the present invention will be described below with reference the accompanying drawings. First, in FIG. 1 and FIG. 2, an outer panel 11 of a door such as a front side door D installed in a passenger vehicle is provided with an outside handle 12 serving as a door handle, and a cylinder lock 13 located in the rear of the outside handle 12.

[0013] In FIG. 3, the front side door D is provided with a latch mechanism 14, which enables switching between an unlocked state and a locked state and enables a latched state of retaining a closed state of the front side door D to be released in the unlocked state.

[0014] A locked-state switching electric motor 16 configured to exert power to switch the latch mechanism 14 between the locked state and the unlocked state, and an unlatching electric motor 17 serving as electrically-operated unlatching means which can exert unlatching power are built in a case 15 of the latch mechanism 14. A latched state of the front side door D is released in response to an operation of the unlatching electric motor 17 in the unlocked state.

[0015] In addition, a mechanical operational force can be inputted to the latch mechanism 14 by operating the cylinder lock 13 with a mechanical key (not shown). The latch mechanism 14 is switched between the locked state and the unlocked state in response to the input of the mechanical operational force from the cylinder lock 13.

[0016] Referring to FIG. 4 together, the outside handle 12 is formed in such a manner as to extend long in a front-back direction of the vehicle and to be integrally provided with a turnable base portion 12a on a front end portion thereof and a grip portion 12b extending rearward from the turnable base portion 12a. A lock sensor 18 for switching the latch mechanism 14 from the unlocked state to the locked state is arranged inside the turnable base portion 12a, and a mark 19 for indicating the arranged position of the lock sensor 18 is provided on a surface of the turnable base portion 12a. Moreover, it is confirmed whether a vehicle user is legitimate or not in response to a hand of the vehicle user touching the surface of the turnable base portion 12a at a portion corresponding to the mark 19 after closing the front side door D. Upon confirmation that the vehicle user is legitimate, the locked-state switching electric motor 16 operates to set the latch mechanism 14 to the locked state.

[0017] A base member 20 made of a synthetic resin is in contact with an inner surface of the outer panel 11 of the front side door D, and a circular opening 21 is provided at portions of the base member 20 and the outer panel 11 corresponding to the turnable base portion 12a of the outside handle 12. A base shaft 22 having at one end thereof an engagement flange portion 22a protruding outward in a radial direction in such a manner as to be in contact with an outer surface of the outer panel 11, and extending in a vehicle width direction, is inserted into the opening 21.

[0018] A large diameter hole 23 whose one end is opened at a central portion of the engagement flange portion 22a, and a small diameter hole 24 being formed at a smaller diameter than that of the large diameter hole 23, having one end coaxially communicating with another end of the large diameter hole 23, and having another end opened to another end of the base shaft 22, are coaxially provided to the base shaft 22. A first stepped portion 25 in an annular shape which faces the one end side of the base shaft 22 is formed between the other end of the large diameter hole 23 and the one end of the small diameter hole 24.

[0019] Engagement projections 22b projecting outward in radial directions are provided in a projecting manner in multiple portions, such as four portions, of the base shaft 22 which are near the engagement flange portion 22a at regular intervals in a peripheral direction of its outer periphery. Locking recesses 21a which the engagement projections 22b are inserted into and engage with are provided in multiple portions, such as four portions, of the opening 21 at regular intervals in a peripheral direction thereof. Accordingly, the rotation of the base shaft 22 around its axis is inhibited in the state where the base shaft 22 is inserted in the opening 21 until the engagement flange portion 22a is brought into contact with the outer surface of the outer panel 11.

[0020] Meanwhile, a male screw 26 is threaded on the outer periphery of the base shaft 22. A nut 27 for sandwiching the base member 20 between the nut 27 and the outer panel 11 is threadedly engaged with the male screw 26. The base member 20 and the base shaft 22 are fixed to the outer panel 11 by tightening the nut 27.

[0021] One end portion of a support shaft 30 extending in a vehicle width direction is fixed to the turnable base portion 12a of the outside handle 12. The support shaft 30 includes, integrally and sequentially from one end side thereof: an attachment portion 30a formed into such a shape corresponding to an inner surface of the rotational base portion 12a and in contact with the rotational base portion 12a; an attachment flange portion 30b protruding outward and sideways from the attachment portion 30a; a restriction flange portion 30c protruding outward and sideways from the attachment portion 30a in such a manner as to face the attachment flange portion 30b from the other side in the axial direction; a large diameter shaft portion 30d formed in a larger diameter than that of the large diameter hole 23 of the base shaft 22 and continuing to the attachment portion 30a; a medium diameter shaft portion 30e provided with such an outside diameter to be inserted into the large diameter hole 23 of the base shaft 22 and coaxially continuing to the large diameter shaft portion 30d; and a small diameter shaft portion 30f provided with such an outside diameter to be inserted into the small diameter hole 24 of the base shaft 22 and coaxially continuing to the medium diameter shaft portion

30e. A second stepped portion 31 in contact with the engagement flange portion 22a of the base shaft 22 is formed between the large diameter shaft portion 30d and the medium diameter shaft portion 30e, and a third stepped portion 32 closely facing the first stepped portion of the base shaft 22 is formed between the medium diameter shaft portion 30e and the small diameter shaft portion 30f.

[0022] The support shaft 30 is fixed to the rotational base portion 12a by fastening the attachment flange portion 30b of the support shaft 30 to an attachment boss 12c integrally provided in a projecting manner on the inner surface of the rotational base portion 12a of the outside handle 12 by use of a screw member 33. Meanwhile, the medium diameter shaft portion 30e and the small diameter shaft portion 30f of the support shaft 30 are inserted into the large diameter hole 23 and the small diameter hole 24 of the base shaft 22 in such a way that the second stepped portion 31 of the support shaft 30 is brought into contact with the engagement flange portion 22a of the base shaft 22.

