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(72) Inventor: **NAKANO, Shiro**
Toyota-shi,
Aichi 471-8571 (JP)

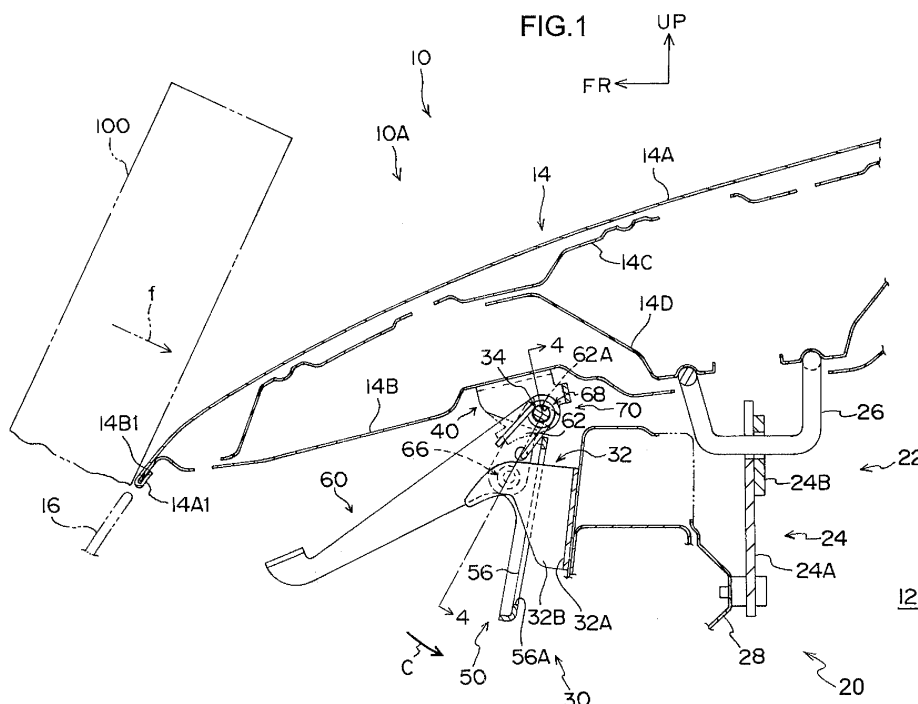
(71) Applicant: **TOYOTA JIDOSHA KABUSHIKI KAISHA**
Aichi-ken, 471-8571 (JP)

(74) Representative: **Winter, Brandl, Färniss, Hübner, Röss, Kaiser, Polte - Partnerschaft**
Bavariaring 10
80336 München (DE)

(54) **HOOD LOCK STRUCTURE**

(57) A hood lock structure is obtained that, while ensuring operability of an auxiliary lever, can make a deformation stroke of a front end portion of a hood large when a collision body collides with the hood from a front-most end side thereof. An upper portion side of a hood catch (50) and an auxiliary lever (60) are connected by a connecting structure (70) so as to be able to rotate and be displaced integrally around an axis of a first pin (34)

that is in a hood transverse direction. Further, when load of a predetermined value or more toward a vehicle rear lower side is inputted to the auxiliary lever (60) in a closed state of the hood (14), relative rotational displacement, around an axis of a second pin (66) that is in the hood transverse direction, of the auxiliary lever (60) with respect to the hood catch (50) due to input of the load is permitted by the connecting structure (70).



Description

Technical Field

[0001] The present invention relates to a hood lock structure that has an auxiliary latch mechanism.

Background Art

[0002] In vehicles in which the distance from the hood lock mechanism to the hood front end is long, there are cases in which the operation lever (auxiliary lever) of the safety mechanism (auxiliary latch mechanism) is set to be long (see, for example, Patent Document 1). The rigidity of such an operation lever is set to be high to a certain extent, from the standpoint of operability. [Patent Document 1] Japanese Patent Application Laid-Open No. 2005-88696

DISCLOSURE OF INVENTION

Technical Problem

[0003] However, when the rigidity of the operation lever is set to be high, in a case in which a collision object collides with the hood, that is in a closed state, from the front-most end side thereof, it is difficult for the operation lever to deform. Therefore, there is room for improvement with respect to the point of making the deformation stroke (deformable stroke) of the front end portion of the hood large.

[0004] In consideration of the above-described circumstances, an object of the present invention is to provide a hood lock structure that, while ensuring operability of an auxiliary lever, can make the deformation stroke of the front end portion of a hood large when a collision body collides with the hood from the front-most end side thereof.

Solution to Problem

[0005] A hood lock structure relating to a first aspect of the present invention comprises: a hood lock mechanism that, in a closed state of a hood that is mounted so as to be able to open and close with respect to a vehicle body, locks a front end portion of the hood at a vehicle body side; and an auxiliary latch mechanism that is provided separately from the hood lock mechanism, wherein the auxiliary latch mechanism has: a hook that is mounted to the vehicle body side; a hood catch that is provided at the hood side, and that anchors with the hook when the hood is displaced in an opening direction in a state in which a locked state of the hood by the hood lock mechanism is released; an auxiliary lever that is joined to an upper portion side of the hood catch, and is provided at a vehicle front side with respect to the hood catch; and a connecting structure that connects an upper portion side of the hood catch and the auxiliary lever such that

the upper portion side of the hood catch and the auxiliary lever are able to rotate and be displaced integrally around an axis that is in a hood transverse direction, and that, when load of a predetermined value or more toward a vehicle rear lower side is inputted to the auxiliary lever in the closed state of the hood, permits relative rotational displacement of the auxiliary lever with respect to the hood catch around an axis that is in the hood transverse direction due to input of the load.

[0006] In accordance with the hood lock structure relating to the first aspect of the present invention, in the closed state of the hood that is mounted so as to be able to open and close with respect to the vehicle body, the front end portion of the hood is locked at the vehicle body side by the hood lock mechanism. Further, when the hood is displaced in the opening direction in a state in which the locked state of the hood by the hood lock mechanism is released, the auxiliary latch mechanism that is provided separately from the hood lock mechanism causes the hood catch that is provided at the hood side to anchor with the hook that is provided at the vehicle body side.

[0007] The upper portion side of the hood catch and the auxiliary lever, that is provided at the vehicle front side with respect to the hood catch, are connected by the connecting structure so as to be able to rotate and be displaced integrally around an axis that is in the hood transverse direction. Due thereto, when the auxiliary lever is operated, in accordance therewith, the hood catch rotates and is displaced around an axis that is in the hood transverse direction, and is withdrawn to a position at which it does not anchor with the hook. On the other hand, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever in the closed state of the hood, relative rotational displacement, around an axis that is in the hood transverse direction, of the auxiliary lever with respect to the hood catch due to the input of this load is permitted by the connecting structure. Therefore, even if the rigidity of the auxiliary lever is set to be high, when a collision body collides with the hood from the front-most end side thereof, the front end portion of the hood deforms in accordance with the rotational displacement of the auxiliary lever.

[0008] In a second aspect of the present invention, in the hood lock structure relating to the first aspect, the connecting structure is structured to include a structure that has: a first pin that is provided at the hood side and that passes, in the hood transverse direction, through an end portion at the hood side of the hood catch and an end portion at the hood catch side of the auxiliary lever; and a second pin that passes, in the hood transverse direction, through the hood catch and the auxiliary lever, apart from the first pin; and, at the structure, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever in the closed state of the hood, a restricted state of relative rotational displacement of the hood catch and the auxiliary lever around an axis of either one of the first pin and the second

pin is released.

[0009] In accordance with the hood lock structure relating to the second aspect of the present invention, the first pin that is provided at the hood side passes, in the hood transverse direction, through the end portion at the hood side of the hood catch and through the end portion at the hood catch side of the auxiliary lever. Further, the second pin passes, in the hood transverse direction, through the hood catch and the auxiliary lever at a position that is apart from the first pin. Due thereto, the shape in which the hood catch and the auxiliary lever are made to be integral can be set easily.

[0010] Further, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever in the closed state of the hood, the restricted state of relative rotational displacement of the hood catch and the auxiliary lever around an axis of either one of the first pin and the second pin is released. Thus, the auxiliary lever rotates and is displaced around the axis of either one of the first pin and the second pin due to the input of this load. Therefore, when a collision body collides with the hood from the front-most end side thereof, the front end portion of the hood deforms in accordance with the rotational displacement of the auxiliary lever around the axis of either one of the first pin and the second pin.

[0011] In a third aspect of the present invention, in the hood lock structure relating to the second aspect, the connecting structure has: an engaging portion that is formed at an end portion at the hood catch side of the auxiliary lever, and that is separably engaged with respect to the first pin; and an urging member that is provided at the hood side, and that urges the end portion at the hood catch side of the auxiliary lever in a direction opposite a direction in which the engaging portion separates from the first pin, and urging force of the urging member is set such that, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever in the closed state of the hood, the engaging portion separates from the first pin.

[0012] In accordance with the hood lock structure relating to the third aspect of the present invention, the engaging portion, that is formed at the end portion at the hood catch side of the auxiliary lever, is separably engaged with respect to the first pin. Further, the end portion at the hood catch side of the auxiliary lever is urged, by the urging member that is provided at the hood side, in the direction opposite the direction in which the engaging portion separates from the first pin. Accordingly, at usual times, the shape in which the hood catch and the auxiliary lever are made integral is maintained.

[0013] Here, the urging force of the urging member is set such that, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever in the closed state of the hood, the engaging portion separates from the first pin. Accordingly, due to the input of this load, the engaging portion separates from the first pin and the auxiliary lever rotates and is

displaced around the axis of the second pin. Therefore, when a collision body collides with the hood from the front-most end side thereof, the front end portion of the hood deforms in accordance with the rotational displacement of the auxiliary lever around the axis of the second pin.

[0014] In a fourth aspect of the present invention, in the hood lock structure relating to the second aspect, the connecting structure is structured to include a structure in which a through portion, that is shaped as an arc whose center is the first pin, is formed in the hood catch, and the second pin passes through an inner side upper portion of the through portion, and a convex portion that supports the second pin is formed at an inner surface of the through portion.

[0015] In accordance with the hood lock structure relating to the fourth aspect of the present invention, a through portion, that is shaped as an arc whose center is the first pin, is formed in the hood catch, and the second pin passes through an inner side upper portion of the through portion, and a convex portion, that is formed at the inner surface of the through portion, supports the second pin. Therefore, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever in the closed state of the hood, due to the convex portion deforming due to the load from the second pin, the auxiliary lever rotates and is displaced, together with the second pin, around the axis of the first pin. Therefore, when a collision body collides with the hood from the front-most end side thereof, the front end portion of the hood deforms in accordance with the rotational displacement of the auxiliary lever around the axis of the first pin.

Advantageous Effects of Invention

[0016] As described above, in accordance with the hood lock structure relating to the first aspect of the present invention, there is the excellent effect that, while the operability of the auxiliary lever is ensured, the deformation stroke of the front end portion of the hood can be made to be large when a collision body collides with the hood from the front-most end side thereof.

[0017] In accordance with the hood lock structure relating to the second aspect of the present invention, there are the excellent effects that the shape, in which the hood catch and the auxiliary lever are made integral, can be formed easily, and the setting of the relative rotational displacement of the hood catch and the auxiliary lever at the time of input of a collision load also can be made easily.

[0018] In accordance with the hood lock structure relating to the third aspect of the present invention, there is the excellent effect that the setting, that causes the auxiliary lever to rotate and be displaced relative to the hood catch when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever in the closed state of the hood, is possible by

varying the urging force of the urging member, and therefore, this setting can be made even more easily.

[0019] In accordance with the hood lock structure relating to the fourth aspect of the present invention, there is the excellent effect that, when a collision body collides with the hood from the front-most end side thereof, the deformation stroke of the front end portion of the hood can be made to be even larger.

