(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 269 906 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.01.2018 Bulletin 2018/03

(21) Application number: **17174673.8**

(22) Date of filing: **07.06.2017**

(51) Int Cl.:
E05B 53/00 *(2006.01)* ***E05B 79/12*** *(2014.01)*
E05B 79/22 *(2014.01)* ***E05B 83/42*** *(2014.01)*

(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

(30) Priority: **14.07.2016 JP 2016139110**

(71) Applicant: **KOBELCO CONSTRUCTION MACHINERY CO., LTD.**
Hiroshima-shi
Hiroshima 731-5161 (JP)

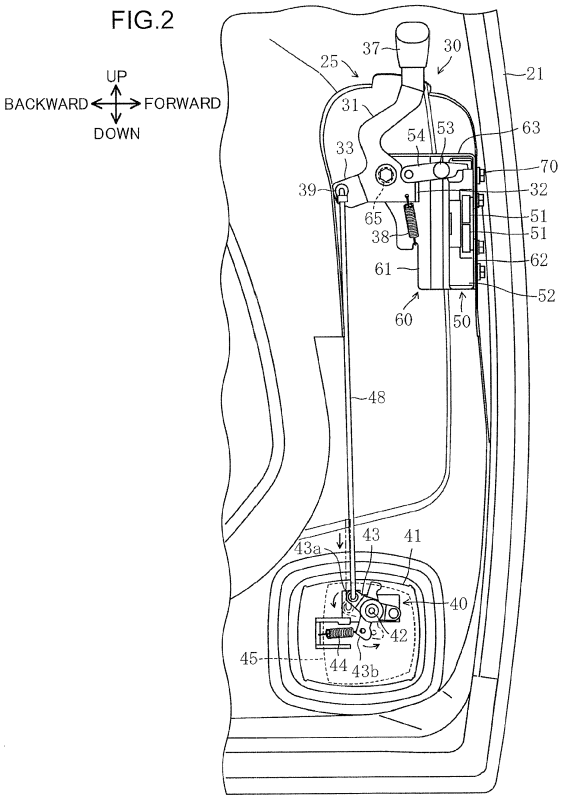
(72) Inventors:
- **NODA, Tsuyoshi**
  Hiroshima-shi,, Hiroshima 731-5161 (JP)
- **NII, Haruo**
  Hiroshima-shi,, Hiroshima 731-5161 (JP)

(74) Representative: **TBK**
Bavariaring 4-6
80336 München (DE)

(54) DOOR UNLOCKING DEVICE FOR CONSTRUCTION MACHINE

(57) There is provided a door unlocking device that is of relatively simple configuration and has good assembling workability and unlocking operability. The inner handle, which is rotatable about a support portion, includes an operating arm, a release arm for performing an unlock operation on a locking device, and a connecting arm connected to a link rod. When a door is locked by the locking device, a position of a center of gravity of the inner handle is located on a vertical line passing through the axial center of the support portion. The link rod rotates the inner handle in conjunction with the operation of the outer handle, thereby performing an unlock operation on the locking device.

FIG.2



EP 3 269 906 A1

Description

Technical Field

[0001] The present invention relates to a door unlocking device for a construction machine.

Background Art

[0002] Conventionally, a door unlocking device for a construction machine including a locking device for locking a door of a cab and capable of unlocking the door from the outside and inside of the cab, has been known.

[0003] JP 2004-360205 A discloses a configuration in which an operating lever of an outer handle lever is interlocked with a locking device via a push-pull cable, while an operating lever of an inner handle lever is interlocked with the locking device via a pin caulked to the operating lever.

[0004] JP 2008-14027 A discloses a configuration in which an open-close handle inside a cab is connected to a bell crank via a rod member, while an open-close handle outside the cab is connected to the bell crank via a lock link mechanism and a rod member.

[0005] Incidentally, the conventional configuration, in which interlocking of the outer handle with the locking device and interlocking of the inner handle with the locking device are performed via the respective separate members, requires more parts for an entire device and is complicated in assembling.