[0023] Referring to FIG. 5 together, one projection strip 30g projecting outward in a radial direction is projectingly provided integrally on the small diameter shaft portion 30f of the support shaft 30. In the meantime, a restriction recess 34 for housing the projection strip 30g is formed on the other end portion of the base shaft 22 in such a manner as to be opened to an inner periphery of the small diameter hole 24. A turnable range of the projection strip 30g, i.e., a turnable range of the support shaft 30 and the outside handle 12 is restricted by the projection strip 30g coming into contact with both ends of the restriction recess 34 along the peripheral direction of the support shaft 30.

[0024] A shaft lever 35 is connected to a projecting portion projecting from the other end portion of the base shaft 22, and inclusive of the projection strip 30g of the support shaft 30. The shaft lever 35 is integrally provided with: a disc-shaped lever base portion 35a having an attachment hole 36 in which the projecting portion of the support shaft 30 is fitted in such a manner as to disable relative rotation, and being brought in contact with the other end portion of the base shaft 22; and an arm portion 35b extending rearward from the lever base portion 35a in the front-back direction of the vehicle while having an intermediate portion bent to the base member 20 side. The lever base portion 35a is held between the other end portion of the base shaft 22 and an E-shaped retaining ring 37, which is attached to an attachment groove 38 (see FIG. 4) provided on an outer periphery of the small diameter shaft portion 30f of the support shaft 30. The shaft lever 35 is connected to the support shaft 30 in such a manner to be turnable together with the support shaft 30, i.e., the outside handle 12.

[0025] In order to release the latched state of the front side door D by operating the unlatching electric motor 17 in the unlocked state, it is only necessary to execute a first operation to push the outside handle 12 downward. As a consequence of the first operation of the outside handle 12, the shaft lever 35 is turned downward together with the outside handle 12 as shown in FIG. 6. A first rib 39 in sliding contact with the shaft lever 35 in order to prevent backlash of the shaft lever 35 during the turn is provided in a projecting manner on the base member 20.

[0026] The downward turn of the shaft lever 35 is detected by a switch 40 attached to a lower part of the base member 20. The switch 40 is a micro switch including: a switch case 41 attached to the base member 20; a detector 42 being biased in a direction for the detector 42 to project from the switch case 41 and partially projecting from the switch case 41; and a lever 43 made of a leaf spring located outside the switch case 41 with one end portion being supported by the switch case 41. The lever 43 is designed to exert elastic force in a direction for the other end side thereof to move away from the switch case 41. A curved contact portion 43a is formed on the other end portion of the lever 43, and a portion of the lever 43 near the contact portion 43a comes into contact with a tip end of the detector 42.

[0027] A tip end portion of the arm portion 35b of the shaft lever 35 is in contact with the contact portion 43a of the lever 43. A recess 44 configured to house the contact portion 43 a so as to cause the other end side of the lever 43 to be away from the switch case 41 to the maximum extent when the outside handle 12 is in a non-operating state is formed in a lower part of the tip end of the arm portion 35b. When the shaft lever 35 is turned downward by the first operation of the outside handle 12, the tip end portion of the arm portion 35b pushes the lever 43 toward the switch case 41, whereby the detector 42 is pushed by the lever 43 and the first operation of the outside handle 12 is detected by the switch 40. Hence, the locked-state switching electric motor 16 operates to set the latch mechanism 14 to the unlocked state. Subsequently, the unlatching electric motor 17 operates to release the latched state of the front side door D.

[0028] In the meantime, in case it is unable to electrically release the latched state of the front side door D due to a malfunction such as a dead battery, the latched state can be released by: setting the latch mechanism 14 to the unlocked state by operating the cylinder lock 13 with the mechanical key; moving the outside door 12 in accordance with a second operation different from the first operation; and thus, transmitting mechanical unlatching power to the latch mechanism 14 via emergency unlatching means 46. In this embodiment, the first operation is the operation to push and turn the outside handle 12 downward, whereas the second operation is an operation to push and turn the outside handle 12 upward.

[0029] The emergency unlatching means 46 includes: the shaft lever 35 which turns together with the outside handle 12; a handle lever 47 rotatably supported by the base member 20 in such a manner as to turn in conjunction with the turn of the shaft lever 35 associated with the upward turn of the outside handle 12; and a rod 48 which connects the handle lever 47 and the latch mechanism

14 together.

[0030] A pressing portion 35c which is perpendicularly bent from a tip end portion of the arm portion 35b of the shaft lever 35 and faces upwards is formed integrally with the arm portion 35b. A pressure receiving portion 47a facing the pressing portion 35c from above is formed in a front end portion of the handle lever 47 formed in such a manner as to extend in the front-back direction of the vehicle. An intermediate portion of the handle lever 47 in a longitudinal direction is rotatably supported by the base member 20 via a rivet 49. Second and third ribs 50, 51, which are in sliding contact with the handle lever 47 in order to prevent backlash of the handle lever 47, are provided in a projecting manner on the base member 20. Meanwhile, one end of the rod 48 is connected to a rear end portion of the handle lever 47 so that the mechanical unlatching power is transmitted to the latch mechanism 14 when the rod 48 is pushed downward. Moreover, a torsion spring 52 which exerts spring force to bring the handle lever 47 back to a non-operating position side shown in FIG. 3 is provided between the base member 20 and the handle lever 47.

[0031] In addition, when the shaft lever 35 turns upward as shown in FIG. 7 in conjunction with the upward turn of the outside handle 12, the pressing portion 35c of the shaft lever 35 comes into contact with the pressure receiving portion 47a of the handle lever 47 from below, and pushes the pressure receiving portion 47a upward. Hence, as the handle lever 47 turns clockwise in FIG. 7, the rod 48 is pushed down, whereby the mechanical unlatching power is transmitted from the emergency unlatching means 46 to the latch mechanism 14.

[0032] In FIG. 8, an elastic piece 54, including a loose end portion caused to face the pressure receiving portion 47a and a base end portion continuing perpendicularly to the base member 20, is formed in the base member 20 in a position which overlaps the pressure receiving portion 47a of the handle lever 47 when the handle lever 47 is in the non-operating state, by cutting and raising part of the base member 20. A projection 55 projecting toward the pressure receiving portion 47a is provided in the loose end portion of the elastic piece 54.