BRIEF DESCRIPTION OF DRAWINGS

[0020]

Fig. 1 is a side sectional view showing a hood lock structure relating to a first embodiment of the present invention.

Fig. 2 is a perspective view showing an auxiliary latch mechanism of Fig. 1.

Fig. 3 is an exploded perspective view of the auxiliary latch mechanism of Fig. 1.

Fig. 4 is an enlarged sectional view along line 4-4 of Fig. 1.

Fig. 5 is a schematic side sectional view showing a state in which an auxiliary lever of Fig. 1 is displaced at the time of a collision.

Fig. 6A is a side sectional view showing the state at the time of opening a hood of Fig. 1, and shows a state in which a locked state of the hood by a hood lock mechanism is released.

Fig. 6B is a side sectional view showing the state at the time of opening the hood of Fig. 1, and shows a state in which the auxiliary lever is pulled-up and is rotated together with a hood catch.

Fig. 7 is an F-S graph showing the characteristic in a case in which the hood lock structure relating to the first embodiment of the present invention is applied, and the characteristic of a comparative structure.

Fig. 8 is a side sectional view showing an auxiliary latch mechanism of a hood lock structure relating to a second embodiment of the present invention.

Fig. 9 is a perspective view showing the auxiliary latch mechanism of Fig. 8.

Fig. 10 is an exploded perspective view showing the auxiliary latch mechanism of Fig. 8.

Fig. 11 is an enlarged sectional view along line 11-11 of Fig. 8.

Fig. 12 is a schematic side sectional view showing a state in which an auxiliary lever of Fig. 8 is displaced at the time of a collision.

BEST MODES FOR CARRYING OUT THE INVENTION

[First Embodiment]

[0021] A hood lock structure relating to a first embodiment of the present invention is described by using Fig. 1 through Fig. 7. Note that arrow FR that is shown ap-

propriately in these drawings indicates the vehicle front side, arrow UP indicates the vehicle upper side, and arrow W indicates the vehicle transverse direction. Further, in the closed state of the hood, the hood front side is the same direction as the vehicle front side, the hood upper side is the same direction as the vehicle upper side, and the hood transverse direction is the same direction as the vehicle transverse direction.

[0022] A hood lock structure 20 relating to the first embodiment is shown in a side sectional view in Fig. 1. As shown in Fig. 1, a hood 14 (engine hood), that covers an engine room 12 of a vehicle body front portion 10A so as to be able to open and close, is disposed at an automobile (vehicle) 10. Hinges (not shown) are disposed at the rear end portion in the vehicle front-rear direction of the hood 14. Due thereto, the hood 14 is mounted so as to be able to rotate and move around an axis that is in the vehicle transverse direction at the hinges, i.e., so as to be able to open and close with respect to the vehicle body. Note that a radiator grill 16 is disposed at the lower side of the front-most end of the hood 14.

[0023] The outer plate of the hood 14 is structured by a hood outer panel 14A. In the closed state of the hood 14, the hood outer panel 14A extends substantially along the vehicle front-rear direction. A hood inner panel 14B is disposed at the hood lower side with respect to this hood outer panel 14A. The hood inner panel 14B structures the inner plate of the hood 14. The hood outer panel 14A and the hood inner panel 14B are both formed by press-molding metal plates (e.g., steel plates, aluminum alloy plates, or the like). Further, the outer peripheral edge portion (including a front end edge portion 14A1) of the hood outer panel 14A and the outer peripheral edge portion (including a front end edge portion 14B1) of the hood inner panel 14B are joined by adhesion by an adhesive and by hemming processing.

[0024] A dent reinforcement 14C is disposed at the hood outer panel 14A side, between the hood outer panel 14A and the hood inner panel 14B. The dent reinforcement 14C is a reinforcing member that is formed of metal and in a plate shape, and that is for suppressing deformation of the hood outer panel 14A at the time of closing the hood 14. A striker reinforcement 14D is disposed at the hood lower side of the dent reinforcement 14C, between the hood outer panel 14A and the hood inner panel 14B. The striker reinforcement 14D is a reinforcing member that is formed of metal and in a bent plate shape, and that is for ensuring the rigidity of the hood inner panel 14B side (around a striker 26 that is described later) of the front end portion of the hood 14.

[0025] A hood lock mechanism 22 is disposed so as to correspond to the central portion, in the hood transverse direction, of the front end portion side at the hood 14 that is at the closed position. Note that the hood lock structure 20 relating to the present embodiment is applied to a vehicle in which the distance from the hood lock mechanism 22 to the front end edge portion of the hood 14 is long. The hood lock mechanism 22 is a mechanism

that, in the closed state of the hood 14 (the state shown in Fig. 1), locks the front end portion of the hood 14 at a radiator support upper 28 (that is an element that is interpreted in a broad sense as a "vehicle body skeleton member") side that serves as a portion of the vehicle body.

[0026] The hood lock mechanism 22 is structured to include a lock mechanism portion 24 that is disposed at the rear surface side of the radiator support upper 28 within the engine room 12, and the striker 26 (also called the "hood lock striker") that is disposed at the hood 14 side (the hood inner panel 14B side). The lock mechanism portion 24 has a base 24A that is substrate-shaped and is fixed to the radiator support upper 28, and has a latch 24B that is mounted to the base 24A so as to be able to rotate and move around an axis that is substantially in the vehicle front-rear direction. Further, the latch 24B is anchored with the striker 26 at the closed position of the hood 14, and due to the latch 24B being anchored, the hood 14, that is in the state of being at the closed position, is held.

[0027] On the other hand, the radiator support upper 28, to which the base 24A of the lock mechanism portion 24 is mounted, structures the upper portion of a radiator support (not shown) that is formed in a substantially rectangular frame shape in a vehicle front view (not shown). The radiator support upper 28 is disposed so as to extend along the vehicle transverse direction at the front end side upper portion within the engine room 12.

[0028] An auxiliary latch mechanism 30, that is separate from the hood lock mechanism 22, is provided at the vehicle front side of the hood lock mechanism 22. The auxiliary latch mechanism 30 has a hook 32 that is disposed at the radiator support upper 28 side. The hook 32 is a bent-plate-shaped member that is bent substantially at a right angle, and a mounting piece 32A is mounted to the front surface side of the radiator support upper 28 by a fastener (e.g., a bolt and a nut). At the hook 32, a hook main body 32B, that is bent from one end of the mounting piece 32A, is formed substantially in a backward J-shape as seen in a vehicle side view.

[0029] In contrast thereto, a bracket 40, that is for mounting a hood catch 50 and an auxiliary lever 60, is disposed at the hood 14 side. As shown in Fig. 2 and Fig. 3, at the bracket 40, the rear end portions of a pair of side plate portions 42, 43 that face one another are connected by a back plate portion 44, and mounting pieces 46, 47, that extend in directions of moving apart from one another from the upper end portions of the pair of side plate portions 42, 43, are formed. Fastening holes 46A, 47A for the passing through of fasteners (e.g., bolts) are formed to pass through the mounting pieces 46, 47 of the bracket 40, and the mounting pieces 46, 47 are mounted to the hood inner panel 14B (see Fig. 1) by fasteners (e.g., bolts and nuts).

[0030] Further, as shown in Fig. 3, first pin insert-through holes 42A, 43A, for the passing through of a first pin 34, are formed to pass through the pair of side plate

portions 42, 43 of the bracket 40. Moreover, a bent piece 48, that is bent at a substantial right angle from the front end of the one side plate portion 43 of the bracket 40 toward the front end side of the other side plate portion 42, is formed. A stopper main body 36, that is substantially rectangular box shaped, is mounted to the bent piece 48, and a stopper portion 37 is structured by the bent piece 48 and the stopper main body 36.

[0031] The upper end portion of the hood catch 50 is disposed between the pair of side plate portions 42, 43 of the bracket 40. The hood catch 50 has a pair of side plate portions 52, 54 that oppose one another at the upper portion of the hood catch 50, and has a catch main body 56 that connects the rear end lower portions of the pair of side plate portions 52, 54 together and extends downward. First pin insert-through holes 52A, 54A, for passing through the first pin 34, are formed to pass through the upper portions of the side plate portions 52, 54 of the hood catch 50. Bushes 38A, 38B, that are cylindrical tube shaped, are inserted within the first pin insert-through holes 52A, 54A. The first pin 34 can be passed through the interiors of these bushes 38A, 38B. Namely, the hood catch 50 is mounted to the bracket 40 via the first pin 34, and is supported at the bracket 40 in a state of being able to rotate and be displaced around the axis of the first pin 34.

[0032] A hole portion 54B that is substantially rectangular is formed to pass through the one side plate portion 54 at the hood catch 50, at the lower side of the pin insert-through hole 54A. The stopper portion 37 is accommodated within this hole portion 54B, and the stopper portion 37 abuts one side of the inner surface portion of the hole portion 54B (see Fig. 2). A second pin insert-through hole 52B, for passing through of a second pin 66, is formed to pass through the one side plate portion 52 at the hood catch 50, at the lower side of the first pin insert-through hole 52A.

[0033] Further, the catch main body 56 at the hood catch 50 is formed in a substantially rectangular plate shape that is long vertically. A bent portion 55, that has a narrow width and is bent substantially at a right angle at the same side as the side plate portions 52, 54, is formed at the both side end portions of the catch main body 56 from the lower sides of the side plate portions 52, 54 and the lower end portion of the catch main body 56. A long hole 56A, that is substantially rectangular and is long vertically along the longitudinal direction of the catch main body 56, is formed to pass through the catch main body 56. The auxiliary latch mechanism 30 and peripheral portions thereof in a state in which the locked state of the hood 14 by the hood lock mechanism 22 (see Fig. 1) is released, is shown in Fig. 6A. When the hood catch 50 displaces the hood 14 further in the opening direction (arrow A direction) from the state shown in Fig. 6A, the lower end of the catch main body 56 anchors with the hook 32. Further, as shown in Fig. 6B, due to the hood catch 50 being rotated and displaced toward the front upper side (in the arrow B direction) around the first

pin 34 that is in the hood transverse direction, the hood catch 50 can withdraw to a withdrawn position at which it is not engaged with the hook 32.

[0034] As shown in Fig. 1, the auxiliary lever 60 is joined to the upper portion side of the hood catch 50. The auxiliary lever 60 is provided at the vehicle front side with respect to the hood catch 50, in the closed state of the hood 14. As shown in Fig. 2 and Fig. 3, the general portion of the auxiliary lever 60 is formed in the shape of a plate whose plate thickness direction is the vehicle transverse direction, and the auxiliary lever 60 has a lever base portion 62 that is made integral with the hood catch 50, and has a lever main body portion 64 that extends, from the lever base portion 62, toward the side opposite the bracket 40 side.

Further, an operation portion 64A, whose top end portion side is bent substantially at a right angle, is formed at the distal end portion of the lever main body portion 64. Note that, as illustrated in these drawings, this auxiliary lever 60 has a length of certain extent in the lever longitudinal direction, and, from the standpoint of operability, has rigidity of an extent that it does not bend at the time of operation.

[0035] As shown in Fig. 3, an engaging portion 62A that is concave is formed in the lever base portion 62 (the end portion at the hood catch 50 side) of the auxiliary lever 60. This engaging portion 62A is formed so as to open toward the vehicle rear lower side in the closed state of the hood, and is separably engaged with (caught on) the first pin 34 (see Fig. 2). The first pin 34 is passed, in the hood transverse direction, through the first pin insert-through holes 42A, 43A of the side plate portions 42, 43 of the bracket 40, and through the first pin insert-through holes 52A, 54A of the side plate portions 52, 54 (the end portion at the hood 14 side) of the hood catch 50, and through the engaging portion 62A of the lever base portion 62 (the end portion at the hood catch 50 side) of the auxiliary lever 60. As shown in Fig. 4 that is an enlarged sectional view along line 4-4 of Fig. 1, this first pin 34 has a head portion 34A at one end side (the left side in Fig. 4) in the axial direction of a shaft portion 34B, and the axial end at the axial direction other end side (the right side in Fig. 4) of the shaft portion 34B is crushed (caulked) and becomes a removal-preventing portion 34C. Due thereto, the first pin 34 is mounted to the hood 14 side via the bracket 40.