Summary of Invention

[0006] An object of the present invention is to provide a door unlocking device that is of relatively simple configuration and has good assembling workability and unlocking operability.

[0007] The present invention is directed to a door unlocking device for a construction machine including a cab having an openable and closable door and a locking device for locking the door, and provides the following solution.

[0008] That is, a door unlocking device according to the present invention includes an outer handle, an inner handle, and a link rod. The outer handle is supported by the door and operated to unlock the door from an outside of the cab. The inner handle is supported by the door, operated to unlock the door from an inside of the cab, and rotatable about a predetermined rotation axis. The link rod is supported by the door, has an inner end and an outer end, and connects the inner handle and the outer handle. The inner handle includes, in order to unlock the door, an operating arm subjected to an operating force about the rotation axis, a release arm for performing an unlock operation on the locking device associated with rotational movement of the inner handle caused by the operating force, and a connecting arm connected to the inner end of the link rod. The outer handle includes an operative portion operated to unlock the door and a portion connected to the outer end of the link rod. The link rod rotates the inner handle about the rotation axis in conjunction with the operation of the outer handle, thereby causing the release arm to perform an unlock operation on the locking device. When the door is locked by the locking device, a position of a center of gravity of the inner handle is located on a vertical line passing through the rotation axis when viewed from a direction parallel to an axial center of the rotation axis.

Brief Description of Drawings

[0009]

FIG. 1 is a side view illustrating a configuration of a construction machine according to one embodiment of the present invention;
FIG. 2 is a side view illustrating an internal structure of a door;
FIG. 3 is an exploded perspective view illustrating a structure of an inner handle;
FIG. 4 is a rear view illustrating the structure of the inner handle;
FIG. 5 is a side view of the inner handle positioned in a locked position;
FIG. 6 is a side view of the inner handle positioned in an unlocked position;
FIG. 7 is a perspective view of a locking device as seen from inside a cab; and
FIG. 8 is a side view of the locking device as seen from inside the cab.

Description of Embodiments

[0010] Embodiments of the present invention will now be described with reference to the accompanying drawings. The following description of the preferred embodiments is merely exemplary in nature and is not intended to limit the invention or the application and uses of the invention. Vertical, longitudinal and lateral directions are indicated by arrows in the drawings. Unless specifically stated otherwise, descriptions of vertical direction etc. are made according to the directions indicated by the arrows.

[0011] As illustrated in FIG. 1, a construction machine 10, which is a hydraulic excavator, includes a crawler-type lower traveling body 11 and an upper slewing body 12 turnably mounted on the lower traveling body 11. The construction machine 10 also includes an attachment 13, a cab 20, a machine room cover 16, and a counterweight 17.

[0012] The upper slewing body 12 has an upper frame 15. The attachment 13 for an excavation operation or the like is attached to the front central portion of the upper frame 15. The attachment 13 includes a boom 13a attached so as to be capable of vertical pivotal movement relative to the upper frame 15, an arm 13b rotatably at-

tached to the distal end of the boom 13a, a bucket 13c rotatably attached to the distal end of the arm 13b, and a plurality of hydraulic cylinders 13d. The boom 13a, the arm 13b, and the bucket 13c can be vertically moved by extending and contracting the respective hydraulic cylinders 13 d.

[0013] The cab 20 is located on the left side of the attachment 13 on the upper frame 15. Control valves, engine and the like (not shown) are located on the back of the upper frame 15, and they are covered by the machine room cover 16. The counterweight 17 is located on the back of the machine room cover 16.

[0014] The cab 20 includes a door 21, a locking device 50, and a door unlocking device 25. The door 21, which can be opened and closed, is provided on the left side of the cab 20.

[0015] As illustrated in FIG. 2, the door 21 has a locking device 50 therein for locking the door 21 in a closed state. The locking device 50 is interlocked with a door unlocking device 25. The door unlocking device 25 includes an outer handle 40 that is supported by the door 21 and releases the lock of the door 21 provided by the locking device 50 from the outside of the cab 20, an inner handle 30 that is supported by the door 21 and releases the lock of the door 21 provided by the locking device 50 from the inside of the cab 20, a link rod 48 supported by the door 21. When the door unlocking device 25 unlocks the door 21, the door 21 can be opened.