[0033] In addition, when the outside handle 12 is turned upward in order to transmit the mechanical unlatching power to the latch mechanism 14 via the emergency unlatching means 46, the pressing portion 35c of the shaft lever 35 turns in such a manner as to run over the projection 55 while bending the elastic piece 54. Accordingly, a vehicle user can feel a click for discriminating between a normal operation and an emergency operation because an operating load is greater in an emergency case in which the outside handle 12 is turned upward than in a normal case where the outside handle 12 is turned downward.

[0034] The outside handle 12 is rotatably attached to the front side door D via the single support shaft 30 so that the outside handle 12 can be switched between the first operation to turn the outside handle 12 downward from a neutral position indicated with a solid line in FIG. 1 and the second operation to turn the outside handle 12 upward from the neutral position. Biasing means 56 for turning and biasing the outside handle 12 in a direction back to the neutral position side is provided between the outside handle 12 and the front side door D.

[0035] Referring to FIG. 9 together, the biasing means 56 is realized by providing a spring 57 between the support shaft 30 which is fixed to the outside handle 12 and the base shaft 22 which is fixed to the outer panel 11 of the front side door D. The spring 57 includes a coil portion 57a surrounding the large diameter portion 30d of the support shaft 30, and first and second pinched pieces 57b, 57c extending from opposite ends of the coil portion 57a. The restriction flange portion 30c of the support shaft 30 is provided with an elongated hole 58 which is formed into an arc shape with a center axis of the large diameter shaft portion 30d being a center and which is configured to allow insertion of tip end portions of the first and second pinched pieces 57b, 57c. First and second spring receiving portions 59, 60, which can be brought into contact with the first and second pinched pieces 57b, 57c from outside, are provided in a projecting manner on the engagement flange portion 22a of the base shaft 22.

[0036] In addition, in the state where the outside handle 12 is located in the neutral position, the tip end portions of the first and second pinched pieces 57b, 57c are located at opposite ends of the elongated hole 58 in a longitudinal direction. In this state, the first and second spring receiving portions 59, 60 are in contact with the first and second pinched pieces 57b, 57c from outside.

[0037] When the outside handle 12 is turned downward from the neutral position in the normal operation, the support shaft 30 is tuned counterclockwise in FIG. 9 together with the outside handle 12, whereby the first pinched piece 57b is detached form the first spring receiving portion 59 and moves closer to the second spring receiving portion 60 while keeping the second pinched piece 57c in contact with the second spring receiving portion 60. Hence, the support shaft 30, i.e., the outside handle 12 is biased toward the neutral position by the spring 57. On the other hand, when the outside handle 12 is turned upward from the neutral position in the emergency operation, the support shaft 30 turns clockwise in FIG. 9 together with the outside handle 12, whereby the second pinched piece 57c is detached form the second spring receiving portion 60 and moves closer to the first spring receiving portion 59 while keeping the first pinched piece 57b in contact with the first spring receiving portion 59. Hence, the support shaft 30, i.e., the outside handle 12 is biased toward the neutral position by the spring 57.

[0038] Next, operations of the embodiment will be described. The outside handle 12 is provided on the front side door D in such a manner as to operate the unlatching electric motor 17 in response to the first operation and to operate the emergency unlatching means 46 in response to the second operation being different from the first operation. Accordingly, both of the first operation in

the normal state where the unlatching electric motor 17 operates normally and the second operation in the emergency state where the operation of the unlatching electric motor 17 is disabled can be performed by using the same outside handle 12. Thus, it is easy to perform the emergency operation in case the latched state of the front side door D cannot be released electrically.

[0039] Moreover, the outside handle 12 is turnably attached to the front side door D via the single support shaft 30 in such a manner that the operations of the outside handle 12 can be switched between the first operation to turn the outside handle 12 downward from the neutral position and the second operation to turn the outside handle 12 upward from the neutral position. Meanwhile, the biasing means 56 for turning and biasing the outside handle 12 in the direction back to the neutral position side is provided between the outside handle 12 and the front side door D. Thus, it is possible to simplify the structure of the handle which facilitates the switching between the first and second operations.

[0040] Although an embodiment of the present invention has been described above, the present invention is not limited to the above-described embodiment, and various changes in design are possible without departing from the gist of the present invention.

[0041] For instance, the present invention is also applicable to a case where a door handle is placed as an inside handle located inside a vehicle door.

Claims

1. An unlatching device for a vehicle door, comprising:
electrically-operated unlatching means (17) capable of exerting unlatching power; emergency unlatching means (46) capable of transmitting mechanical unlatching power in response to an operation by a vehicle driver; and a latch mechanism (14) configured to enable switching between an unlocked state and a locked state and to release a latched state of a door (D) in response to an operation of any one of the electrically-operated unlatching means (17) and the emergency unlatching means (46) in the unlocked state,
characterized in that
a door handle (12) is provided on the door (D) in such a manner as to operate the electrically-operated unlatching means (17) in response to a first operation and to operate the emergency unlatching means (46) in response to a second operation being different from the first operation.

2. The unlatching device for a vehicle door according to claim 1, wherein the door handle (12) is turnably attached to the door (D) via a single support shaft (30) in such a manner as to enable switching between the first operation to turn the door handle (12) in one of upward and downward directions from a neutral position and the second operation to turn the door handle (12) in another one of the upward and downward directions from the neutral position,
and
biasing means (56) for turning and biasing the door handle (12) in a direction back to the neutral position side is provided between the door handle (12) and the door (D).