[0036] As shown in Fig. 3, a second pin insert-through hole 62B, for passing through of the second pin 66, is formed to pass through a portion, that faces the second pin insert-through hole 52B of the hood catch 50, at the lever base portion 62 of the auxiliary lever 60. Apart from the first pin 34, the second pin 66 is passed, in the hood transverse direction, through the second pin insert-through hole 52B of the one side plate portion 42 of the hood catch 50 and the second pin insert-through hole 62B of the lever base portion 62 of the auxiliary lever 60. As shown in Fig. 4, this second pin 66 is a caulking pin, and has a head portion 66A at one end side (the right

side in Fig. 4) in the axial direction of a shaft portion 66B, and the axial end at the axial direction other end side (the left side in Fig. 4) of the shaft portion 66B is crushed (caulked) and becomes a removal-preventing portion 66C.

[0037] As shown in Fig. 3, a small hole 62C, that is for anchoring one end portion 68A of a torsion spring 68 that serves as an urging member, is formed between the engaging portion 62A and the second pin insert-through hole 62B at the lever base portion 62 of the auxiliary lever 60. As shown in Fig. 2, a coil portion 68B of the torsion spring 68 is wound around the shaft of the first pin 34, and the first pin 34 is a rotating shaft. Another end portion 68C of the torsion spring 68 is anchored on the stopper main body 36 that is mounted to the bent piece 48 of the bracket 40. Namely, the torsion spring 68 is supported at the hood 14 (see Fig. 1) side via the bracket 40. The torsion spring 68, that is provided at the hood 14 side shown in Fig. 1, urges the lever base portion 62 (the end portion at the hood catch 50 side) of the auxiliary lever 60 in the direction opposite the direction in which the engaging portion 62A separates from the first pin 34 (substantially the vehicle front upper side) (the torsion spring 68 pushes the lever base portion 62 substantially toward the vehicle rear lower side).

[0038] Due thereto, the upper portion side of the hood catch 50 and the auxiliary lever 60 are connected so as to be able to rotate and be displaced integrally around the axis of the first pin 34 that is in the hood transverse direction. In the present embodiment, a connecting structure 70 that connects the upper portion side of the hood catch 50 and the auxiliary lever 60, is structured to include the bracket 40, the first pin 34, the second pin 66, the respective portions formed at the hood catch 50 that are the first pin insert-through holes 52A, 54A, the second pin insert-through hole 52B and the hole portion 54B, the respective portions formed at the auxiliary lever 60 that are the engaging portion 62A, the second pin insert-through hole 62B and the small hole 62C, the bushes 38A, 38B, the torsion spring 68, and the stopper portion 37, that are shown in Fig. 3.

[0039] The connecting structure 70 is a structure that, by restricting relative rotational displacement of the hood catch 50 and the auxiliary lever 60 around the axis of the first pin 34, and restricting relative rotational displacement of the hood catch 50 and the auxiliary lever 60 around the axis of the second pin 66, makes the hood catch 50 and the auxiliary lever 60 integral, and restricts relative angular displacement, around an axis that is in the hood transverse direction, of the hood catch 50 and the auxiliary lever 60.

[0040] The urging force of the torsion spring 68 at the connecting structure 70 is set such that the engaging portion 62A separates from the first pin 34 when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever 60 in the closed state of the hood 14 shown in Fig. 5. Due thereto, when load of a predetermined value or more toward the vehicle

rear lower side is inputted to the auxiliary lever 60 in the closed state of the hood 14, the state of restricting relative rotational displacement of the hood catch 50 and the auxiliary lever 60 around the axis of the second pin 66 is released.

[0041] Namely, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever 60 in the closed state of the hood 14, the connecting structure 70 permits relative rotational displacement of the auxiliary lever 60 with respect to the hood catch 50 around the axis of the second pin 66 that is in the hood transverse direction, due to the input of this load.

(Operation/Effects)

[0042] The operation and effects of the above-described embodiment are described next.

[0043] As shown in Fig. 1, in the closed state of the hood 14, the front end portion of the hood 14 is locked at the radiator support upper 28 side by the hood lock mechanism 22. On the other hand, when the hood 14 is displaced further in the opening direction (arrow A direction) from the state shown in Fig. 6A, i.e., the state in which the locked state of the hood 14 by the hood lock mechanism 22 (see Fig. 1) is released, the hood catch 50 that is provided at the hood 14 side anchors (not shown) with the hook 32 that is provided at the radiator support upper 28 side. The auxiliary lever 60 is operated in order to displace this hood catch 50 to the withdrawn position at which it is not anchored with the hook 32 (details described later).

[0044] Here, the maintaining of the integrated shape of the hood catch 50 and the auxiliary lever 60 shown in Fig. 1, and the restricting of the relative displacement of the hood catch 50 with respect to the hood 14, are described.

[0045] At the connecting structure 70 that connects the hood catch 50 and the auxiliary lever 60, the first pin 34 that is provided at the hood 14 side is passed, in the hood transverse direction, through the end portion at the hood 14 side of the hood catch 50 and the end portion at the hood catch 50 side of the auxiliary lever 60. Further, the second pin 66 is passed, in the hood transverse direction, through the hood catch 50 and the auxiliary lever 60 at a position apart from the first pin 34. Due thereto, the shape in which the hood catch 50 and the auxiliary lever 60 are made integral is set easily.

[0046] Further, as shown in Fig. 2, at the end portion at the hood catch 50 side of the auxiliary lever 62, the engaging portion 62A that is concave is separably engaged with respect to the first pin 34, and the end portion is urged in the direction (the direction of not causing the engaging portion 62A to separate from the first pin 34) opposite the direction in which the engaging portion 62A separates from the first pin 34, by the torsion spring 68 that employs reaction force at the hood 14 (see Fig. 1) side. Accordingly, at usual times (when a collision load

is not being received), the shape in which the hood catch 50 and the auxiliary lever 60 are made integral is maintained.

[0047] On the other hand, at usual times, as shown in Fig. 1, the engaging portion 62A is engaged with the first pin 34, and the first pin 34 is mounted to the hood 14 via the bracket 40, and therefore, the auxiliary lever 60 cannot rotate clockwise in Fig. 1 around the axis of the second pin 66 past the engaged position of the engaging portion 62A and the first pin 34. As a result, the urging force of the torsion spring 68 works so as to rotate the auxiliary lever 60 counterclockwise in Fig. 1 (so as to push the auxiliary lever 60 in an arrow C direction) around the first pin 34. Here, because the hood catch 50 is made integral with the auxiliary lever 60 as described above, the hood catch 50 also attempts to rotate counterclockwise (pushed in the arrow C direction) in Fig. 1 together with the auxiliary lever 60. In contrast thereto, the stopper portion 37, that is provided at the bracket 40 at the hood 14 (see Fig. 1) side, hits the hole portion 54B of the hood catch 50 shown in Fig. 2, and therefore, relative displacement of the hood catch 50 with respect to the hood 14 is restricted.

[0048] Due thereto, the catch main body 56, at which relative displacement with respect to the hood 14 shown in Fig. 6A is restricted, anchors (not illustrated) with the hook 32 as described above when the hood 14 is displaced in the opening direction (the arrow A direction) in the state in which the locked state of the hood 14 is released. Accordingly, the hood 14 can be prevented from inadvertently moving in the opening direction (the arrow A direction).

[0049] On the other hand, as shown in Fig. 6B, due to the auxiliary latch mechanism 30 rotating and displacing the hood catch 50 toward the front upper side (in the arrow B direction) around the axis of the first pin 34, the hood catch 50 can withdraw to the withdrawn position at which the hood catch 50 does not anchor with the hook 32.

[0050] Further, as described above, the upper portion side of the hood catch 50 and the auxiliary lever 60 are connected by the connecting structure 70 so as to be able to rotate and be displaced integrally around the axis of the first pin 34. Due thereto, at the time of causing the hood catch 50 to withdraw to the withdrawn position, when the operation portion 64A of the auxiliary lever 60 is operated so as to be brought upward, in accordance therewith, the hood catch 50 rotates and is displaced toward the front upper side (in the arrow B direction) around the axis of the first pin 34.

[0051] More concretely, when the operation portion 64A of the auxiliary lever 60 is operated so as to be brought upward, the auxiliary lever 60 first attempts to move around the second pin 66, but, because the engaging portion 62A at the proximal end is engaged with the first pin 34, as a result, the auxiliary lever 60 rotates and is displaced around the first pin 34 (in the arrow B direction). Then, when the hood catch 50 is pulled-up-

ward integrally with the auxiliary lever 60 in accordance therewith, the hood catch 50 is withdrawn to the withdrawn position at which it does not anchor with the hook 32. If the hood 14 is brought upward in the opening direction (the arrow A direction) in this state, the hood 14 is opened.

[0052] Next, operation when a collision body 100 collides with the hood 14 from the front-most end side thereof is described with reference to Fig. 1 and Fig. 5 and the like. Note that the collision body 100 in the drawings is made to be a femoral region impactor that simulates the femoral region of a pedestrian, and arrow f in the drawings indicates the impactor hitting direction (the colliding direction of the collision body). Further, the two-dot chain lines at the hood 14 and the auxiliary lever 60 in Fig. 5 show the positions before collision.

[0053] In the present embodiment, the urging force of the torsion spring 68 at the connecting structure 70 shown in Fig. 1 is set such that, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever 60 in the closed state of the hood 14, the engaging portion 62A separates from the first pin 34 as shown in Fig. 5. In other words, in the closed state of the hood 14, when the collision body 100 collides and the hood 14 deforms and load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever 60 via the hood inner panel 14B, the state of restricting relative rotational displacement of the hood catch 50 and the auxiliary lever 60 around the axis of the second pin 66 is released.

[0054] When the engaging portion 62A separates from the first pin 34 due to the input of this load, the auxiliary lever 60 rotates and is displaced around the axis of the second pin 66 (in the arrow C direction), and the operation portion 64A side of the auxiliary lever 60 is pushed downward. Therefore, even if the rigidity of the auxiliary lever 60 is set to be high, when the collision body 100 collides with the hood 14 from the front-most end side thereof, the auxiliary lever 60 rotates and is displaced around the axis of the second pin 66, and, in accordance therewith, the front end portion of the hood 14 deforms. Accordingly, the load that is applied to the collision body 100 is suppressed by an amount corresponding to the amount by which the auxiliary lever 60 is not thrust-out, and a deformation stroke S (also called the "impact absorption stroke") of the front end portion of the hood 14 becomes larger by an amount corresponding to a stroke S 1 that corresponds to the rotational displacement of the auxiliary lever 60.

[0055] Fig. 7 is a graph showing the relationship between load (F) and stroke (S) when a collision body collides with the hood. The solid line in Fig. 7 shows the characteristic in a case in which a structure that is similar to the hood lock structure 20 relating to the present embodiment is employed, and the two-dot chain line in Fig. 7 shows the characteristic of a comparative structure in which an auxiliary latch mechanism, in which a hood catch and an auxiliary lever are formed by a single part,

is disposed at a similar position as in the present embodiment.

