



EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.06.2016 Bulletin 2016/23

(51) Int Cl.:
E05B 77/24 ^(2014.01) **E05B 77/28** ^(2014.01)
E05B 77/30 ^(2014.01) **E05B 83/40** ^(2014.01)

(21) Application number: **15196970.6**

(22) Date of filing: **30.11.2015**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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(30) Priority: **03.12.2014 JP 2014245405**

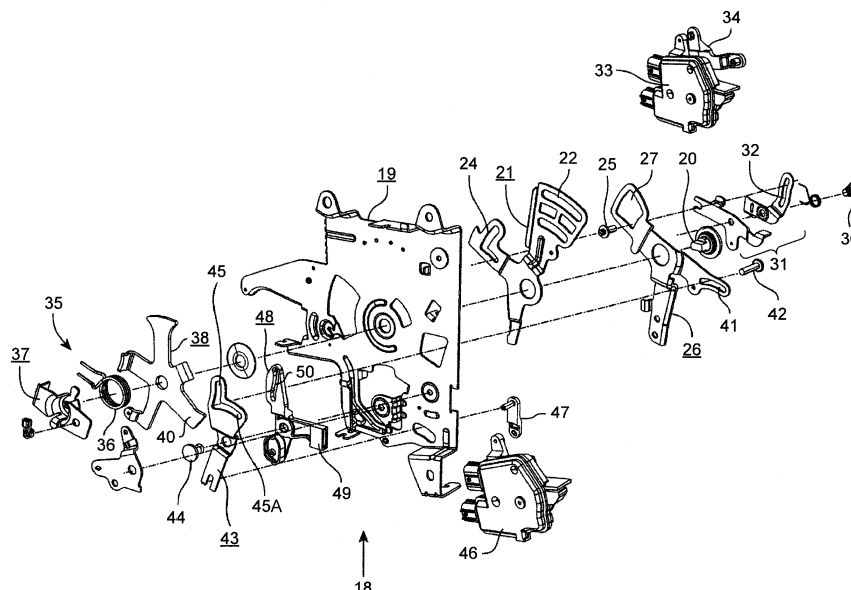
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(54) **RELAY MECHANISM OF VEHICLE SLIDING DOOR**

(57) A relay mechanism (18) of a vehicle sliding door (10), includes: an outer open lever (21) configured to be coupled with an outer open handle (12) of a sliding door (10) and to release latch units (15, 17) to open the sliding door (10) when the outer open lever (21) is operated; an inner open lever mechanism (35) configured to be coupled with an inner open handle (13) of the sliding door (10) and to release the latch units (15, 17) to open the

sliding door (10) when the inner open lever mechanism (35) is operated;
an outer lock lever (31) configured to disable the release of the latch units (15, 17) by the operation of the outer open lever (21); and an inner lock lever (43) configured to disable the release of the latch units (15, 17) by the operation of the inner open lever mechanism (35).

FIG.2



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a relay mechanism of a vehicle sliding door, and specifically, to a relay mechanism which transmits an operating force from an open handle of the door to a latch unit of the door while performing relay control to the operating force.

2. Description of the Related Art

[0002] An "anti-theft mechanism (double lock mechanism)" and a "child-proof mechanism" have been provided in a relay mechanism and a latch unit in the related art (see Japanese Patent Application Laid-open No. 2009-30362, Japanese Patent Application Laid-open No. 2009-30363, Japanese Patent Application Laid-open No. 8-74455, and Japanese Patent Application Laid-open No. 2000-345751, for example). The anti-theft mechanism improves crime prevention and is a function to prevent an incorrect unlock operation of a lock lever of a locking/unlocking mechanism by an unauthorized access from outside. Also, the child-proof mechanism can perform an operation to open a door by an outer open handle from among open handles of the door and makes an operation to open the door by an inner open handle be invalid.

[0003] An anti-theft mechanism, which has been proposed until now, has acted relative to a single lock lever of a locking/unlocking mechanism. That is, the lock lever functions relative to both the outer open handle and the inner open handle of the door. When the lock lever is in the unlocked state, the door can be opened by both the open handles. When the lock lever is in the locked state, the door cannot be opened by both the open handles.

[0004] However, in recent years, a number of doors in which an inside lock operating unit (sill knob) is omitted has been employed. When the sill knob-less relay mechanism and the latch unit in which the sill knob is omitted are designed, there is a problem in that the conventional anti-theft mechanism for a common lock lever has less generality, and especially, waste is increased in a combination with the child-proof mechanism.

SUMMARY OF THE INVENTION

[0005] It is an object of the present invention to at least partially solve the problems in the conventional technology.

[0006] To solve the problem described above, a relay mechanism of a vehicle sliding door includes: an outer open lever configured to be coupled with an outer open handle (12) of a sliding door and to release latch units to open the sliding door when the outer open lever is operated; an inner open lever mechanism configured to be

coupled with an inner open handle of the sliding door and to release the latch units to open the sliding door when the inner open lever mechanism is operated; an outer lock lever configured to disable the release of the latch units by the operation of the outer open lever; and an inner lock lever configured to disable the release of the latch units by the operation of the inner open lever mechanism. The inner lock lever is configured to switch between an unlock position where the inner open lever mechanism is operated and an anti-theft position where the inner open lever mechanism is disabled to be operated.

[0007] The above and other objects, features, advantages and technical and industrial significance of this invention will be better understood by reading the following detailed description of presently preferred embodiments of the invention, when considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is a side view of a relation between a sliding door and a vehicle body to which a relay mechanism has been applied;

FIG. 2 is an exploded sectional view of the relay mechanism;

FIG. 3 is a rear view of the relay mechanism;

FIG. 4 is a front view of the relay mechanism;

FIG. 5 is an enlarged rear view of a main part of the relay mechanism;

FIG. 6 is an enlarged front view of the main part of the relay mechanism;

FIG. 7 is a rear view of an outer open lever which is applied to the relay mechanism;

FIG. 8 is a rear view of a ratchet lever which is applied to the relay mechanism;

FIG. 9 is a front view of a main inner open lever which is applied to the relay mechanism;

FIG. 10 is a front view of a sub inner open lever which is applied to the relay mechanism;

FIG. 11 is a front view of an inner lock lever which is applied to the relay mechanism;

FIG. 12 is a front view of a child-proof lever which is applied to the relay mechanism; and

FIGS. 13A to 13C are action brief explanatory diagrams of the relay mechanism. FIG. 13A is a diagram of a state where the inner lock lever is placed at an unlock position. FIG. 13B is a diagram of a state where the inner lock lever is placed at a lock position (anti-theft position). FIG. 13C is a diagram of a child-proof state.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] One embodiment of the present invention will

be described with reference to the drawings. A side surface of a vehicle body 11 having a sliding door 10 is illustrated in FIG. 1. The sliding door 10 is opened and closed by sliding in the front-back direction along the side surface of the vehicle body 11. As is well known, the sliding door 10 has an outer open handle 12 and an inner open handle 13. The sliding door 10 has a front-side latch unit 15, which engages with a front-side striker 14 fixed to the vehicle body 11, on a front end. The sliding door 10 has a rear-side latch unit 17, which engages with a rear-side striker 16 fixed to the vehicle body 11, on a rear end. The sliding door 10 is held in a door closed state by engaging the front-side latch unit 15 with the front-side striker 14 and engaging the rear-side latch unit 17 with the rear-side striker 16. In the present embodiment, a sill knob and a door key cylinder are not provided in the sliding door 10.