FIG. 1

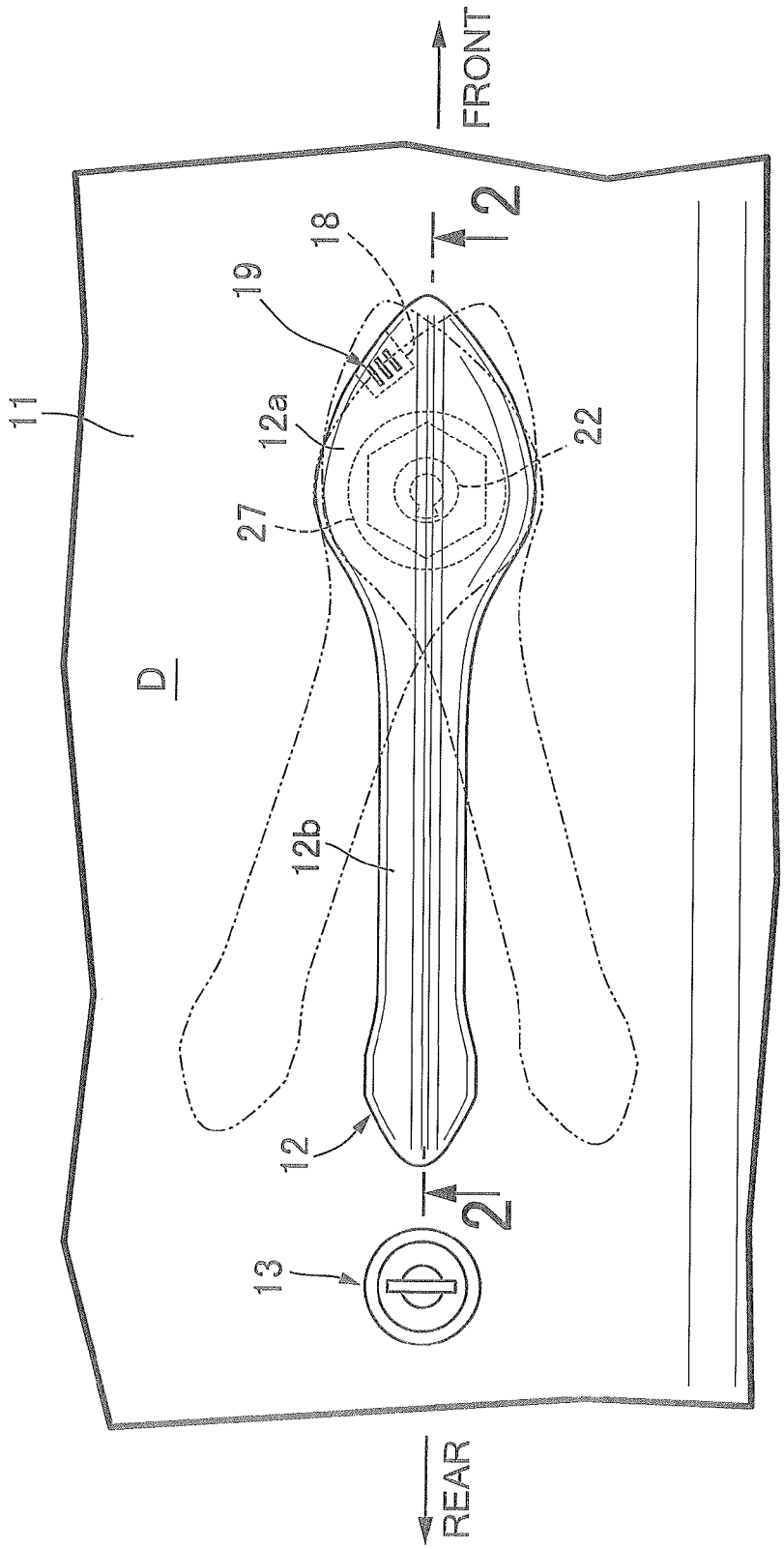


FIG.2

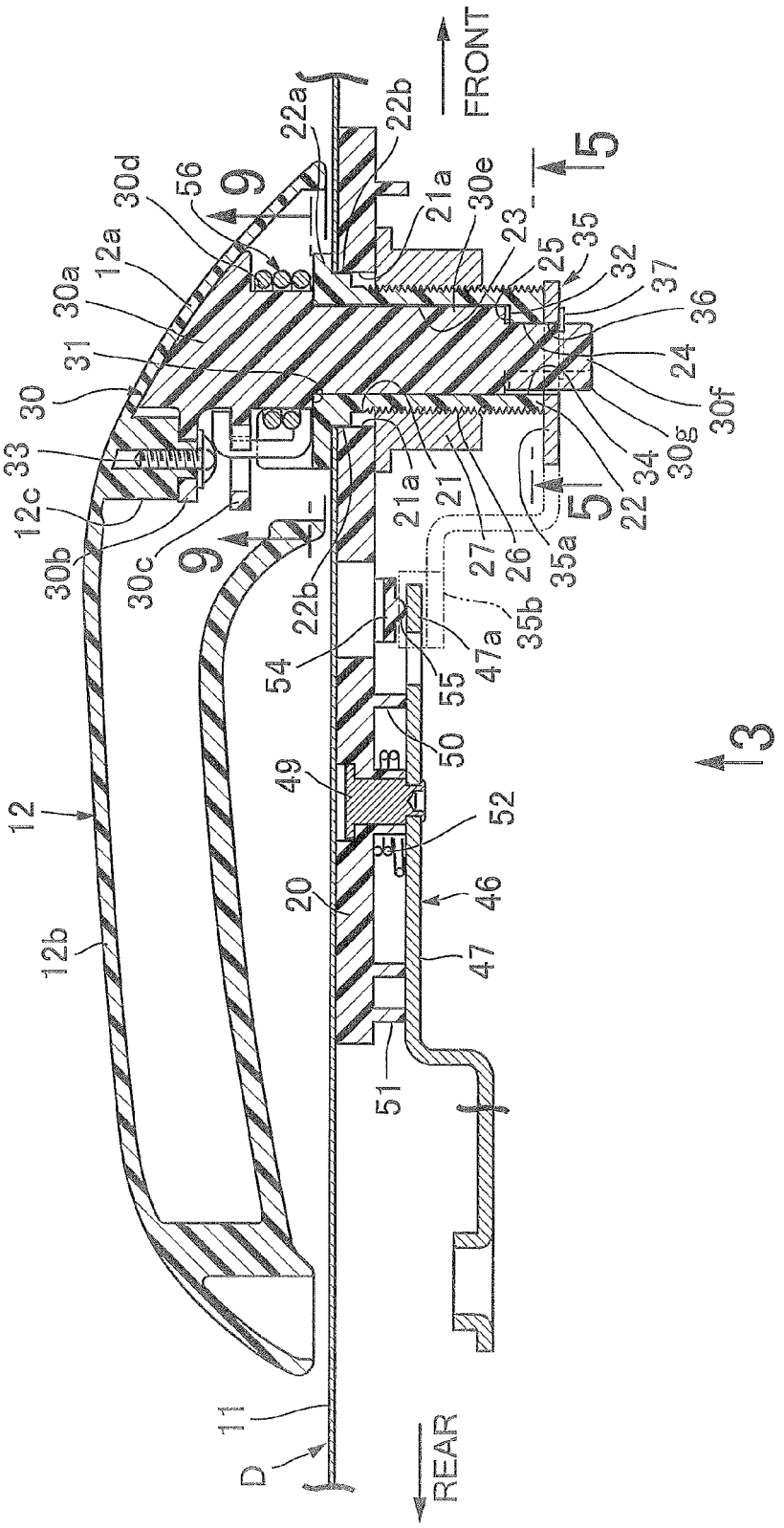

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