[0056] As shown in Fig. 7, it can be understood that, when a structure that is similar to the hood lock structure 20 relating to the present embodiment is employed (refer to the solid line), the load after the deformed hood hits the auxiliary lever is suppressed and the stroke is large, and the energy of the collision body is absorbed ideally, as compared with the comparative structure (refer to the two-dot chain line).

[0057] As described above, in accordance with the hood lock structure 20 relating to the present embodiment, while the operability of the auxiliary lever 60 shown in Fig. 1 is ensured, the deformation stroke of the front end portion of the hood 14 when the collision body 100 collides with the hood 14 from the front-most end side thereof can be made to be large.

[0058] Further, in the present embodiment, setting (tuning) for causing the auxiliary lever 60 to rotate and be displaced relative to the hood catch 50 when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever 60 in the closed state of the hood 14, is possible by changing the urging force of the torsion spring 68. Therefore, this setting (load management) can be accomplished easily, and jiggling of connected portions and the generation of abnormal noise accompanying this can also be suppressed.

[Second Embodiment]

[0059] A hood lock structure relating to a second embodiment of the present invention is described next by using Fig. 8 through Fig. 12. An auxiliary latch mechanism 82 of a hood lock structure 80 relating to the second embodiment of the present invention is shown in a side sectional view in Fig. 8. Note that, although not illustrated, the auxiliary latch mechanism 82 is provided at the vehicle front side of the hood lock mechanism 22, in the same way as in the first embodiment. Further, the auxiliary latch mechanism 82 of Fig. 8 is shown in a perspective view in Fig. 9, and the auxiliary latch mechanism 82 of Fig. 8 is shown in an exploded perspective view in Fig. 10. Further, an enlarged sectional view along line 11-11 of Fig. 8 is shown in Fig. 11, and the displaced state, at the time of a collision, of an auxiliary lever 90 of Fig. 8 is shown in a schematic side sectional view in Fig. 12.

[0060] As shown in these drawings, the hood lock structure 80 relating to the present embodiment differs from the hood lock structure 20 (see Fig. 1) relating to the first embodiment with regard to the point of having a connecting structure 94 instead of the connecting structure 70 (see Fig. 3 and the like). The other structures are structures that are substantially similar to the first embodiment. Accordingly, structural portions that are substantially similar to the first embodiment are denoted by the same reference numerals, and description thereof is omitted.

[0061] As shown in Fig. 8 to Fig. 10, a long hole portion

86A serving as a pass through portion is formed in the side plate portion 52 of a hood catch 84, instead of the second pin insert-through hole 52 (see Fig. 3 and the like). The long hole portion 86A is formed in the shape of an arc whose center is the first pin 34, and the second pin 66 is passed through the inner side upper portion of the long hole portion 86A. A pair of convex portions 88, that project-out in the shapes of projections toward the hole inner side and support the second pin 66, are formed at the inner surface of the long hole portion 86A. The distance between the pair of convex portions 88 is set to be shorter than the outer diameter of the second pin 66. Due thereto, the second pin 66 is held at the upper end portion inner side of the long hole portion 86A. The hole width, at the region further toward the lower side (the side at which the second pin 66 is not disposed) than the convex portions 88, at the long hole portion 86A is set to be slightly wide as compared with the hole width at the region further toward the upper side (the side at which the second pin 66 is disposed) than the convex portions 88. Further, as shown in Fig. 10 and Fig. 11, a small hole 86B for anchoring the one end portion 68A of the torsion spring 68 is formed in the side plate portion 52 between the first pin insert-through hole 52A and the long hole portion 86A. Other than the above-described points, the hood catch 84 is structured substantially similarly to the hood catch 50 (see Fig. 3 and the like) of the first embodiment.

[0062] As shown in Fig. 10, the lever base portion 62 of the auxiliary lever 90 is disposed at the side plate portion 42 side of the bracket 40 (the left side in the drawing) with respect to the side plate portion 52 of the hood catch 84, and a first pin insert-through hole 92A for passing through of the first pin 34 is formed so as to pass there-through instead of the engaging portion 62A (see Fig. 3 and the like). The bush 38A that is cylindrical tube shaped is inserted within the first pin insert-through hole 92A. Further, the first pin 34 can be inserted through the interior of the bush 38A. Other than the above-described points, the auxiliary lever 90 is structured substantially similarly to the auxiliary lever 60 (see Fig. 3 and the like) of the first embodiment.

[0063] Due thereto, the upper portion side of the hood catch 84 and the auxiliary lever 90 are connected so as to be able to rotate and be displaced integrally around the axis of the first pin 34 that is in the hood transverse direction. In the present embodiment, a connecting structure 94 that connects the upper portion side of the hood catch 84 and the auxiliary lever 90, is structured to include the bracket 40, the first pin 34, the second pin 66, the respective portions formed at the hood catch 84 that are the first pin insert-through holes 52A, 54A, the long hole portion 86A, the small hole 86B and the hole portion 54B, the respective portions formed at the auxiliary lever 90 that are the first pin insert-through hole 92A and the second pin insert-through hole 62B, the bushes 38A, 38B, the torsion spring 68, and the stopper portion 37.

[0064] The connecting structure 94 is a structure that,

by restricting relative rotational displacement of the hood catch 84 and the auxiliary lever 90 around the axis of the first pin 34, and restricting relative rotational displacement of the hood catch 84 and the auxiliary lever 90 around the axis of the second pin 66, makes the hood catch 84 and the auxiliary lever 90 integral, and restricts relative angular displacement, around an axis that is in the hood transverse direction, of the hood catch 84 and the auxiliary lever 90.

[0065] Further, there is a structure in which, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever 90 in the closed state of the hood 14 shown in Fig. 8, due to the convex portions 88 of the long hole portion 86A receiving load from the second pin 66 and being crushed (deforming), as shown in Fig. 12, the restricted state of the relative rotational displacement of the hood catch 84 and the auxiliary lever 90 around the axis of the first pin 34 is released. Note that the two-dot chain lines at the hood 14 and the auxiliary lever 90 in Fig. 12 show the positions before a collision.

[0066] Namely, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever 90 in the closed state of the hood 14, the connecting structure 94 permits relative rotational displacement, around the axis of the first pin 34 that is in the hood transverse direction, of the auxiliary lever 90 with respect to the hood catch 84 due to the input of this load.

(Operation/Effects)

[0067] In accordance with the hood lock structure relating to the present embodiment, when the hood 14 is closed, and when the hood 14 is opened, operation and effects that are similar to the first embodiment are obtained. Further, when a collision body collides with the hood 14 from the front-most end side thereof, load in the pushing-down direction is applied to the auxiliary lever 90 via the hood 14. Thus, as shown in Fig. 12, due to the convex portions 88 (see Fig. 8) of the long hole portion 86A received load from the second pin 66 and being crushed, even if the rigidity of the auxiliary lever 90 is set to be high, the auxiliary lever 90 rotates and is displaced around the axis of the first pin 34 (in the arrow D direction), and the operation portion 64A side of the auxiliary lever 90 is pushed downward. Then, the front end portion of the hood 14 deforms in accordance with the rotational displacement of this auxiliary lever 90. Accordingly, the load that is applied to the collision body is suppressed by an amount corresponding to the amount by which the auxiliary lever 90 is not thrust-out, and the deformation stroke S of the front end portion of the hood 14 becomes larger by an amount corresponding to a stroke S2 that corresponds to the rotational displacement of the auxiliary lever 90.

[0068] Therefore, in accordance with the structure of the present embodiment as well, while the operability of

the auxiliary lever 90 is ensured, the deformation stroke S of the front end portion of the hood 14 when a collision body collides with the hood 14 from the front-most end side thereof can be made to be large. In particular, in the present embodiment, because the auxiliary lever 90 rotates and is displaced around the axis of the first pin 34, when a collision body collides with the hood 14 from the front-most end side thereof, the deformation stroke S of the front end portion of the hood 14 can be made to be even larger.

[Supplementary Description of Embodiments]

[0069] Note that, in the above-described embodiments, the connecting structures 70, 94 are structured to have two pins that are the first pin 34 and the second pin 66. However, the connecting structure may be another connecting structure such as a structure in which, for example, the upper portion side of the hood catch and the auxiliary lever are connected to as to be able to rotate and be displaced integrally around an axis that is in the hood transverse direction by a single pin that is supported so as to rotate freely at a bracket at the hood side with the axial direction thereof being the hood transverse direction and that is press-fit into the auxiliary lever and the hood catch, and the holding force due to this press-fitting is set (adjusted) such that, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever in the closed state of the hood, relative rotational displacement of the auxiliary lever with respect to the hood catch around the axis of this one pin that is in the hood transverse direction due to input of this load is permitted, or the like.

[0070] Further, the connecting structure may be another connecting structure such as a structure in which, for example, the upper portion side of the hood catch and the auxiliary lever are connected so as to be able to rotate and be displaced integrally around an axis that is in the hood transverse direction by providing a first pin that passes through at least one of the auxiliary lever and the hood catch in the hood transverse direction and is supported so as to rotate freely at a bracket at the hood side, and a second pin that is press-fit into the auxiliary lever and the hood catch with the axial direction thereof being the hood transverse direction, and the holding force due to this press-fitting is set (adjusted) such that, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever in the closed state of the hood, relative rotational displacement of the auxiliary lever with respect to the hood catch around the axis of the second pin that is in the hood transverse direction due to input of this load is permitted, or the like.

[0071] Further, the connecting structure may be structured by a structure in which a long hole portion, that is shaped as an arc whose center is the second pin 66, is formed in the end portion at the hood catch side of the auxiliary lever instead of the concave engaging portion 62A relating to the first embodiment, and the hole width

of this long hole portion is set to be slightly larger than the outer diameter (diameter) of the first pin, and the region at the upper end inner surface side, that is one end side in the longitudinal direction, of this long hole portion is made to be an engaging portion.

[0072] Further, in the above-described second embodiment, the pass through portion is made to be the long hole portion 86A, but the pass through portion may be, for example, a cut-out portion that is the shape of an arc whose center is the first pin (34) (i.e., a pass through portion of a shape in which the upper end portion side or the lower end portion side of the long hole portion 86A in the second embodiment is extended and an open end is formed).

[0073] Note that the above-described embodiments and the above-described plural modified examples may be implemented by being combined appropriately.

Claims

1. A hood lock structure comprising:

- a hood lock mechanism that, in a closed state of a hood that is mounted so as to be able to open and close with respect to a vehicle body, locks a front end portion of the hood at a vehicle body side; and
- an auxiliary latch mechanism that is provided separately from the hood lock mechanism,

wherein the auxiliary latch mechanism has:

- a hook that is mounted to the vehicle body side;
- a hood catch that is provided at the hood side, and that anchors with the hook when the hood is displaced in an opening direction in a state in which a locked state of the hood by the hood lock mechanism is released;
- an auxiliary lever that is joined to an upper portion side of the hood catch, and is provided at a vehicle front side with respect to the hood catch; and
- a connecting structure that connects an upper portion side of the hood catch and the auxiliary lever such that the upper portion side of the hood catch and the auxiliary lever are able to rotate and be displaced integrally around an axis that is in a hood transverse direction, and that, when load of a predetermined value or more toward a vehicle rear lower side is inputted to the auxiliary lever in the closed state of the hood, permits relative rotational displacement of the auxiliary lever with respect to the hood catch around an axis that is in the hood transverse direction due to input of the load.

2. The hood lock structure of claim 1, wherein the con-

necting structure is structured to include a structure that has:

a first pin that is provided at the hood side and that passes, in the hood transverse direction, through an end portion at the hood side of the hood catch and an end portion at the hood catch side of the auxiliary lever; and
 a second pin that passes, in the hood transverse direction, through the hood catch and the auxiliary lever, apart from the first pin;
 and, at the structure, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever in the closed state of the hood, a restricted state of relative rotational displacement of the hood catch and the auxiliary lever around an axis of either one of the first pin and the second pin is released.