[0016] The outer handle 40 is provided at the lower position of the left side of the door 21, the outer handle 40 being operated by an operator to unlock the locked door 21 from the outside of the cab 20. The outer handle 40 includes an attachment bracket 41, an outer rotation shaft 42, an operating lever 43, a bias spring 44, and a grip portion 45 (i.e., an operative portion). The attachment bracket 41 is provided in the door 21. The outer rotation shaft 42 is provided in the attachment bracket 41 and extends widthwise. The operating lever 43 is rotatably supported about the outer rotation shaft 42. The bias spring 44 biases the operating lever 43 in a locking direction (i.e., in the clockwise direction in FIG. 2). The grip portion 45 is proximally pulled (i.e., operated) from the outside of the cab 20 by the operator, and thus rotating the operating lever 43 in an unlocking direction.

[0017] The operating lever 43 includes a connecting portion 43a (i.e., a connected portion) connected to the lower end (i.e., outer end) of the link rod 48 connecting the inner handle 30 and the outer handle 40, and a spring hook 43b with which the bias spring 44 is engaged. The operating lever 43 is rotated counterclockwise in FIG. 2 by the operator pulling the grip portion 45 proximally. Thus, the link rod 48 is pulled downward, so that the inner handle 30 rotates in conjunction with the operation of the operator pulling the grip portion 45.

[0018] As illustrated in FIGS. 3 to 5, the door unlocking device 25 includes a holding bracket 60 (i.e., a bracket) supported by the door 21. The inner handle 30 and the locking device 50, which are held by the holding bracket 60, are supported by the door 21. In the present embodiment, all three of a subassembly of the inner handle 30, a subassembly of the outer handle 40, and a subassembly in which the holding bracket 60 holds the locking device 50 are prepared and assembled in advance, and this facilitates assembling these subassemblies to the door 21 easily.

[0019] The locking device 50 includes a striker 23 (FIG. 7) provided near the door 21 in the cab 20, a pair of upper and lower striker catches 51 for gripping and locking the striker 23, a body 52 for openably and closably supporting the striker catches 51, and a release lever 54 that includes a pivot shaft 53 and releases the locked striker catches 51 by pivoting about the pivot shaft 53.

[0020] The holding bracket 60 includes a left side wall 61, a front wall 62 extending rightward from the front edge of the left side wall 61, an upper wall 63 extending over the upper edge of the left side wall 61 and the upper edge of the front wall 62, and a support portion 65. The support portion 65 is positioned on a right side surface of the left side wall 61 to extend to the right and rotatably supports the inner handle 30 about a predetermined rotation axis.

[0021] The front wall 62 is formed of four through-holes 62a. The body 52 of the locking device 50 is formed of four screw holes 52a corresponding to the four through-holes 62a formed in the front wall 62 of the holding bracket 60. The front wall 62 of the holding bracket 60 is fastened together by a plurality of fastening bolts 70 with sandwiched between an inner panel 22 of the door 21 and the body 52 of the locking device 50. In this manner, the holding bracket 60 is attached to the door 21. Herein, the striker catches 51, which can be opened and closed at the right side of the body 52, are located in a position where the striker catches 51 engage with the striker 23 when the door 21 is closed.

[0022] The inner handle 30 is longitudinally (in the front and rear direction) rotatable about the support portion 65. The inner handle 30 includes, in order to unlock the door 21, an operating arm 31 that is subjected to an operating force about the rotation axis and provides rotational movement to the inner handle 30, a release arm 32 for performing an unlock operation on the locking device 50 associated with the rotational movement of the inner handle 30 caused by the operating force, and a connecting arm 33 connected to the upper end (i.e., inner end) of the link rod 48.