FIG.3

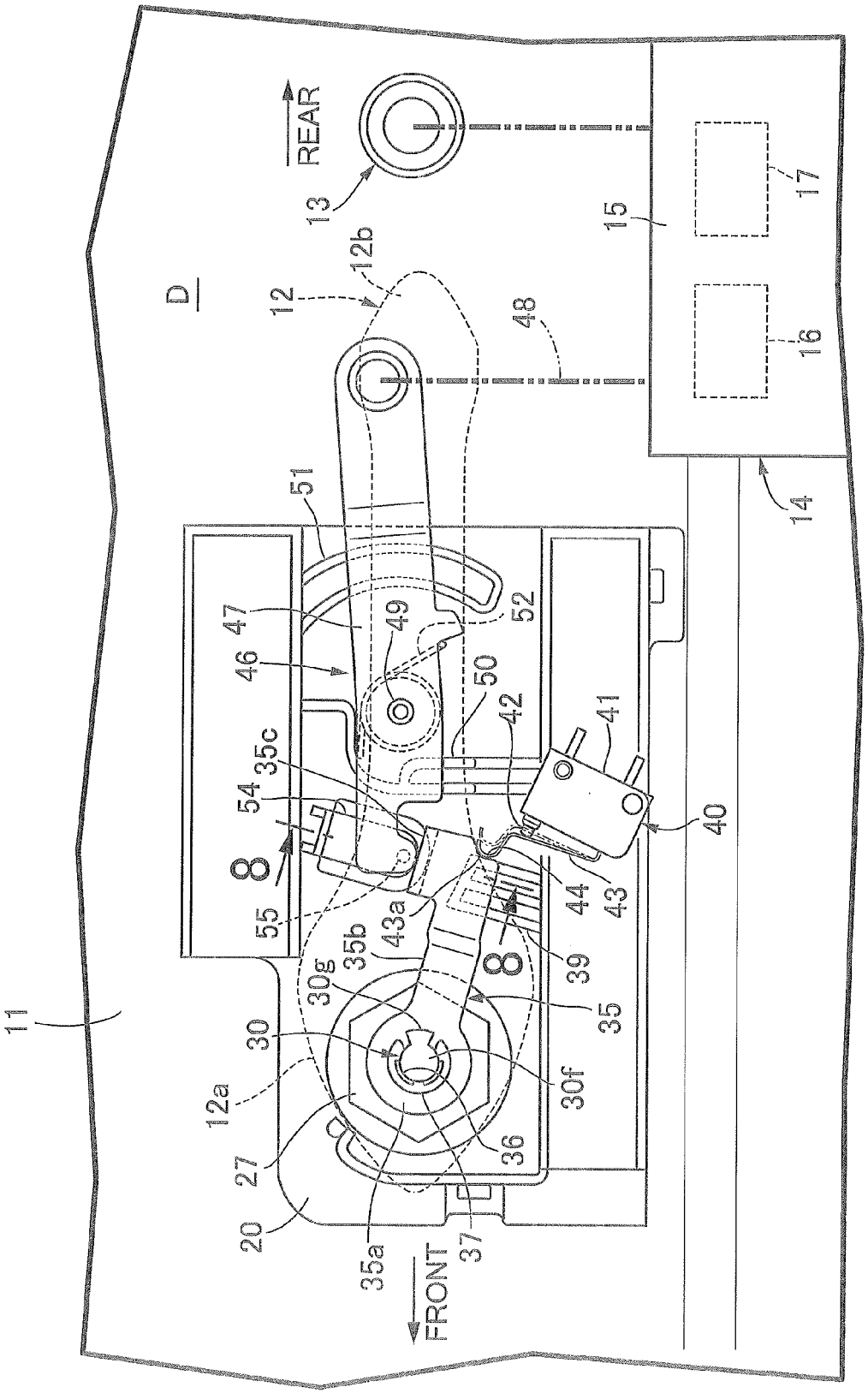
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FIG.4