3. The hood lock structure of claim 2, wherein the connecting structure has:

an engaging portion that is formed at an end portion at the hood catch side of the auxiliary lever, and that is separatably engaged with respect to the first pin; and
 an urging member that is provided at the hood side, and that urges the end portion at the hood catch side of the auxiliary lever in a direction opposite a direction in which the engaging portion separates from the first pin, and urging force of the urging member is set such that, when load of a predetermined value or more toward the vehicle rear lower side is inputted to the auxiliary lever in the closed state of the hood, the engaging portion separates from the first pin.

4. The hood lock structure of claim 2, wherein the connecting structure is structured to include a structure in which a through portion, that is shaped as an arc whose center is the first pin, is formed in the hood catch, and the second pin passes through an inner side upper portion of the through portion, and a convex portion that supports the second pin is formed at an inner surface of the through portion.

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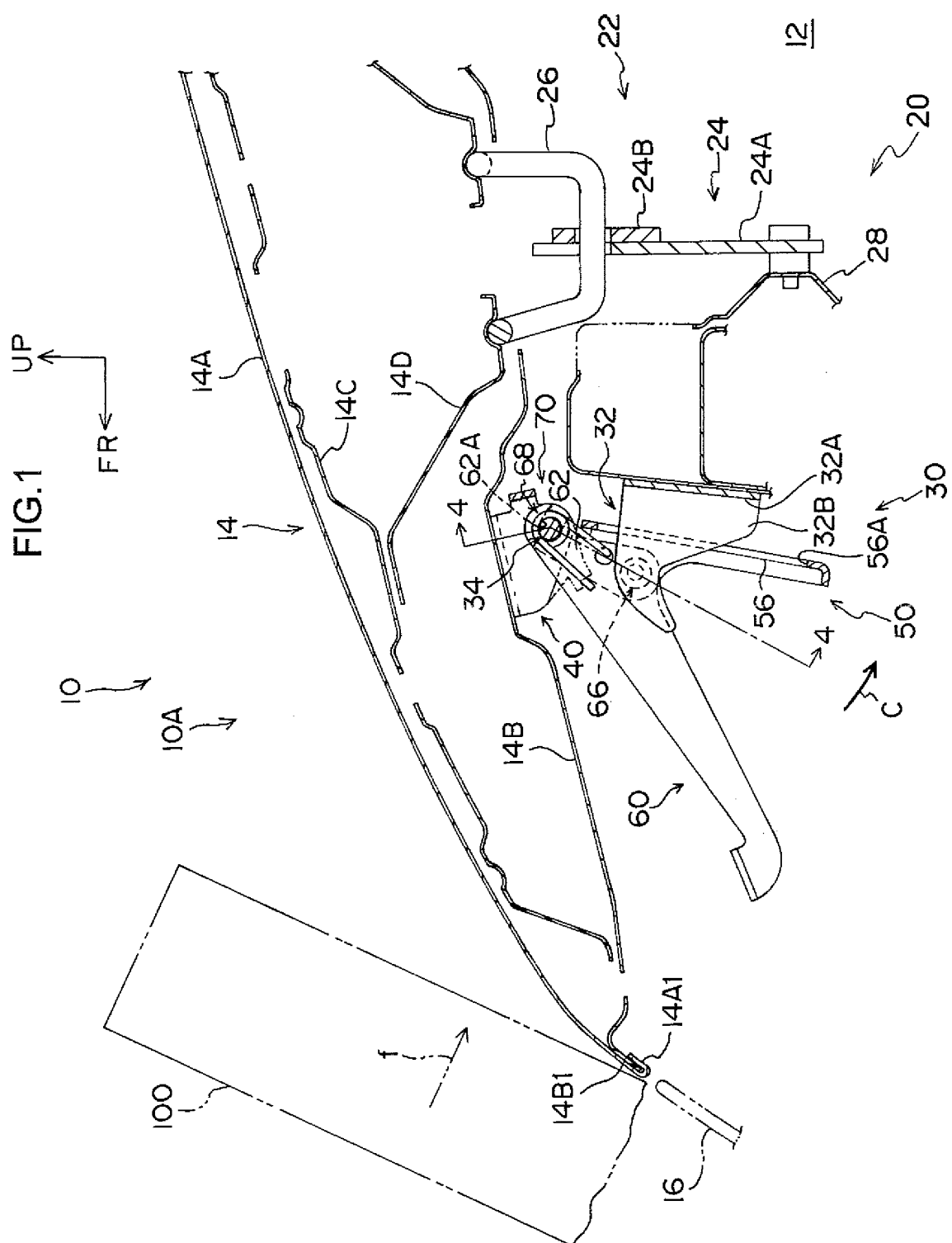