[0010] A relay mechanism 18 is attached in the sliding door 10, and the open handles 12 and 13 are respectively coupled with the latch units 15 and 17 by the relay mechanism 18.

[0011] A detail on the relay mechanism 18 will be illustrated after FIG. 2. The relay mechanism 18 has a base plate 19 fixed to a metallic inner plate of the sliding door 10. An outer open lever 21 (FIG. 7) is rotatably attached to the base plate 19 with a central shaft 20. An arc-shaped hole 22 having the central shaft 20 as the center is provided in an arm unit extending upward of the outer open lever 21. An end portion of a coupling tool 23 (FIG. 3) such as a rod which extends to the outer open handle 12 is engaged with the arc-shaped hole 22. When the outer open handle 12 is rotated to open the door, the outer open lever 21 rotates clockwise in FIG. 3.

[0012] As illustrated in FIG. 7, an L-shaped hole 24 is formed in the arm unit extending to the right of the outer open lever 21. An outer lock pin 25 (FIG. 3) is slidably engaged with the L-shaped hole 24.

[0013] A ratchet lever 26 (FIG. 8) is rotatably supported by the central shaft 20. The ratchet lever 26 is arranged to overlap with the outer open lever 21. An engagement window 27 which can be engaged with the outer lock pin 25 is provided in the ratchet lever 26. The engagement window 27 is overlapped with the L-shaped hole 24. The ratchet lever 26 is coupled with the front-side latch unit 15 and the rear-side latch unit 17 respectively with coupling tools 28 and 29 (FIG. 8) such as a rod. When the ratchet lever 26 rotates clockwise in FIG. 3, the latch units 15 and 17 respectively release the strikers 14 and 16 so as to open the door.

[0014] Two pieces of an outer lock lever 31 is rotatably attached to the base plate 19 with a lock shaft 30, and the two pieces of the outer lock lever 31 are coupled with the lock shaft 30. A slot 32 with which the outer lock pin 25 is slidably engaged is provided in the outer lock lever 31. When the outer lock lever 31 rotates, the outer lock pin 25 moves in an engage slot 24A of the L-shaped hole 24.

[0015] As illustrated in FIG. 3, when the outer lock pin

25 moves in the engage slot 24A and moves to a position close to the central shaft 20, a state of the door becomes an unlocked state. In the unlocked state, clockwise rotation of the outer open lever 21 is transmitted to the ratchet lever 26 via the outer lock pin 25, and the sliding door 10 can be opened. On the other hand, when the outer lock pin 25 is separated from the central shaft 20 and moves to a position to face to a uselessly swinging slot 24B of the L-shaped hole 24, the state of the door becomes a locked state. In the locked state, even when the outer open lever 21 rotates clockwise, the outer lock pin 25 relatively moves in the uselessly swinging slot 24B. Accordingly, the ratchet lever 26 does not rotate, and an operation to open the door becomes invalid.

[0016] An outer actuator 33 is fixed to the base plate 19. An output lever 34 of the outer actuator 33 is engaged with the outer lock lever 31.

[0017] An inner open lever mechanism 35 is provided in the base plate 19 (FIGS. 2 and 4). The inner open lever mechanism 35 includes a main inner open lever 37 (FIG. 9) and a sub inner open lever 38 (FIG. 10). The main inner open lever 37 and the sub inner open lever 38 are supported by the central shaft 20 and are integrally rotated by an elastic force of a pressed spring 36. The main inner open lever 37 is coupled with the inner open handle 13 via a coupling tool 39 such as a rod.

[0018] A rotatable leg unit 40 of the sub inner open lever 38 is faced to an inner lock pin 42 which is slidably engaged with a horizontally long slot 41 of the ratchet lever 26. When the sub inner open lever 38 rotates, the rotatable leg unit 40 is engaged with the inner lock pin 42, and the ratchet lever 26 is rotated via the inner lock pin 42. Accordingly, the sliding door 10 is in a state where the door can be opened.

[0019] An inner lock lever 43 (FIG. 11) is provided on the side of the inner open lever mechanism 35. The inner lock lever 43 is attached to the base plate 19 with a lock shaft 44. An L-shaped hole 45 is provided in an upper portion of the inner lock lever 43, and the inner lock pin 42 is slidably engaged with the L-shaped hole 45. The L-shaped hole 45 includes a block slot 45A having the lock shaft 44 as the center and a free slot 45B having the central shaft 20 as the center. When the inner lock lever 43 rotates, the inner lock pin 42 relatively moves in the block slot 45A. The inner lock lever 43 is coupled to an output lever 47 of an inner actuator 46.

[0020] When the inner lock lever 43 is rotated counterclockwise from the state in FIG. 4, the inner lock pin 42 relatively moves in the block slot 45A. In this state, upward movement of the inner lock pin 42 is prevented by the engagement with the block slot 45A, and the state becomes a mechanism block state. Therefore, when the sub inner open lever 38 is rotated to open the door and the rotatable leg unit 40 is engaged with the inner lock pin 42, the ratchet lever 26 cannot be rotated. This state is to switch the state to the locked state by the inner lock lever 43, and also, this state is an anti-theft state where the rotation of the ratchet lever 26 is prevented by the

mechanism block state.

[0021] When the operation to open the door has been actually performed to the inner open handle 13 in the anti-theft state, the main inner open lever 37 is rotated via the coupling tool 39, and the torque is transmitted to the sub inner open lever 38 via the pressed spring 36. However, the sub inner open lever 38 cannot rotate according to the mechanism block state made by the inner lock lever 43 and the inner lock pin 42, and the pressed spring 36 is elastically widened. Accordingly, an excessive operating force is not transmitted to the sub inner open lever 38 and the inner lock pin 42, and damage of components is reduced.

[0022] A child-proof lever 48 (FIG. 12) is supported by the lock shaft 44. The lock shaft 44 may be integrally formed with the child-proof lever 48. When the sliding door 10 is in the door closed state, a switching operation knob 49 of the child-proof lever 48 is arranged at a position where the switching operation knob 49 cannot be operated as it is hidden from outside.