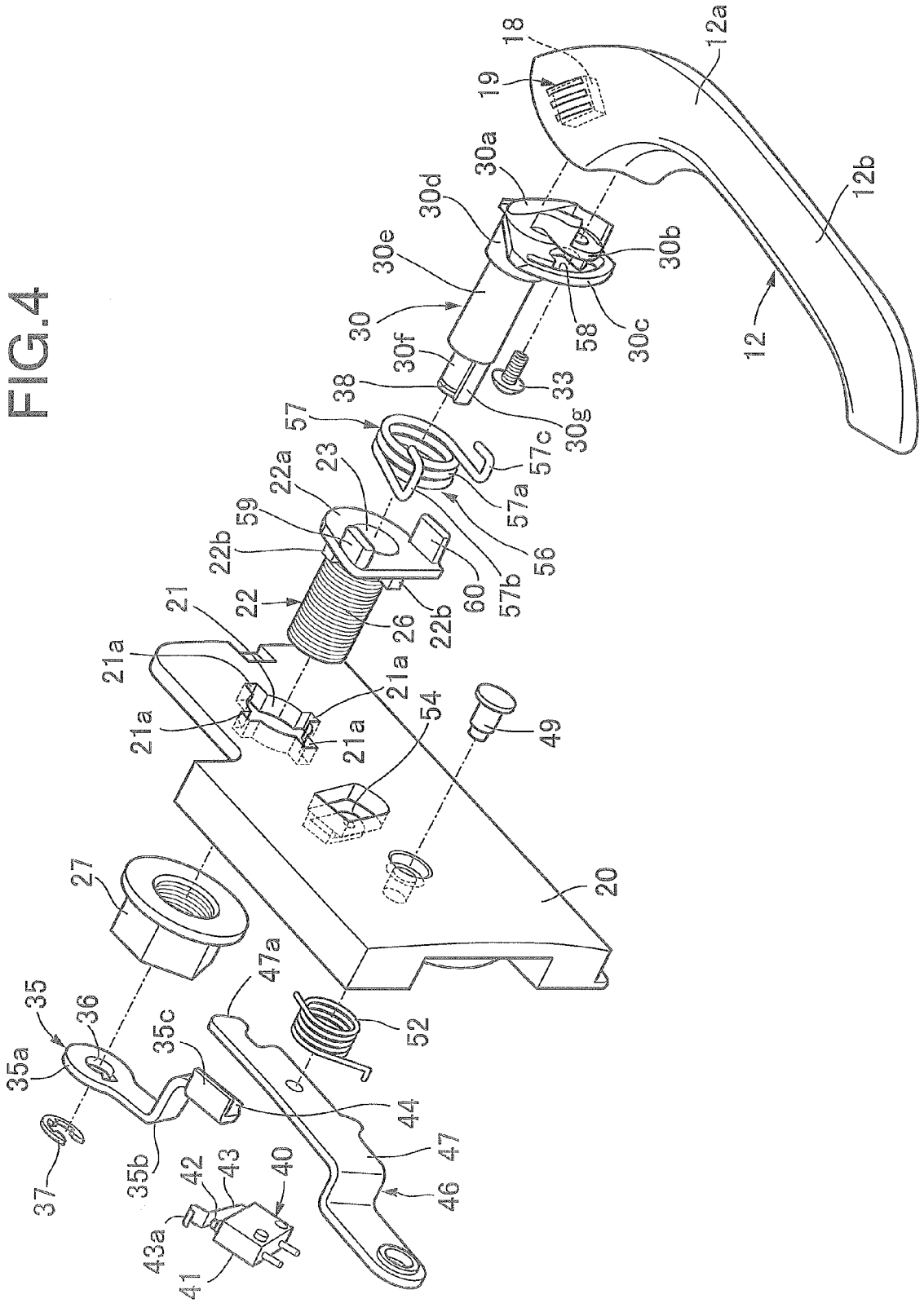
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FIG.5