FIG.2

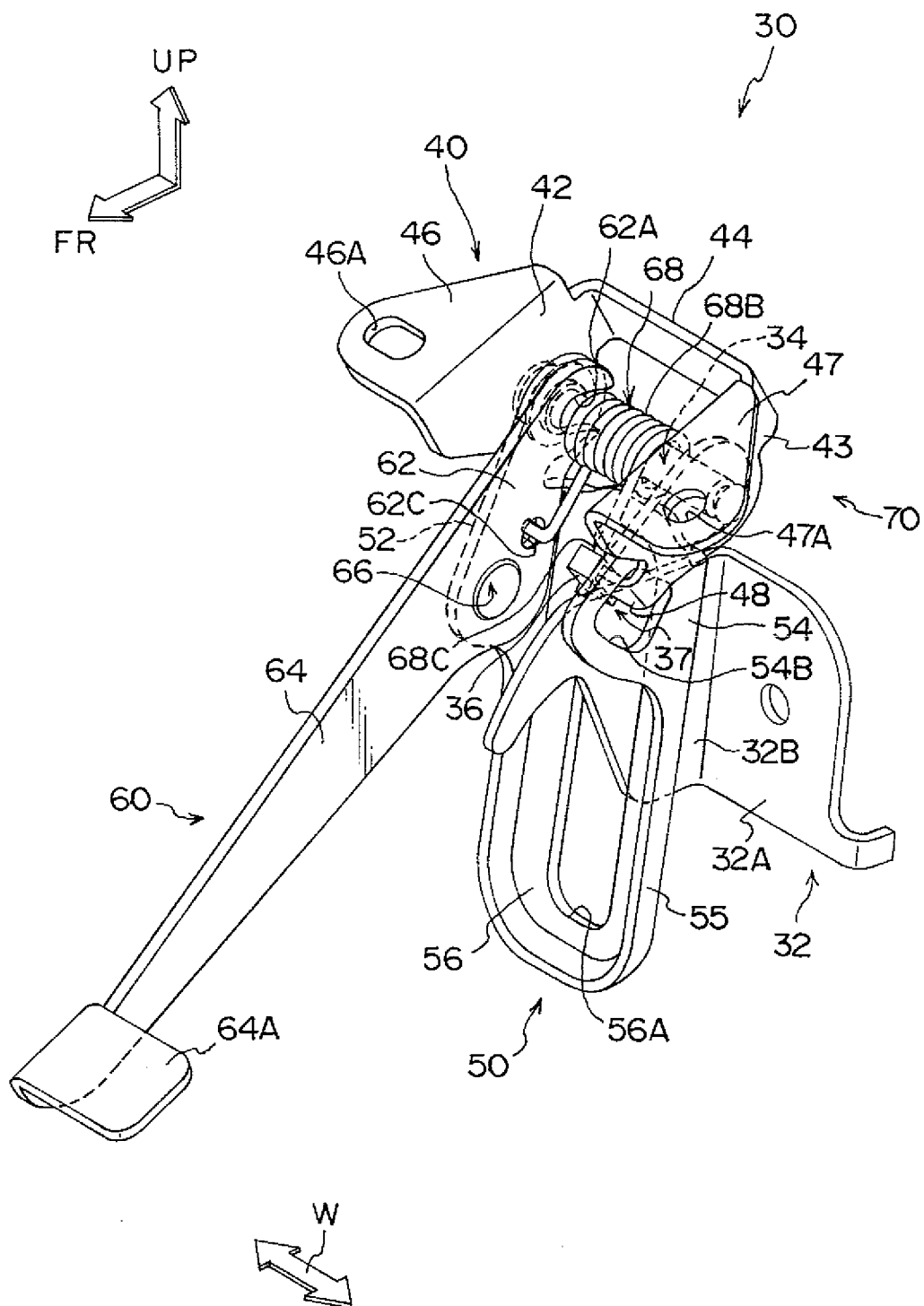


FIG.3

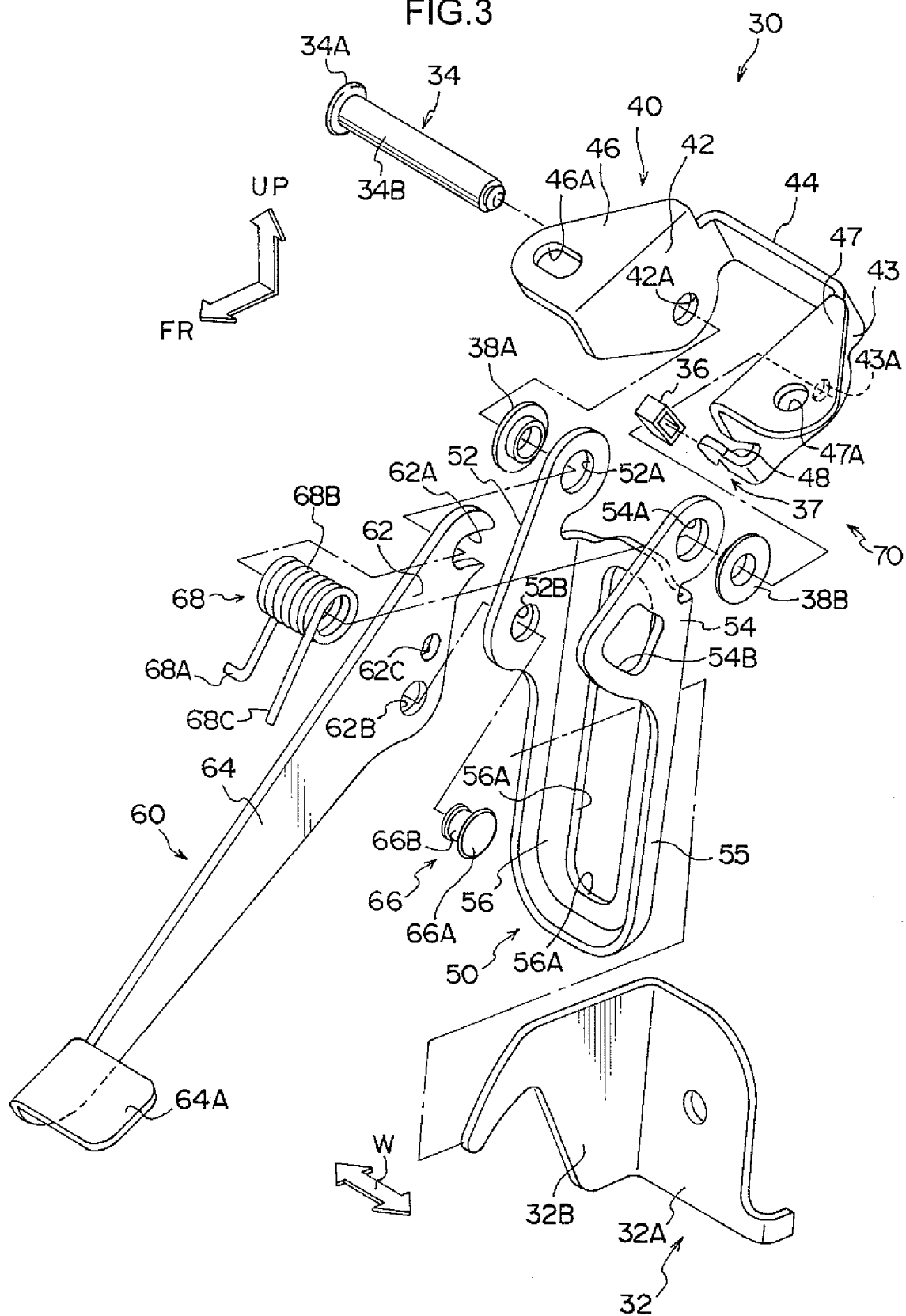
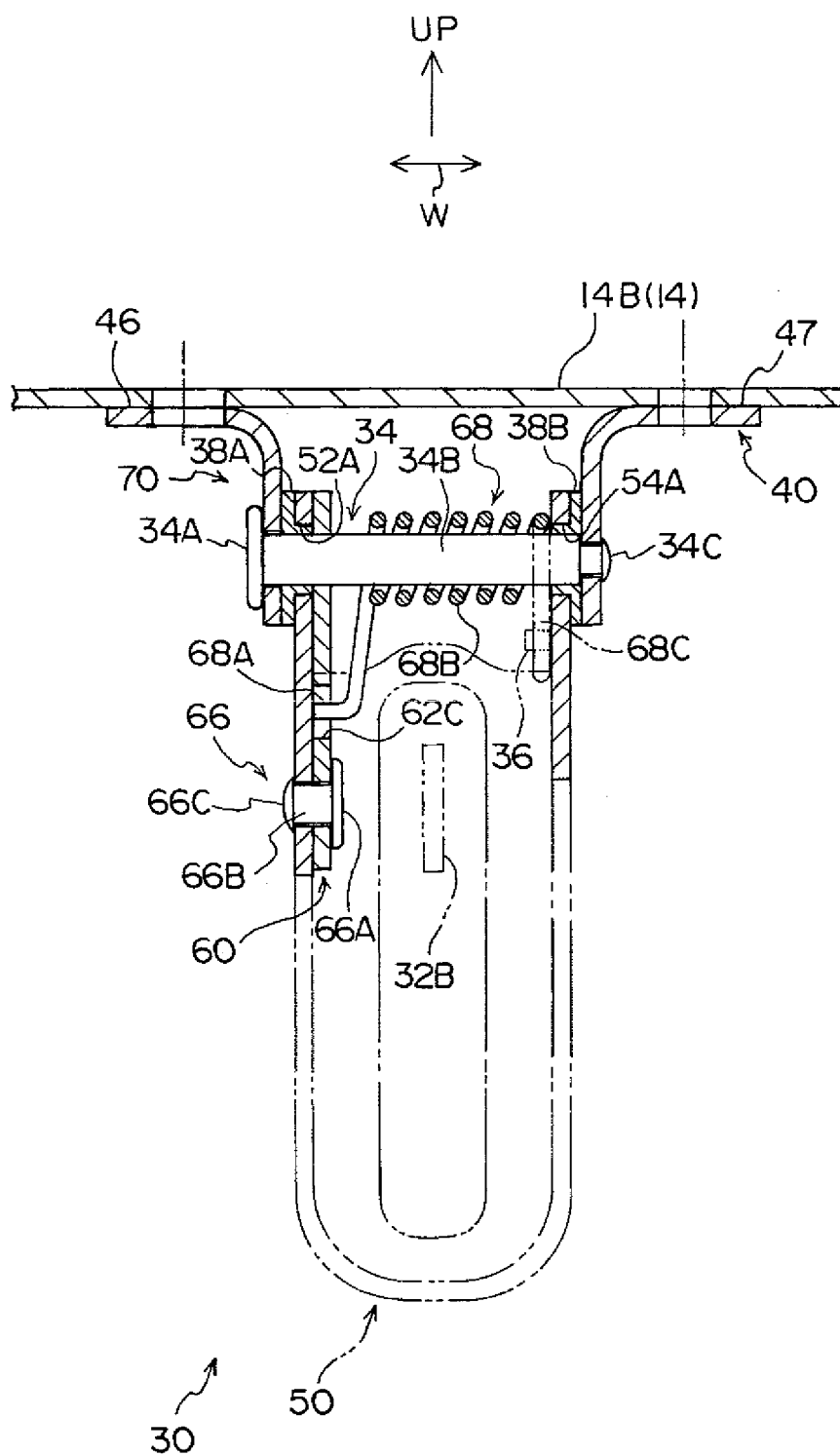