[0023] A vertically long slot 50 is provided in the child-proof lever 48, and the inner lock pin 42 is slidably engaged with the vertically long slot 50. When the child-proof lever 48 is switched, the inner lock pin 42 moves in the horizontally long slot 41 of the ratchet lever 26 by the contact with the slot 50 and switched between a position which overlaps with a rotational locus of the rotatable leg unit 40 provided in the sub inner open lever 38 (non-child-proof position) and a position which separates from the rotational locus of the rotatable leg unit 40 (child-proof position).

[0024] FIGS. 13A to 13C are action explanatory diagrams by using positions of the inner lock pin 42 and the inner lock lever 43. As illustrated in FIG. 13A, when the inner lock lever 43 is placed on the slightly right side relative to the rotatable leg unit 40 and the inner lock pin 42 is placed on the left, the inner lock pin 42 is placed at a position facing to the free slot 45B and overlapping with the rotational locus of the rotatable leg unit 40. Therefore, the state becomes a normal unlocked state. That is, in this state, when the rotatable leg unit 40 rotates, the inner lock pin 42 moves upward so that the ratchet lever 26 is rotated.

[0025] Also, in FIG. 13B, a state is illustrated where the inner lock lever 43 is lock-rotated (anti-theft rotation) from the state of FIG. 13A. The inner lock pin 42 is positioned in the block slot 45A, and the state is switched to the anti-theft state. In this state, even when the inner lock pin 42 is made to move upward by rotating the rotatable leg unit 40, the inner lock pin 42 cannot move upward as it has a contact with the block slot 45A, and the mechanism block is performed. Therefore, the state becomes excellent in crime prevention.

[0026] FIG. 13C is a diagram of a state where the child-proof lever 48 is switched from the state in FIG. 13A to the child-proof position. Although the inner lock pin 42 moves in the block slot 45A, the inner lock lever 43 stays at the unlock position. This state is a normal child-proof

state, and the rotatable leg unit 40 uselessly swings without being engaged with the inner lock pin 42.

[0027] In the present invention, the lock levers 31 and 43 are respectively provided in the outer open handle 12 and the inner open handle 13, and the respective levers can be individually switched. However, naturally, when the sliding door 10 is locked, it is desirable that both of the lock levers 31 and 43 be switched to the locked state (anti-theft state) by the actuators 33 and 46.

[0028] Also, as illustrated in FIG. 13C, when a locking operation is performed in the child-proof state, the inner lock lever 43 rotates counterclockwise and is changed to a lock position (anti-theft position). At this time, since the block slot 45A of the inner lock lever 43 has enough length, the block slot 45A can move without interfering with the inner lock pin 42. Accordingly, when the child-proof state is continuously used, both or one of the lock levers 31 and 43 can be selectively switched by the actuators 33 and 46. The degree of freedom in design is improved, and a using method according to a need can be selected.

[0029] In the embodiment of the present invention, since the lock lever is set relative to both the outer open handle and the inner open handle of the door, it is easy to design the anti-theft mechanism.

[0030] In the embodiment of the present invention, since it is only necessary to set the child-proof mechanism relative to the inner lock lever for acting relative to the inner open handle, it is easy to design the anti-theft mechanism and the child-proof mechanism.

[0031] In the embodiment of the present invention, since the inner lock pin can be commonly used in the child-proof mechanism and the anti-theft mechanism, the design can be reasonable.

[0032] In the embodiment of the present invention, the structure is more specific, and the design can be easily realized.

[0033] In the embodiment of the present invention, the crime prevention can be more improved by using the anti-theft mechanism with a mechanism block, and a damage relative to a component caused by the unauthorized access can be reduced.

[0034] Although the invention has been described with respect to specific embodiments for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art that fairly fall within the basic teaching herein set forth.

Claims

1. A relay mechanism (18) of a vehicle sliding door (10), comprising:

an outer open lever (21) configured to be coupled with an outer open handle (12) of a sliding

door (10) and to release latch units (15, 17) to
 open the sliding door (10) when the outer open
 lever (21) is operated;
 an inner open lever mechanism (35) configured
 to be coupled with an inner open handle (13) of
 the sliding door (10) and to release the latch units
 (15, 17) to open the sliding door (10) when the
 inner open lever mechanism (35) is operated;
 an outer lock lever (31) configured to disable the
 release of the latch units (15, 17) by the opera-
 tion of the outer open lever (21); and
 an inner lock lever (43) configured to disable the
 release of the latch units (15, 17) by the opera-
 tion of the inner open lever mechanism (35),
 wherein
 the inner lock lever (43) is configured to switch
 between an unlock position where the inner
 open lever mechanism (35) is operated and an
 anti-theft position where the inner open lever
 mechanism (35) is disabled to be operated.

2. The relay mechanism (18) of the vehicle sliding door
 (10), according to claim 1, further comprising:

a child-proof lever (48); and
 an inner lock pin (42) which is switched between
 a child-proof position and a non-child-proof po-
 sition by the operation of the child-proof lever
 (48).

3. The relay mechanism (18) of the vehicle sliding door
 (10), according to claim 2, wherein
 the inner lock lever (43) is configured to relatively
 move with respect to the inner lock pin 42 so as to
 be switched between the unlock position and the an-
 ti-theft position.

4. The relay mechanism (18) of the vehicle sliding door
 (10), according to any one of claims 1 to 3, wherein
 when the inner lock lever (43) is placed at the anti-
 theft position, the inner lock lever (43) is configured
 to disable the operation of the inner open lever mech-
 anism (35) by a mechanism block state.

5. The relay mechanism (18) of the vehicle sliding door
 (10), according to claim 4, wherein
 the inner open lever mechanism (35) includes a main
 inner open lever (37) which is coupled with the inner
 open handle (13) without a play and a sub inner open
 lever (38) which is connected so as to rotate inte-
 grally with respect to the main inner open lever (37)
 by an elastic force of a pressed spring (36).