[0023] The inner handle 30 further includes a cylindrical body 34 extending to the left and fitting with the support portion 65 and a resin washer 35 (see FIG. 3). The resin washer 35 as a resin spacer member is fitted to the outer periphery of the support portion 65. When the cylindrical body 34 of the inner handle 30 is fitted to the support portion 65, the resin washer 35 is sandwiched between the left side wall 61 of the holding bracket 60 and the cylindrical body 34 of the inner handle 30. This reduces the frictional resistance between the inner handle 30 and the holding bracket 60, so that the unlocking operation of the inner handle 30 can be smoothly per-

formed.

[0024] A fastening bolt 70 is inserted through the rotational center (i.e., the cylindrical body 34) of the inner handle 30. The inner handle 30 and the support portion 65 are fastened with the fastening bolt 70, and thus the inner handle 30 is rotatably supported about a predetermined rotation axis around the support portion 65. The inner handle 30 is also provided with a metal washer 36. The metal washer 36 is sandwiched between the inner handle 30 and the fastening bolt 70.

[0025] When viewed from the side as shown in FIG. 5, the operating arm 31 is shaped to curve obliquely forward as it extends upward and then to curve again to extend upward. The operating arm 31 has a knob 37 gripped by the operator. The knob 37 is attached to the upper end of the operating arm 31.

[0026] In this manner, since the operating arm 31 has a plurality of curved portions, a position G of a center of gravity of the inner handle 30 is set such that the position G is located on a vertical line passing through the axial center (i.e., rotation axis) of the support portion 65 when the unlock operation on the locking device 50 is not performed (i.e., when the door 21 is locked by the locking device 50).

[0027] Such a configuration prevents the inner handle 30 from being tilted toward the locked position or the unlocked position due to the weight imbalance of the inner handle 30, and the inner handle 30 can maintain a neutral posture.

[0028] Thus, when the operator performs the unlocking operation with the outer handle 40, the outer handle 40 is not subjected to the weight of the inner handle 30 via the link rod 48, thereby achieving good operability for unlocking.

[0029] When viewed from the rear as shown in FIG. 4, the operating arm 31 has a shape bent to the right as the operating arm 31 extends upward from the proximal end of the cylindrical body 34 and then further bent again to extend upward. In this manner, since an offset amount of the upper end of the operating arm 31 to the right is set equal to an offset amount of the connecting arm 33 extending to the left in FIG. 4 from the operating arm 31, the position G of the center of gravity of the inner handle 30 is set such that the position G is located at the substantial center of the operating arm 31 in the transverse direction. Thus, the operator can smoothly rotate the operating arm 31 longitudinally.

[0030] The release arm 32 extends forward from the proximal end of the cylindrical body 34 and is shaped such that the distal end of the release arm 32 is bent to the right. The inner handle 30 further includes a bias spring 38. The bias spring 38 biases the release arm 32 in the locking direction (i.e., in the clockwise direction about the support portion 65 in FIG. 5). One end of the bias spring 38 is engaged with the release arm 32. The other end of the bias spring 38 is engaged with the holding bracket 60.

[0031] The link rod 48 rotates the inner handle 30 about the rotation axis in conjunction with the operation of the outer handle 40, thereby causing the release arm 32 to perform an unlock operation on the locking device 50. The link rod 48 has an inner end at its upper end and an outer end at its lower end and connects the inner handle 30 and the outer handle 40.

[0032] When the operator unlocks the locking device 50, the operating arm 31 is pulled backward and the release arm 32 is rotated counterclockwise against the biasing force of the bias spring 38 as indicated by the arrow in FIG. 6, and thus the release arm 32 raises the rear end of the release lever 54 of the locking device 50. Then, the front end of the release lever 54 pivots clockwise about the pivot shaft 53, thereby unlocking the locking device 50.

[0033] The connecting arm 33 has a rod holder 39 (FIGS. 3 and 6). The rod holder 39 holds the upper end of the link rod 48. Thus, the outer handle 40 and the inner handle 30 are connected to each other via the link rod 48, and the operator can perform the unlocking operation of the door 21 by interlocking the inner handle 30 with the outer handle 40.