FIG.4



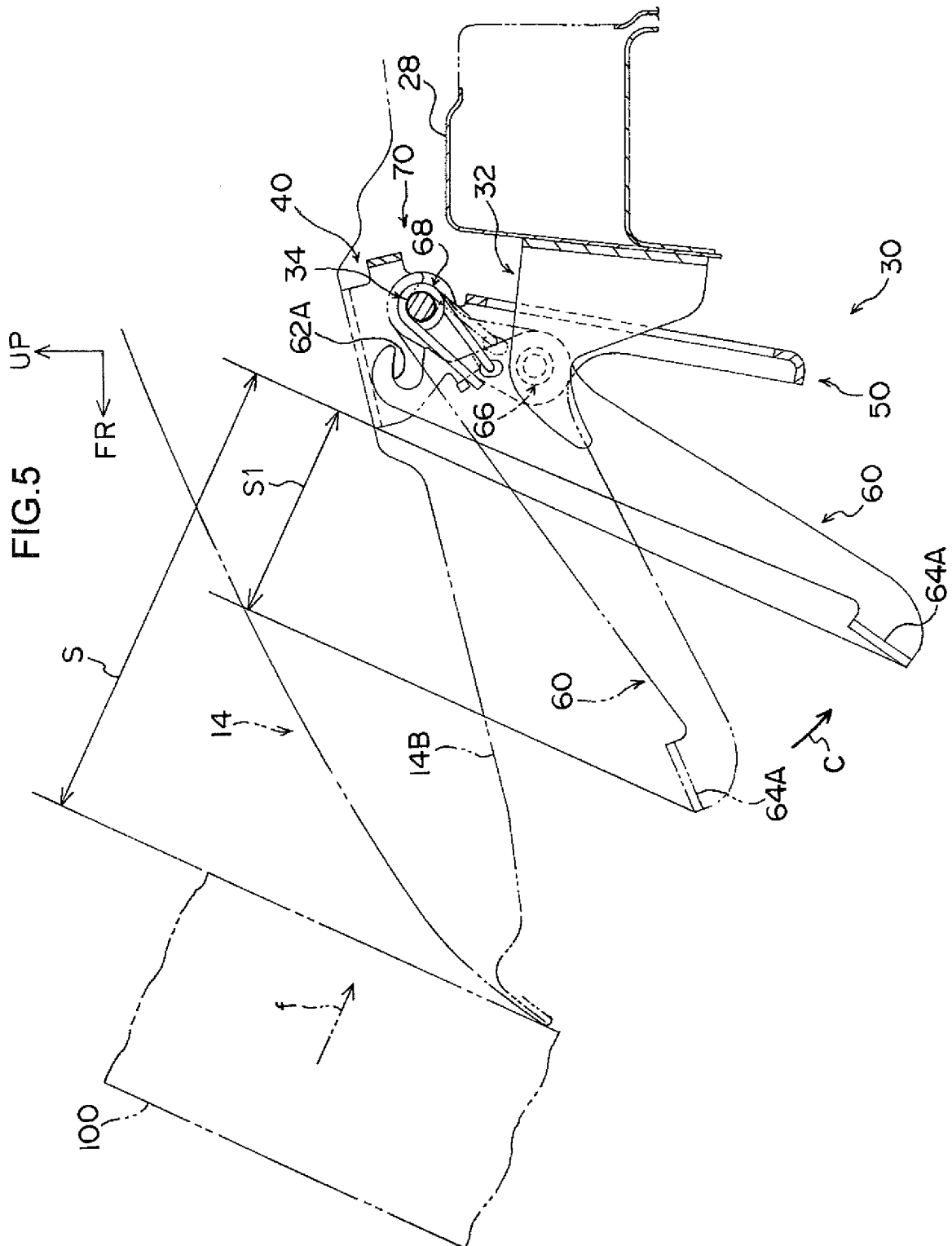


FIG.6A

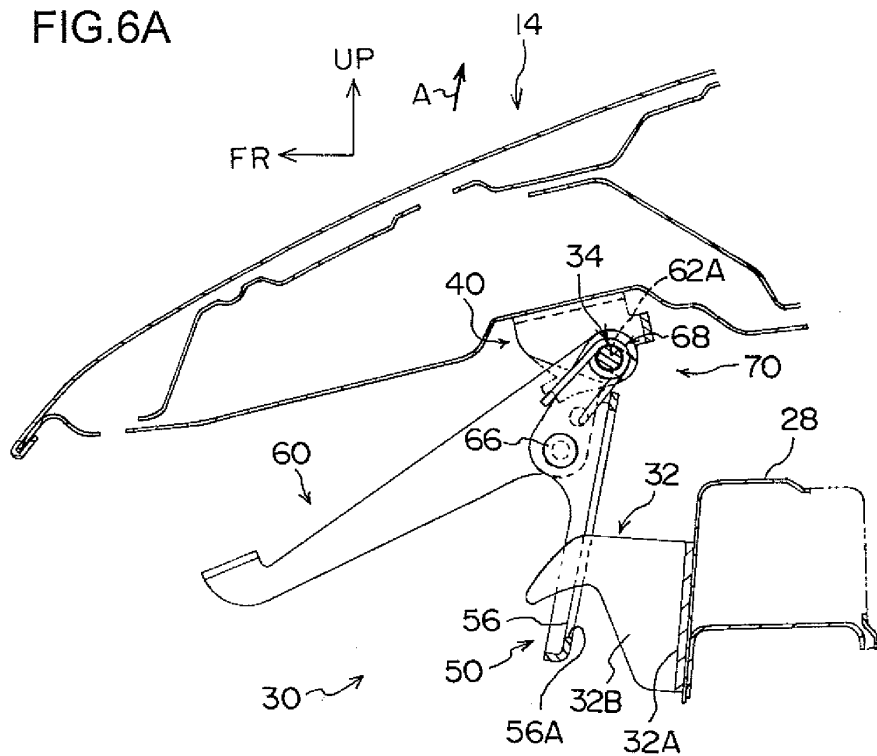


FIG.6B

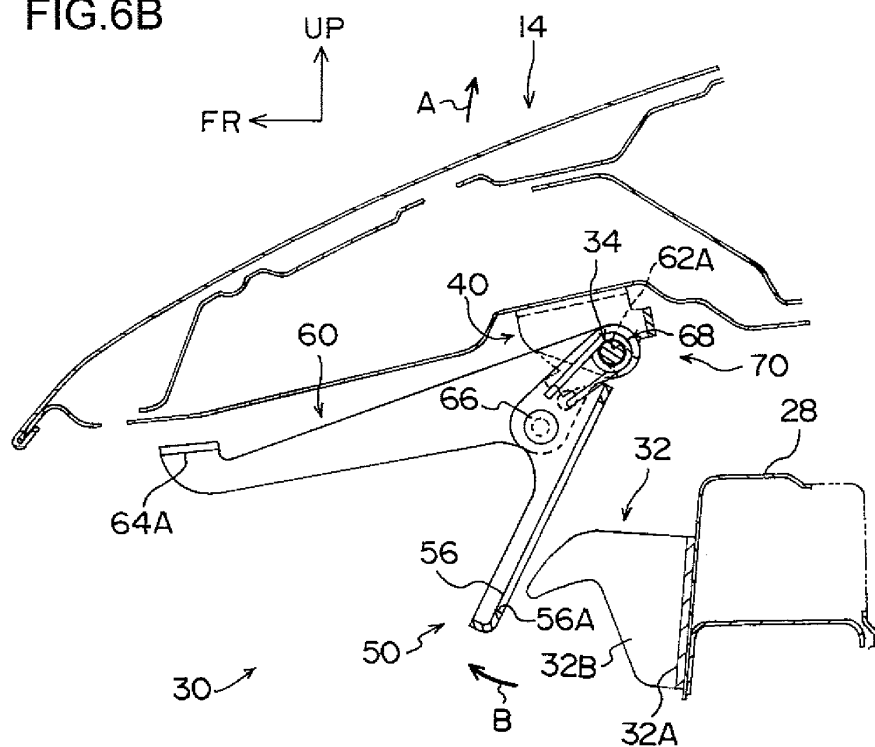
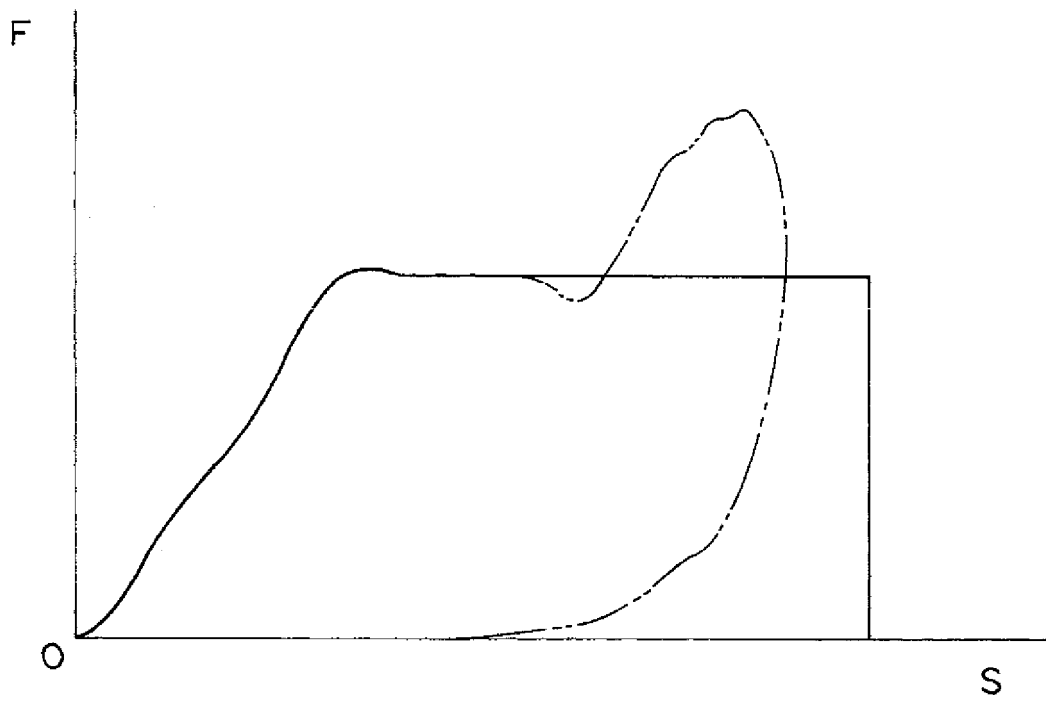