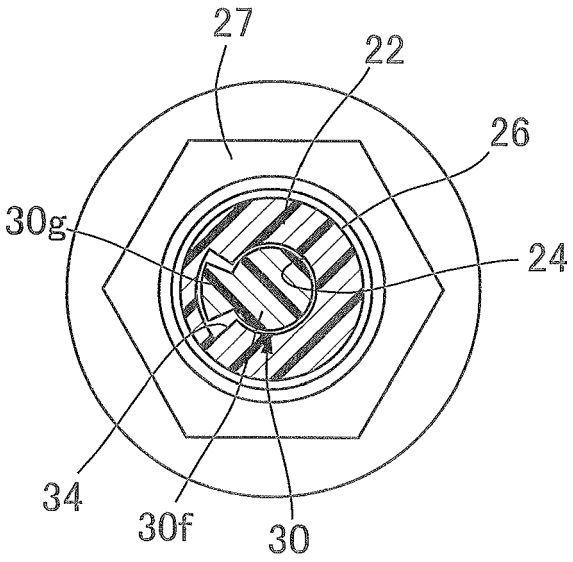

FIG.6

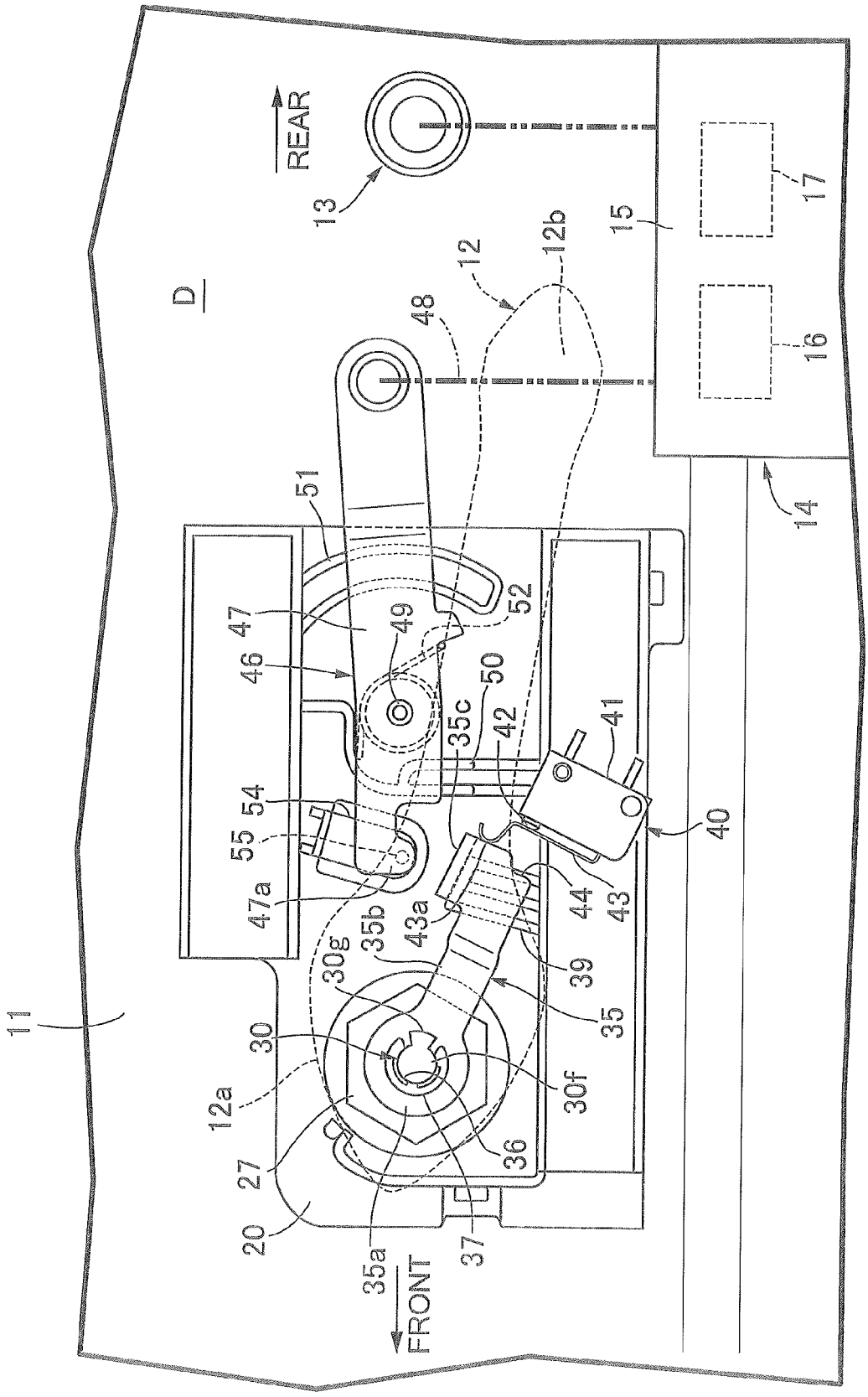
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FIG.7

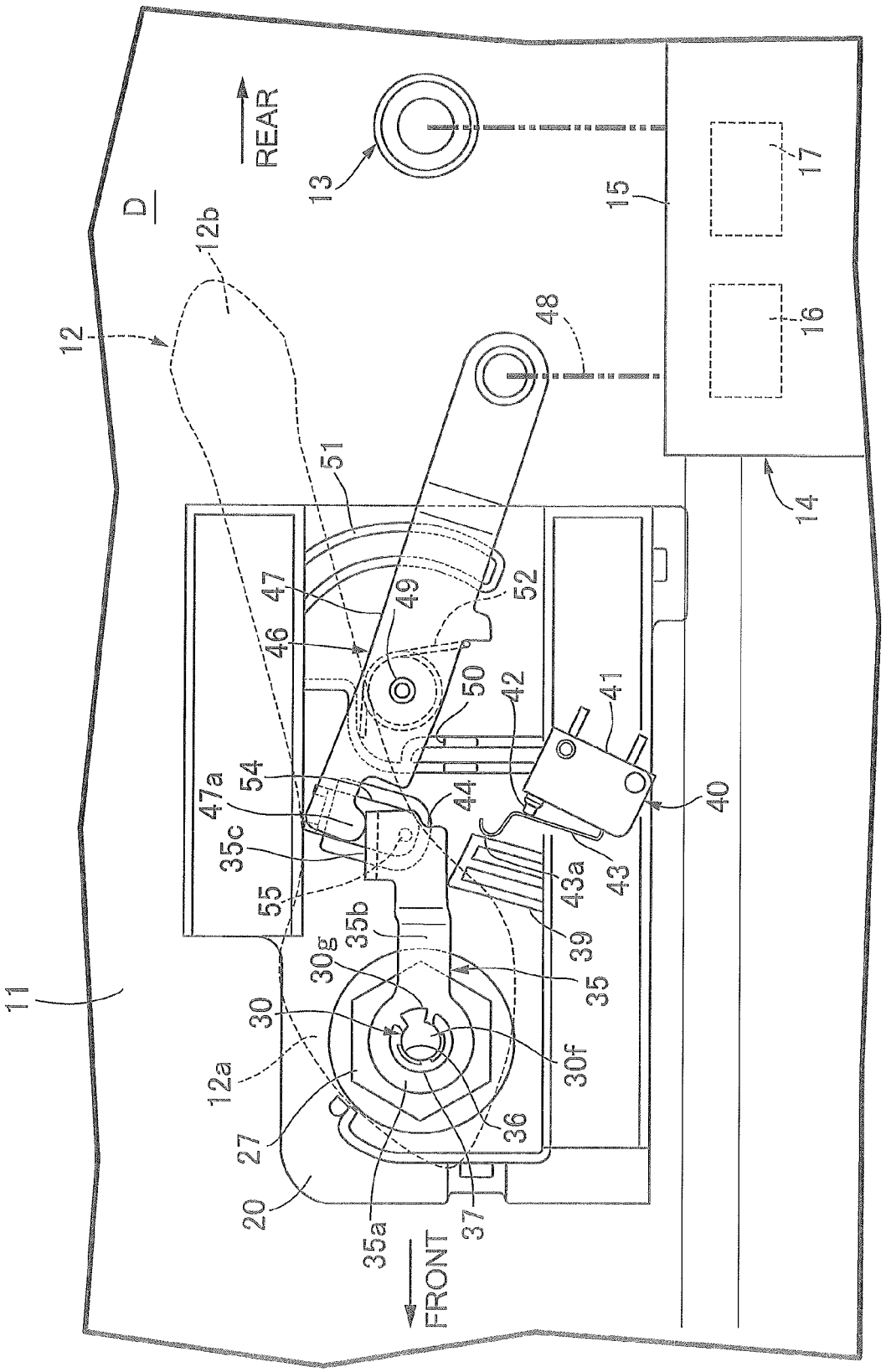
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FIG.8