[0034] Specifically, when the operator performs an unlocking operation using the outer handle 40, the unlocking operation causes the link rod 48 to be pulled downward, so that the inner handle 30 rotates counterclockwise about the support portion 65 in FIG. 6, the release arm 32 raises the rear end of the release lever 54, and the locking device 50 is unlocked.

[0035] Herein, as illustrated in FIG. 5, three distances a, b, and c are set to satisfy the condition of a > b > c:

> where "a" is a distance from the center position of the upper end of the link rod 48 connected to the connecting arm 33 of the inner handle 30 to the axial center of the support portion 65, "b" is a distance from the axial center of the support portion 65 to a point at which the release arm 32 abuts against the release lever 54, and "c" is a distance from the point at which the release arm 32 abuts against the release lever 54 to the axial center of the pivot shaft 53 of the release lever 54.

[0036] Thus, when the operator performs the unlocking operation with the inner handle 30 or the outer handle 40 and the release arm 32 raises the release lever 54, the amount of downward movement of the front end of the release lever 54 can be increased as compared with the amount by which the release lever 54 is raised. As such, the operability for unlocking is improved.

[0037] As illustrated in FIGS. 7 and 8, in the inner panel 22 of the door 21, an opening hole 26 and a guide hole 27 are formed. The opening hole 26 is used for assembly and maintenance of the locking device 50 and the inner handle 30. The operating arm 31 of the inner handle 30 is inserted through the guide hole 27, which allows the operating arm 31 to be longitudinally pivotable. After completion of assembly of the inner handle 30, the open-

ing hole 26 is closed by a closing plate 28 with only the striker catches 51 of the locking device 50 exposed, as illustrated in FIG. 8. The closing plate 28 is fastened to the inner panel 22 by fastening bolts 70.

[0038] In the present embodiment, there is no need to perform maintenance work on the side of the outer handle 40 after the outer handle 40 and the inner handle 30 have been connected by the link rod 48, so that the opening hole 26 is formed only on the side of the inner handle 30 of the door 21.

[0039] This allows the inner panel 22 of the door 21 to be minimally opened, thereby reducing the manufacturing cost of the inner panel 22 and securing the rigidity of the inner panel 22.

[0040] As described above, the present invention, which has a practical advantage that the door unlocking device can be provided that is of relatively simple configuration and has good assembling workability and unlocking operability, is extremely useful and has high industrial applicability.

[0041] That is, the present invention is directed to a door unlocking device for a construction machine including a cab having an openable and closable door and a locking device for locking the door and provides the following solution.

[0042] That is, a door unlocking device according to the present invention includes an outer handle, an inner handle, and a link rod. The outer handle is supported by the door and operated to unlock the door from an outside of the cab. The inner handle is supported by the door, operated to unlock the door from an inside of the cab, and rotatable about a predetermined rotation axis. The link rod is supported by the door, has an inner end and an outer end, and connects the inner handle and the outer handle. The inner handle includes, in order to unlock the door, an operating arm subjected to an operating force about the rotation axis, a release arm for performing an unlock operation on the locking device associated with rotational movement of the inner handle caused by the operating force, and a connecting arm connected to the inner end of the link rod. The outer handle includes an operative portion operated to unlock the door and a portion connected to the outer end of the link rod. The link rod rotates the inner handle about the rotation axis in conjunction with the operation of the outer handle, thereby causing the release arm to perform an unlock operation on the locking device. When the door is locked by the locking device, the position of the center of gravity of the inner handle is located on a vertical line passing through an axial center of the rotation axis when viewed from a direction parallel to the axial center of the rotation axis.

[0043] In this configuration, the inner handle includes the operating arm, the release arm, and the connecting arm. The inner handle and the outer handle are connected via the link rod. When the unlocking operation is performed using the outer handle, the inner handle rotates via the link rod, and the locking device is unlocked.