FIG.7



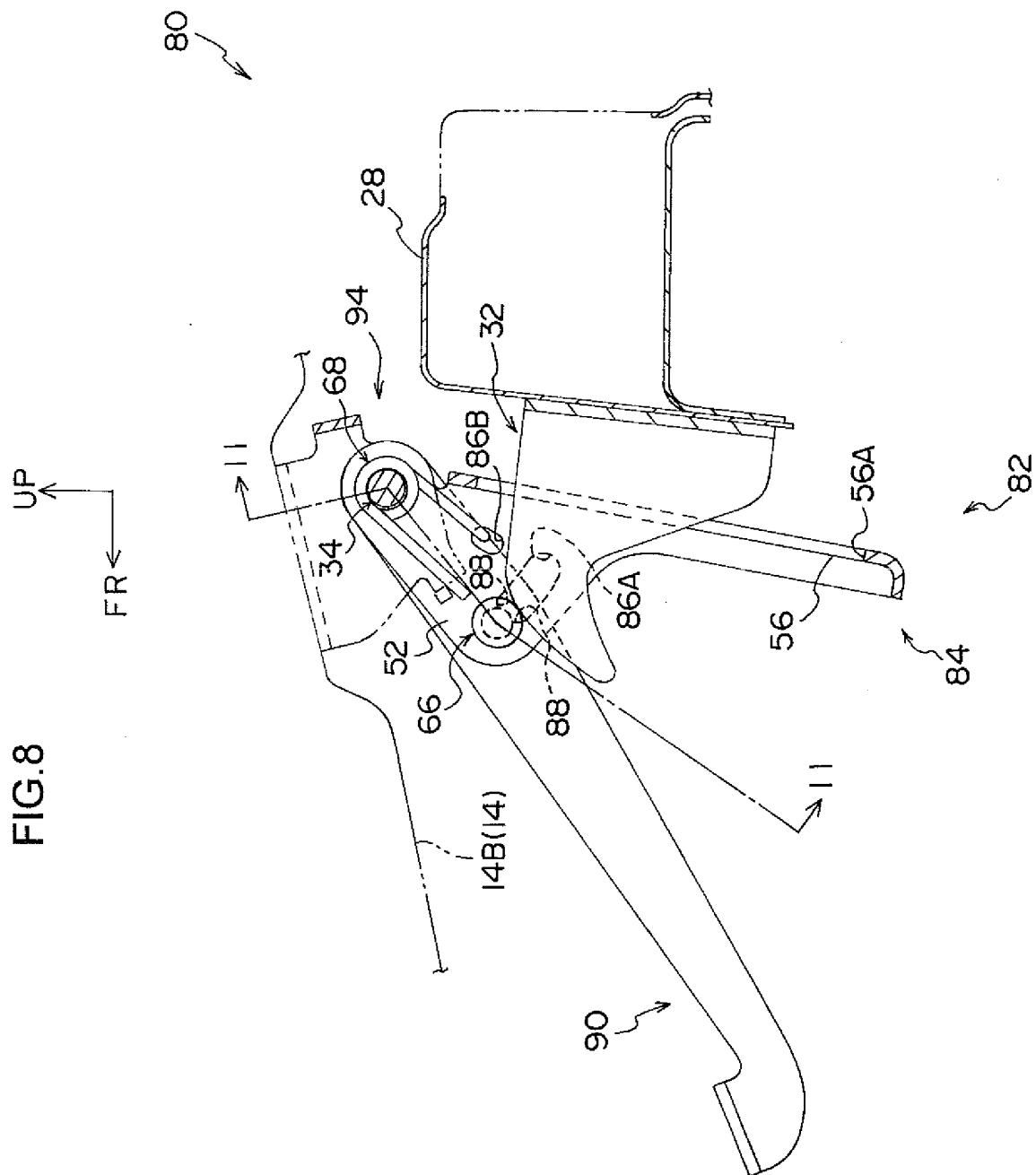


FIG.9

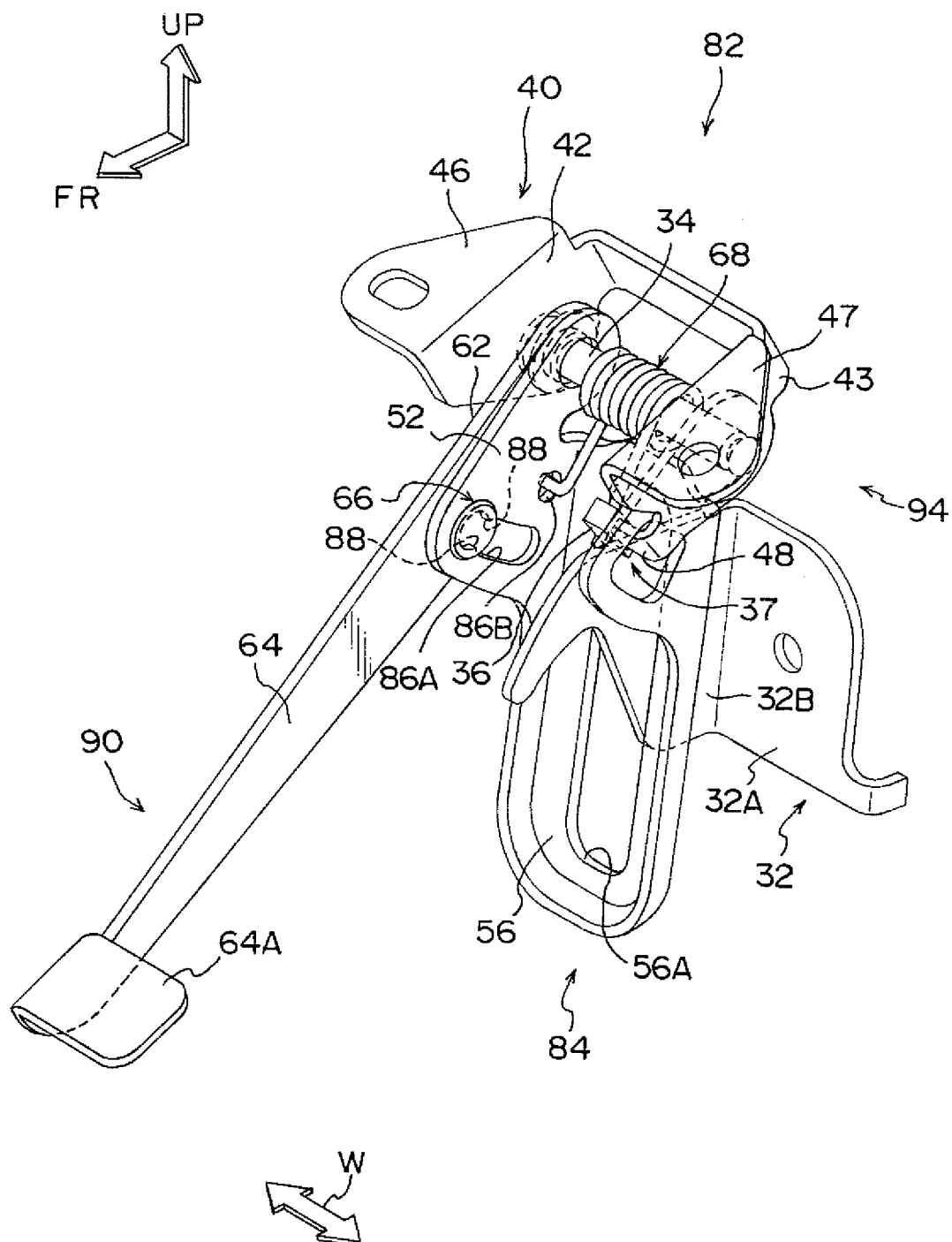


FIG.10

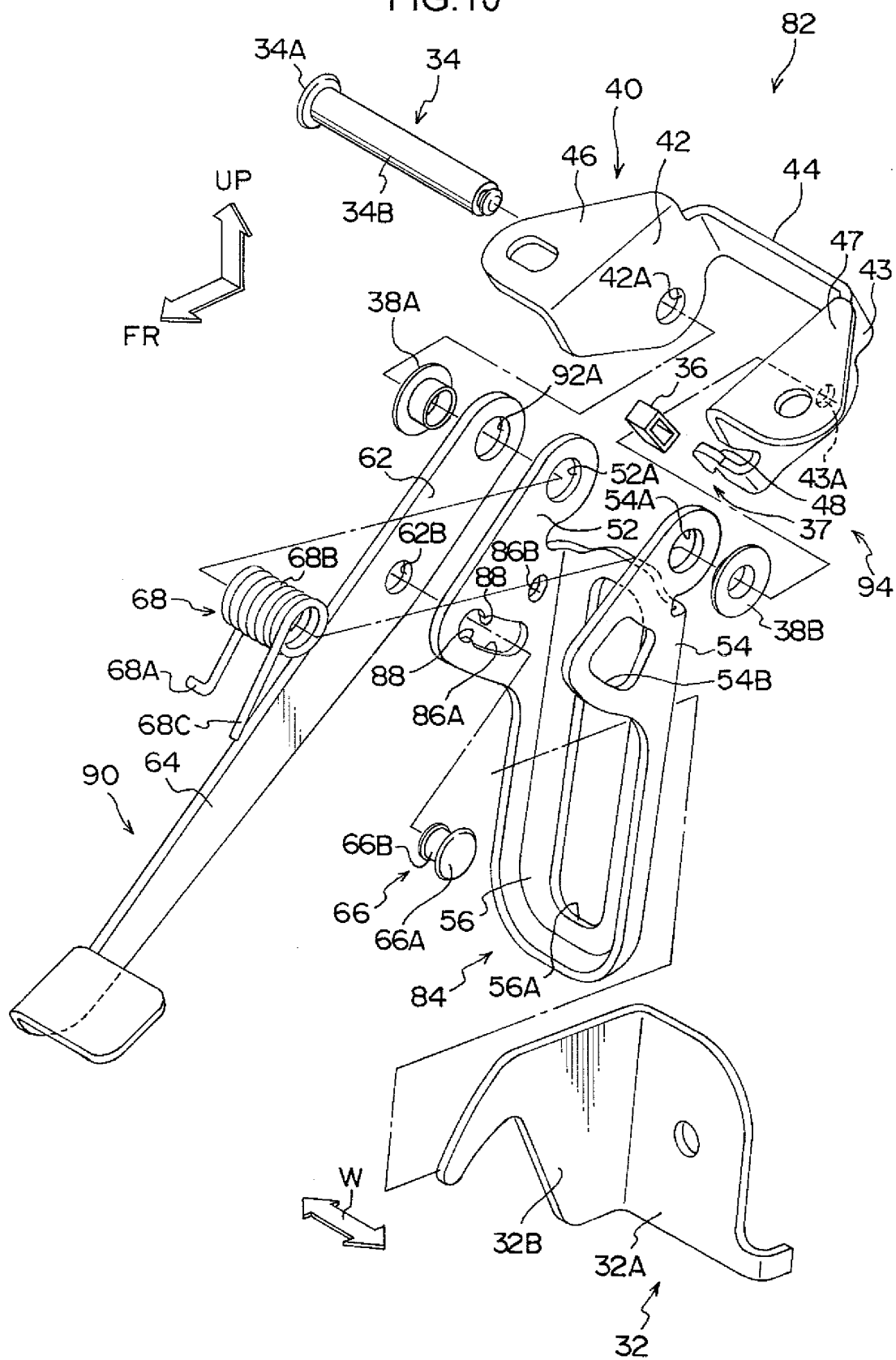
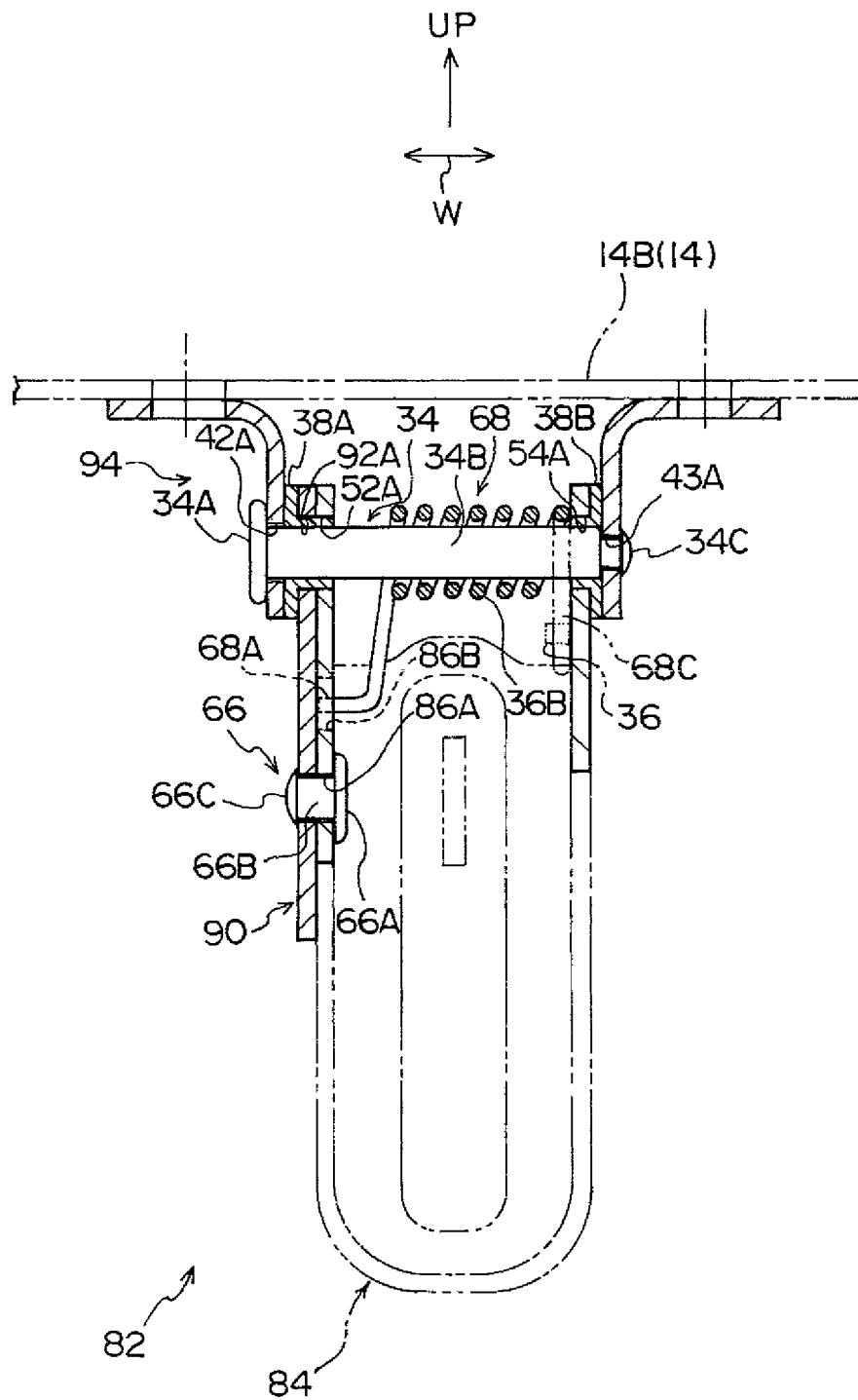
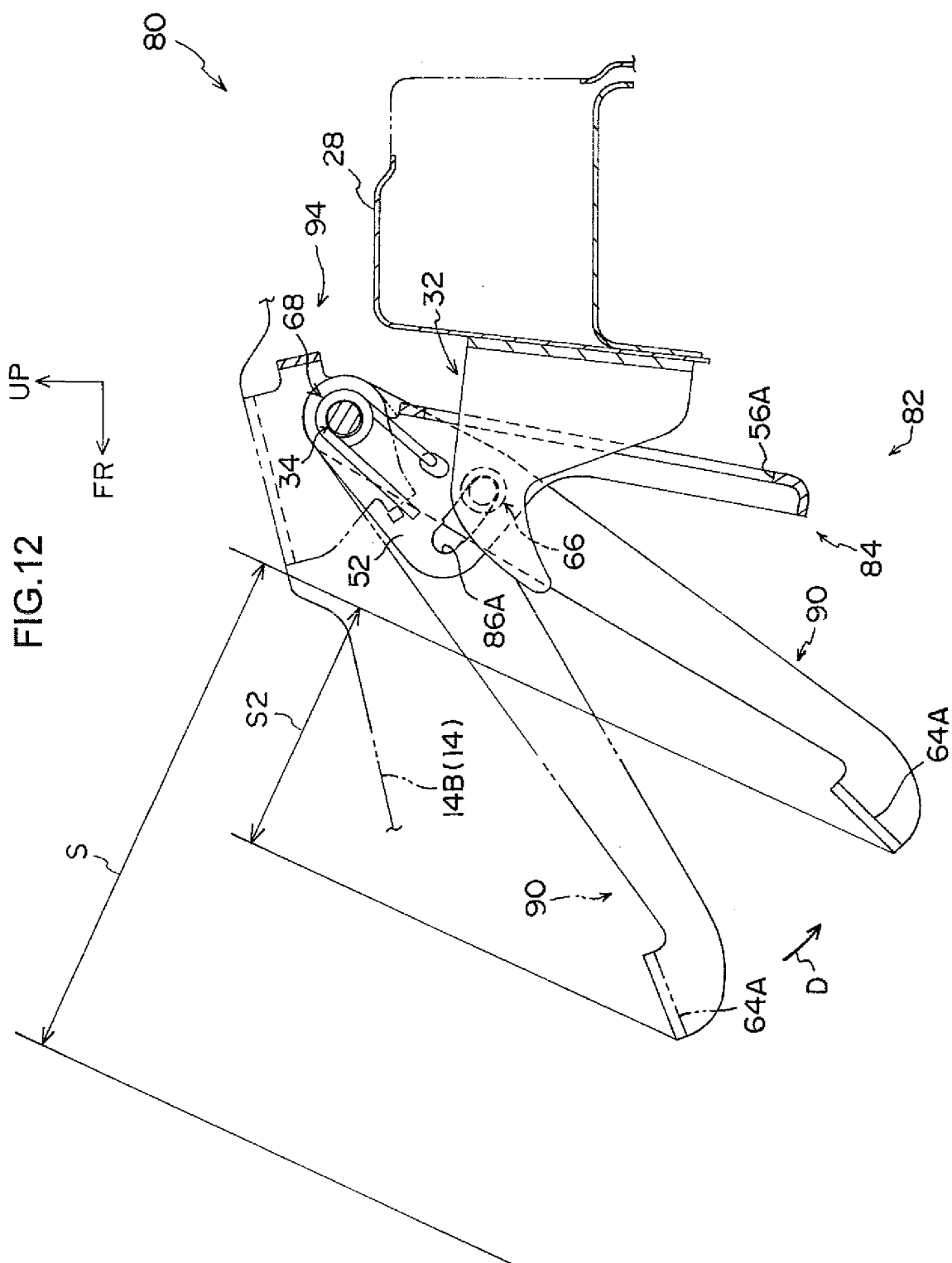


FIG.11





INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/065552

A. CLASSIFICATION OF SUBJECT MATTER

B62D25/12(2006.01)i, B60R21/34(2011.01)i, E05B65/19(2006.01)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)

B62D25/12, B60R21/34, E05B65/19

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 1996-2010

Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010

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 06-221041 A (Mazda Motor Corp.), 09 August 1994 (09.08.1994), paragraph [0014]; fig. 1 (Family: none)	1-4
A	JP 2005-88696 A (Calsonic Kansei Corp.), 07 April 2005 (07.04.2005), paragraph [0003] (Family: none)	1-4
A	JP 2010-163767 A (Hino Motors, Ltd.), 29 July 2010 (29.07.2010), paragraph [0016] (Family: none)	1-4

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Further documents are listed in the continuation of Box C.

☐

See patent family annex.

* Special categories of cited documents:

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

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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

13 December, 2010 (13.12.10)

Date of mailing of the international search report

21 December, 2010 (21.12.10)

Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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