FIG.1

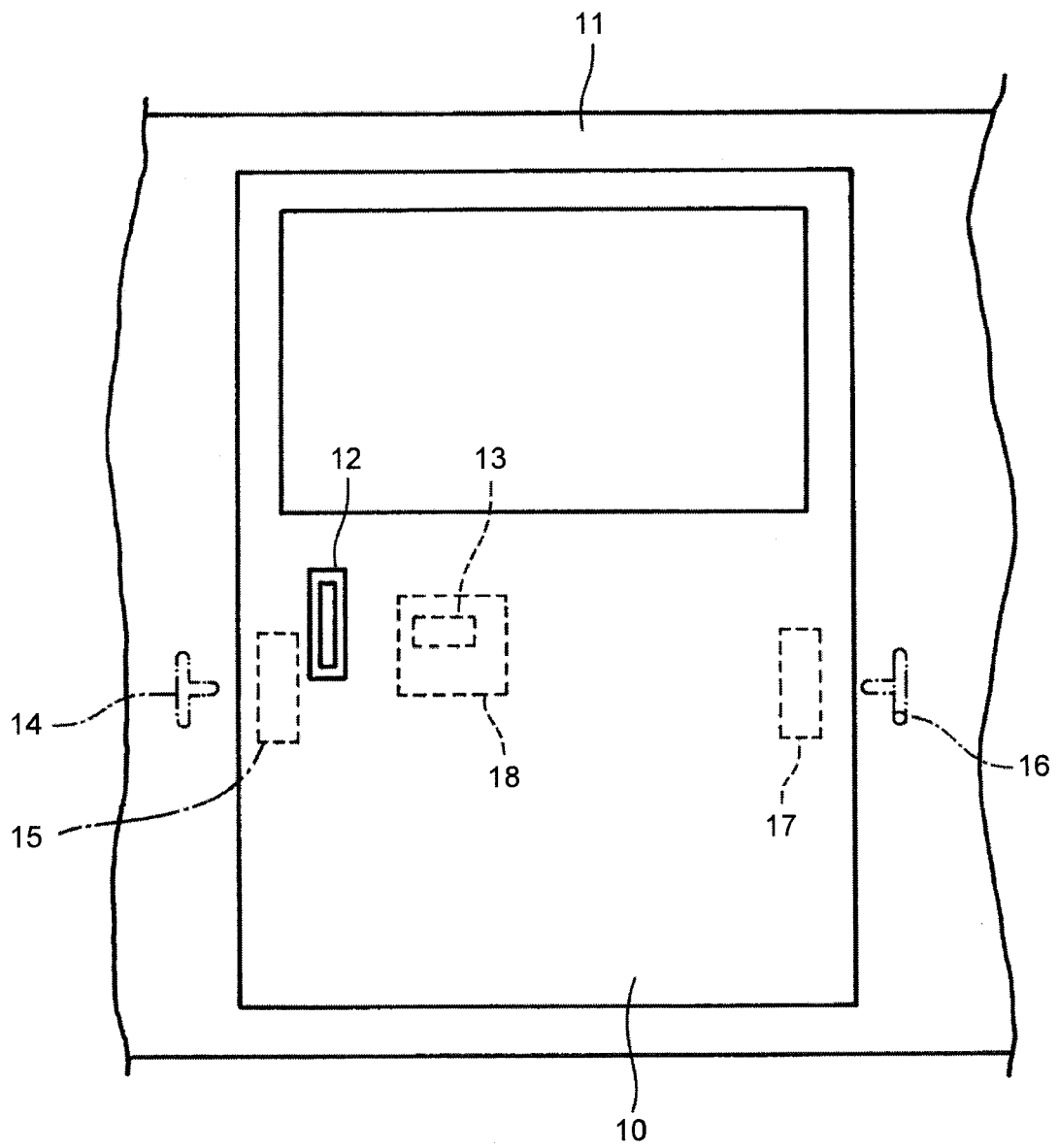


FIG.2

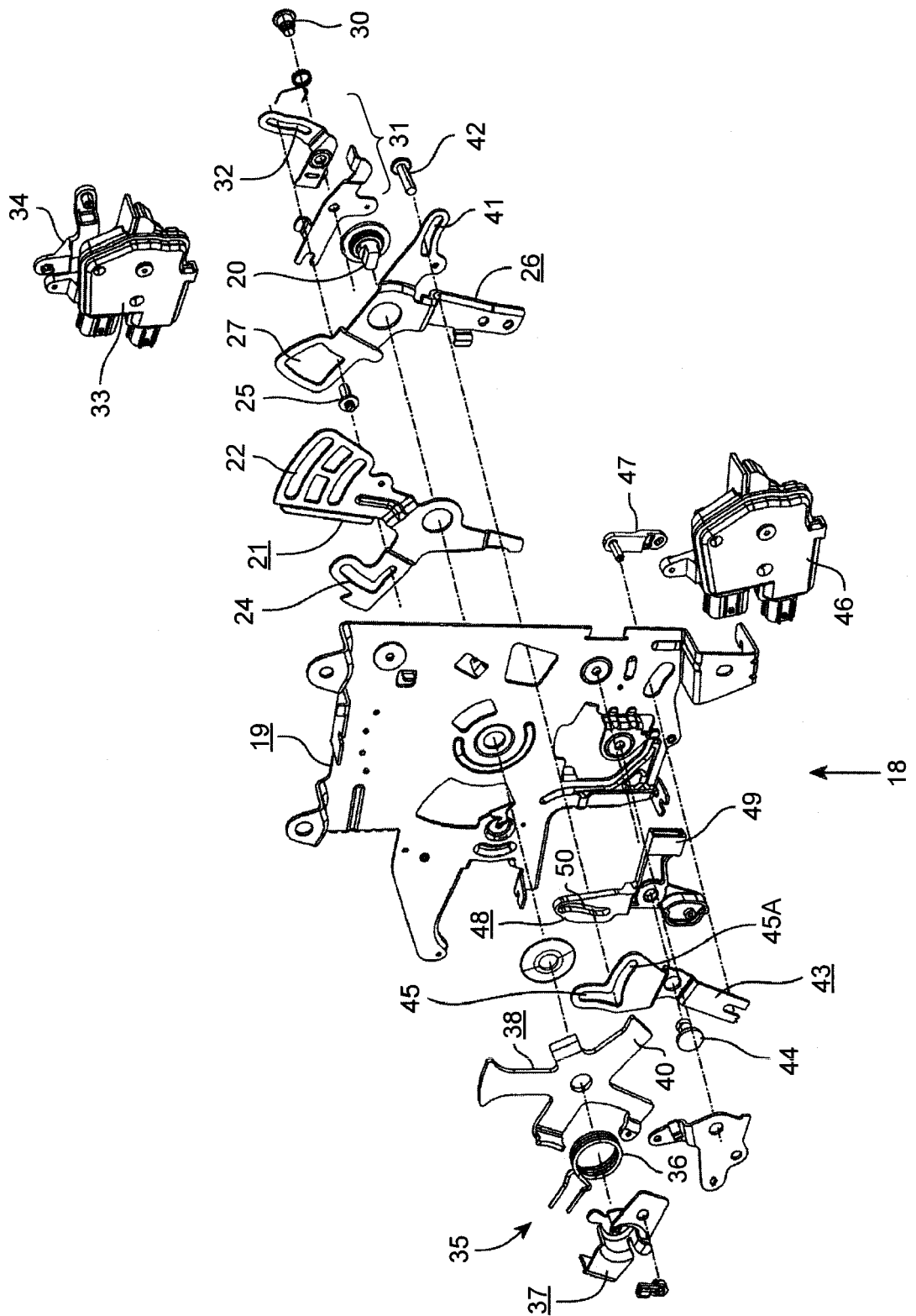


FIG.3

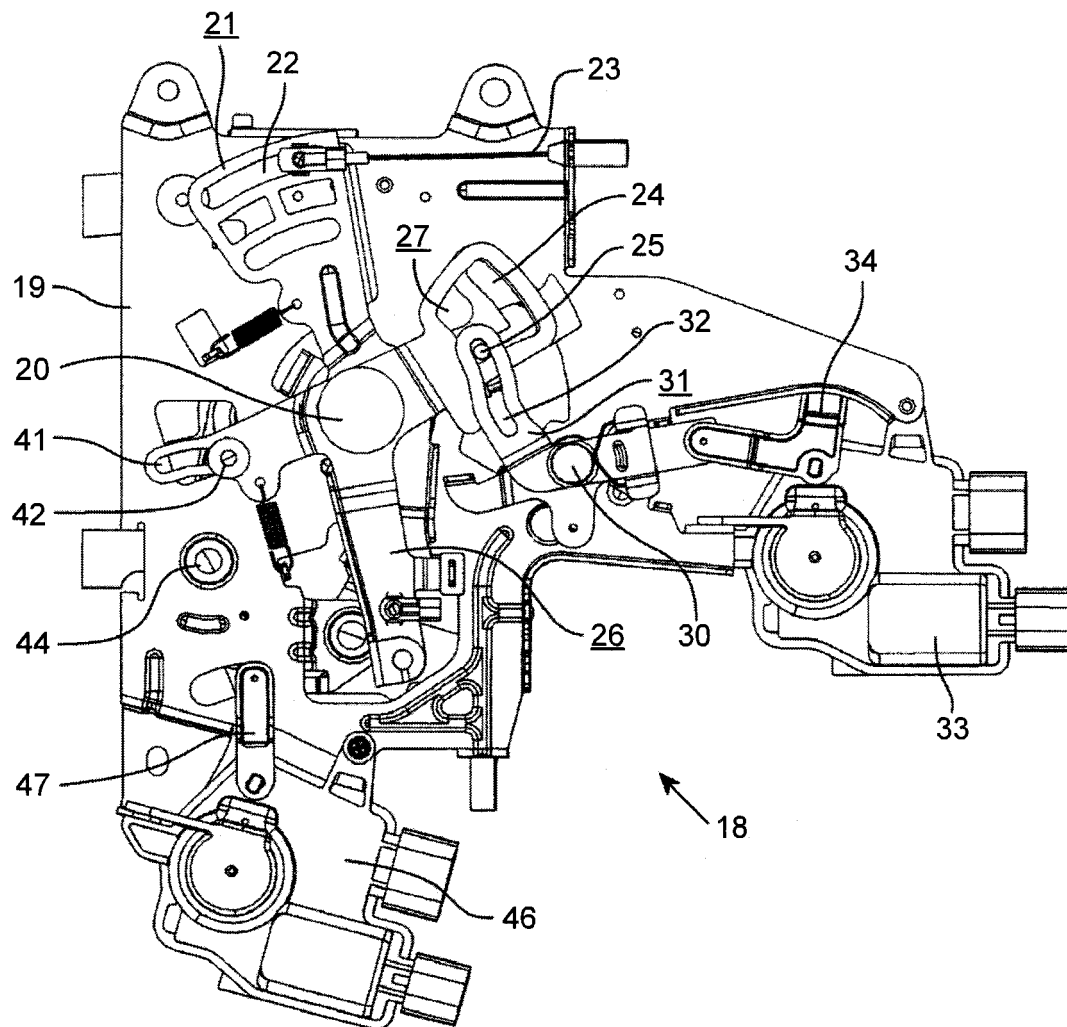


FIG.4

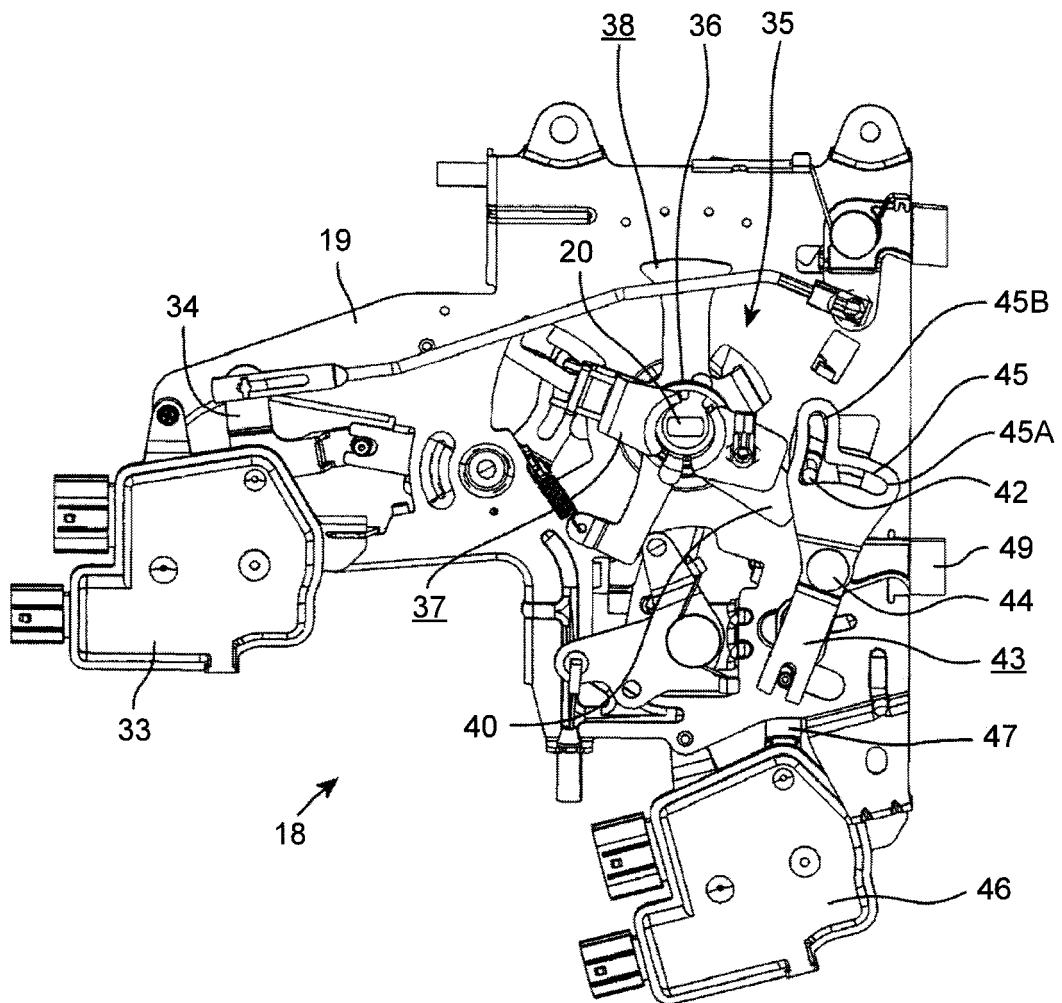


FIG.5

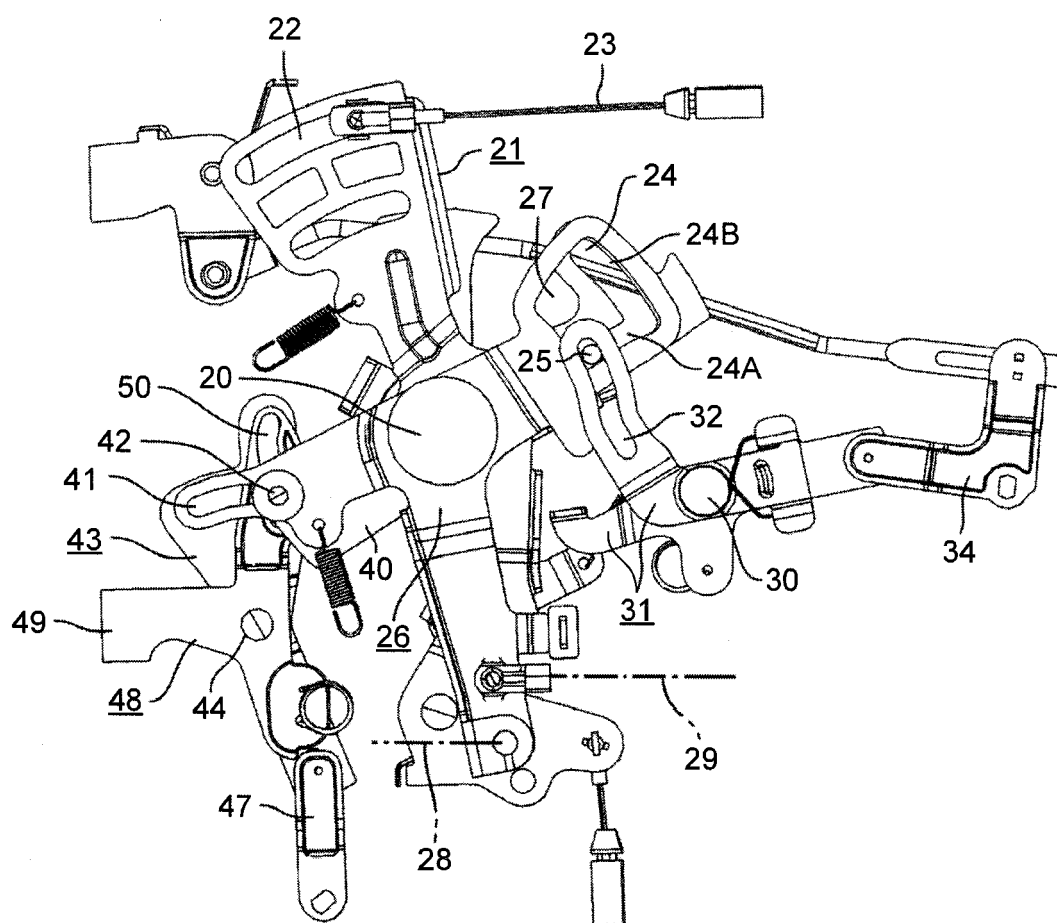