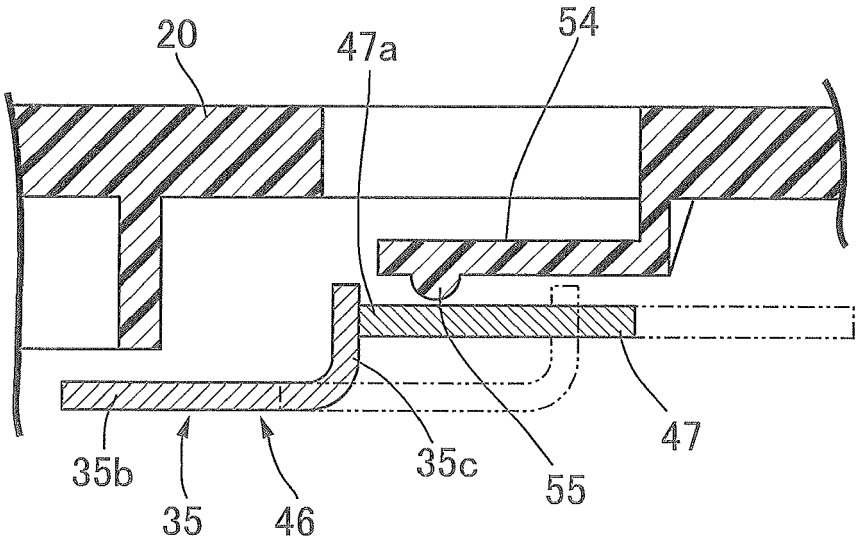
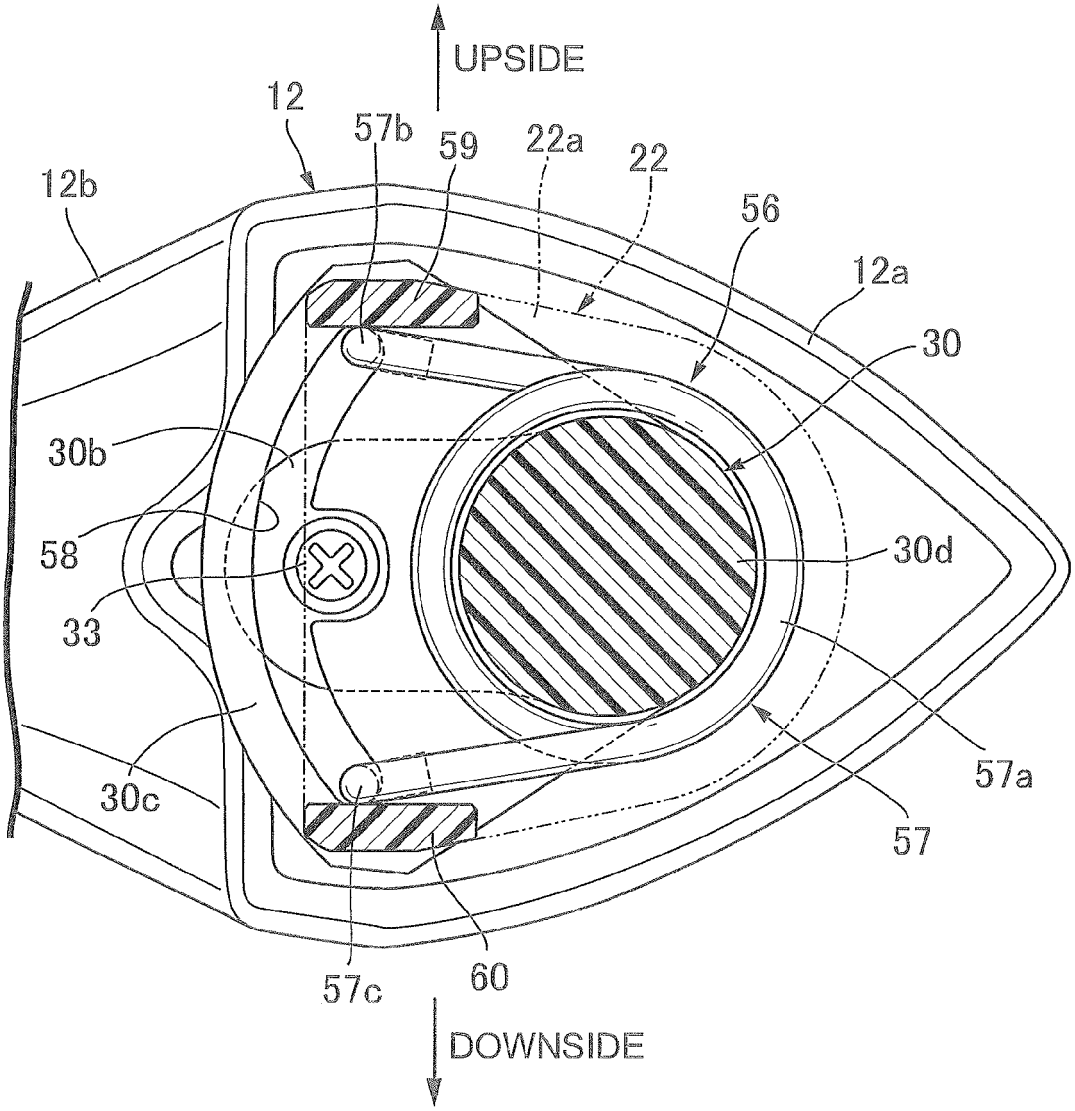


FIG.9


UPSIDE
12
57b
59
22a
22
12b
56
12a
30
30b
58
30d
33
57a
30c
57
57c
60
DOWNSIDE

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 4598668 B **[0002] [0003]**