FIG.6

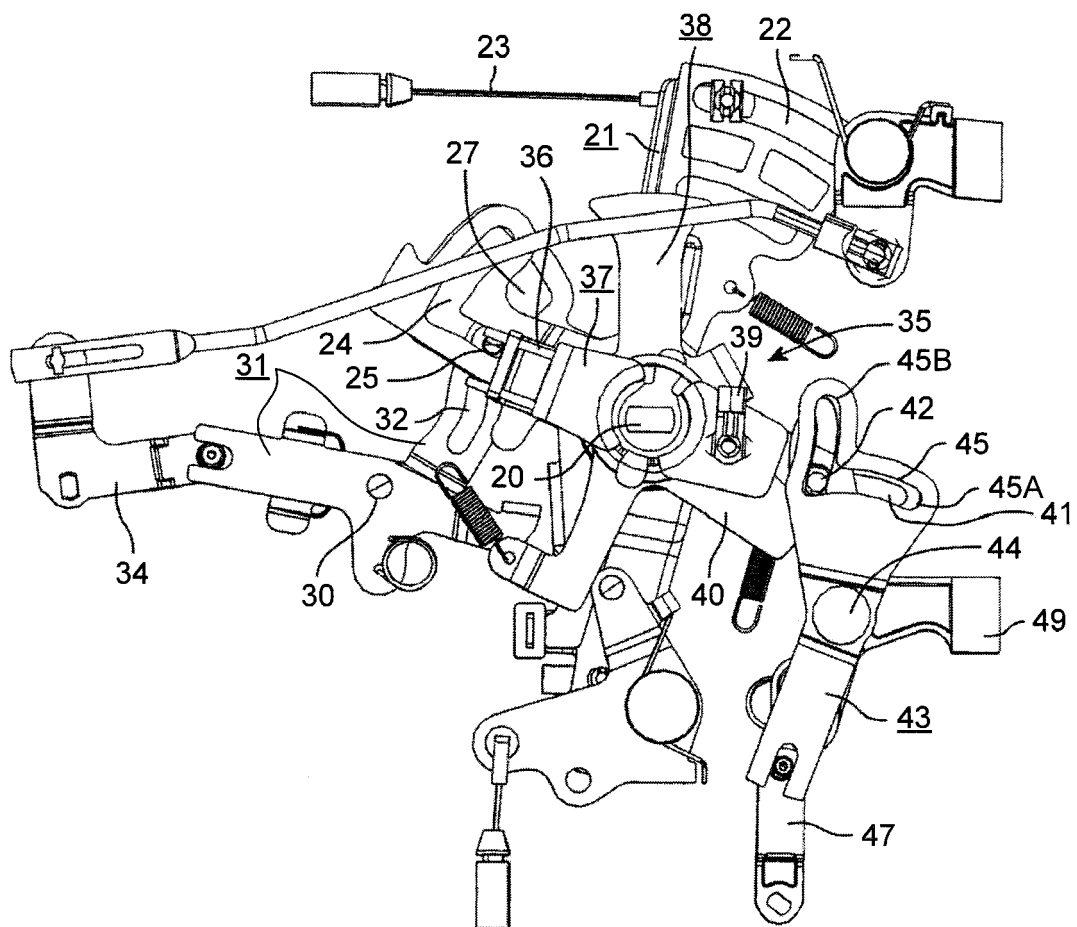


FIG.7

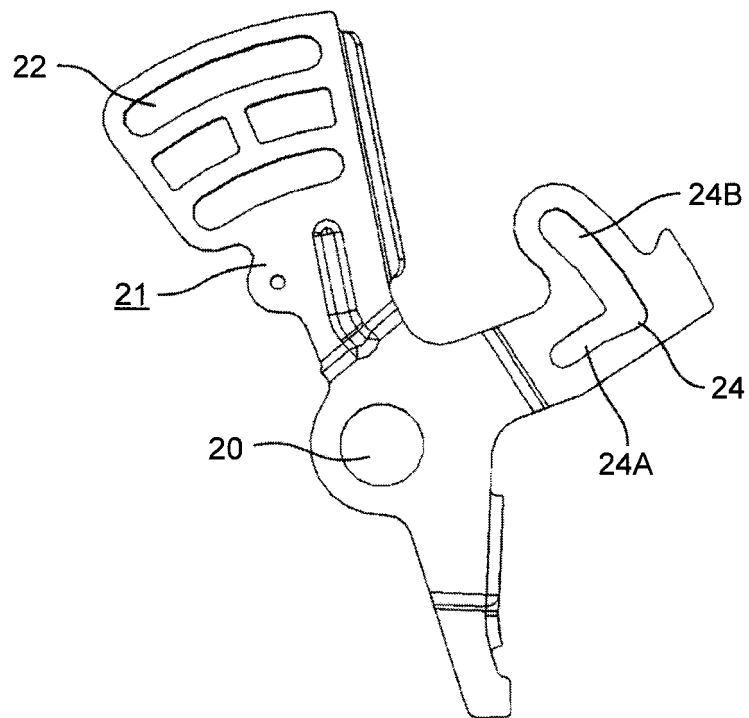


FIG.8

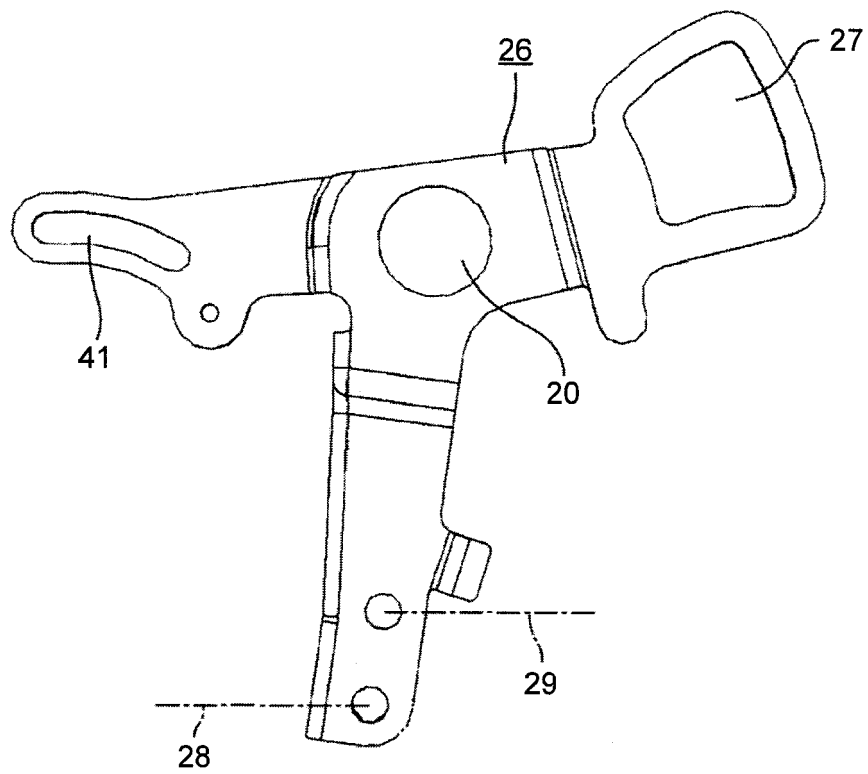


FIG.9

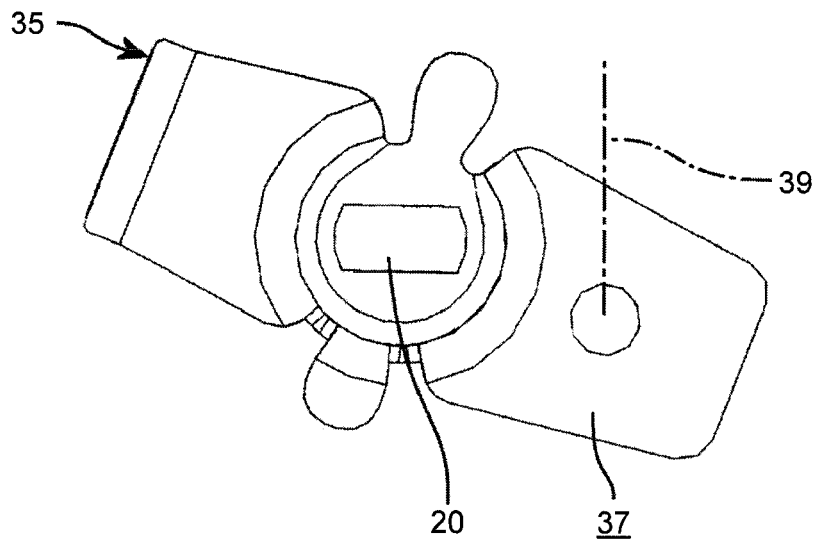


FIG.10

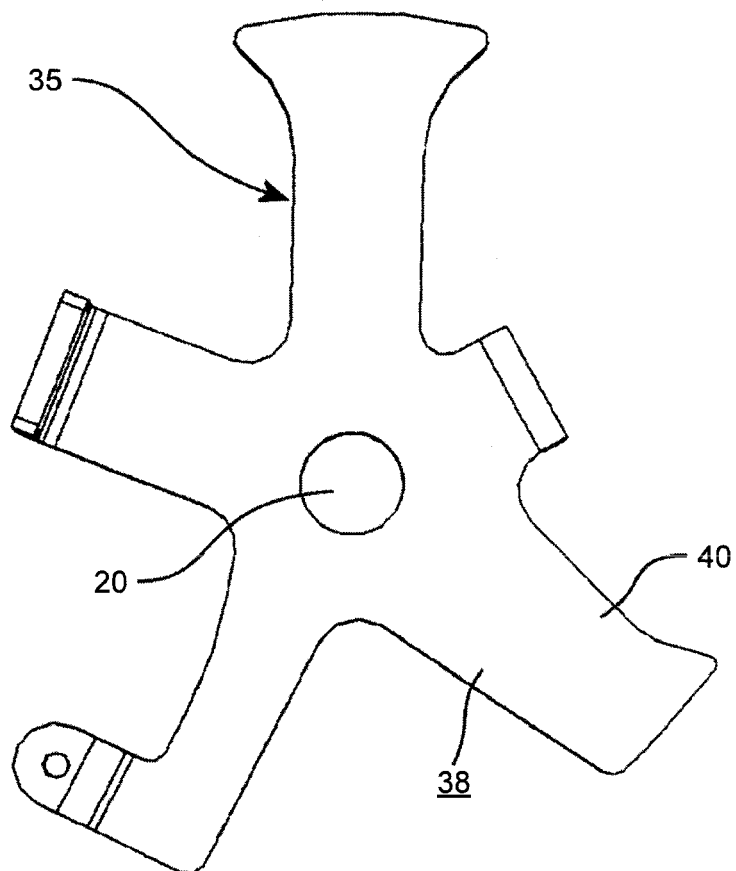


FIG.11

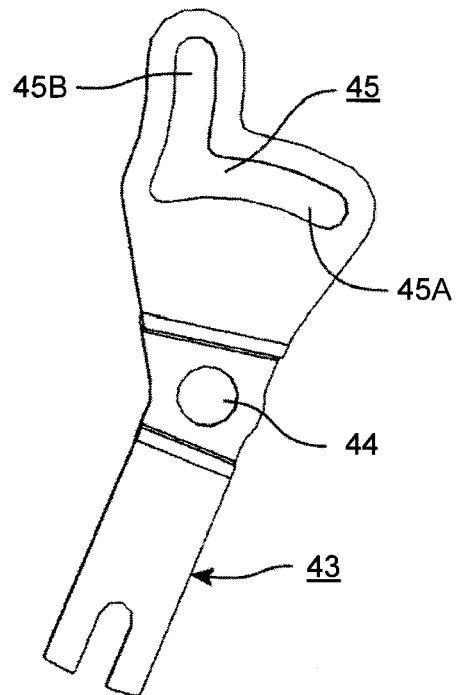


FIG.12

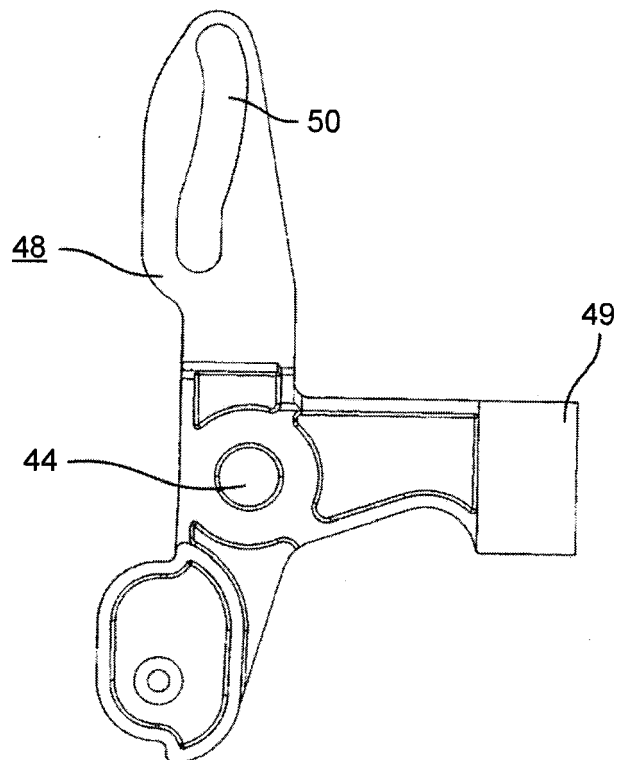


FIG.13A

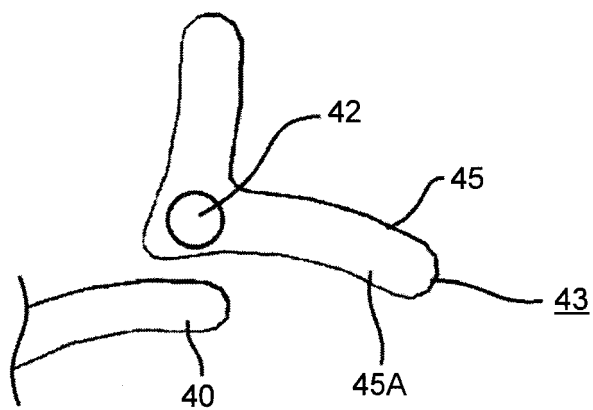


FIG.13B

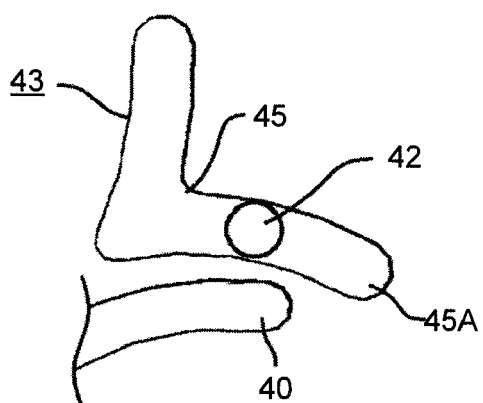
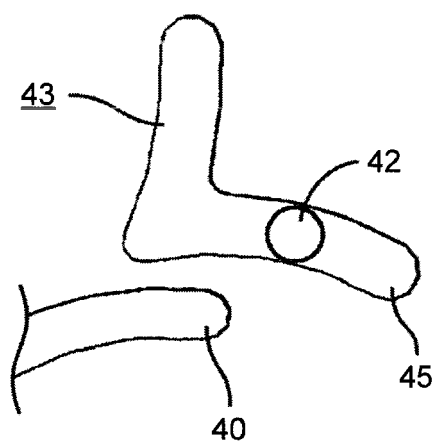


FIG.13C





EUROPEAN SEARCH REPORT

Application Number
EP 15 19 6970

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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
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Place of search		Date of completion of the search	Examiner
The Hague		14 April 2016	Robelin, Fabrice
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 15 19 6970

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