[0044] In this manner, connecting the inner handle and the outer handle with the link rod allows the unlocking operation to be performed by interlocking the inner handle with the outer handle. This reduces the number of parts and achieves good assembling workability as compared to the conventional configuration, in which interlocking of an inner handle with a locking device and interlocking of an outer handle with the locking device are performed via the respective separate members.

[0045] Since the position of the center of gravity of the inner handle is located on a vertical line passing through the rotation axis when the unlock operation on the locking device is not performed (i.e., when the door is locked by the locking device), the weight imbalance of the inner handle is prevented and the inner handle is prevented from being tilted toward the locked position or the unlocked position, so that the inner handle can maintain a neutral posture.

[0046] Thus, when the unlocking operation is performed using the outer handle, the outer handle is not subjected to the weight of the inner handle via the link rod, thereby achieving good operability for unlocking.

[0047] In the above configuration, there are preferably further provided a bracket that includes a support portion for rotatably supporting the inner handle about the rotation axis and is supported by the door; and a resin spacer member that is located around the support portion and sandwiched between the inner handle and the bracket.

[0048] Such a configuration, in which the resin spacer member is sandwiched between the inner handle and the bracket, reduces the frictional resistance between the inner handle and the bracket. This allows the unlocking operation of the inner handle to be smoothly performed and makes it easier to return the inner handle to a neutral posture.

[0049] According to the present invention, the unlocking operation can be performed by interlocking the inner handle with the outer handle, which reduces the number of parts and achieves good assembling workability. Furthermore, since the position of the center of gravity of the inner handle is suitably set, the outer handle is not subjected to the weight of the inner handle via the link rod when the unlocking operation is performed using the outer handle, thereby achieving good operability for unlocking. This application is based on Japanese Patent application No. 2016-139110 filed in Japan Patent Office on July 14, 2016, the contents of which are hereby incorporated by reference.

[0050] Although the present invention has been fully described by way of example with reference to the accompanying drawings, it is to be understood that various changes and modifications will be apparent to those skilled in the art. Therefore, unless otherwise such changes and modifications depart from the scope of the present invention hereinafter defined, they should be construed as being included therein.

[0051] There is provided a door unlocking device that is of relatively simple configuration and has good assem-

bling workability and unlocking operability. The inner handle, which is rotatable about a support portion, includes an operating arm, a release arm for performing an unlock operation on a locking device, and a connecting arm connected to a link rod. When a door is locked by the locking device, a position of a center of gravity of the inner handle is located on a vertical line passing through the axial center of the support portion. The link rod rotates the inner handle in conjunction with the operation of the outer handle, thereby performing an unlock operation on the locking device.

Claims

1. A door unlocking device for a construction machine including a cab having an openable and closable door and a locking device (50) for locking the door, the door unlocking device comprising:

an outer handle (40) that is supported by the door and operated to unlock the door from an outside of the cab;
an inner handle (30) that is supported by the door, operated to unlock the door from an inside of the cab, and rotatable about a predetermined rotation axis; and
a link rod (48) that is supported by the door, has an inner end and an outer end, and connects the inner handle and the outer handle,
wherein the inner handle includes:

an operating arm (31) subjected to an operating force in order to unlock the door about the rotation axis,
a release arm (32) for performing an unlock operation on the locking device associated with rotational movement of the inner handle caused by the operating force, and
a connecting arm (33) connected to the inner end of the link rod,

the outer handle includes:

an operative portion (45) operated to unlock the door; and
a connected portion (43a) connected to the outer end of the link rod,

the link rod rotates the inner handle about the rotation axis in conjunction with the operation of the outer handle, thereby causing the release arm to perform an unlock operation on the locking device, and
when the door is locked by the locking device, a position of a center of gravity of the inner handle is located on a vertical line passing through the rotation axis when viewed from a direction parallel to an axial center of the rotation axis.

2. The door unlocking device for a construction machine according to claim 1, further comprising:

a bracket (60) that includes a support portion (65) for rotatably supporting the inner handle about the rotation axis and is supported by the door; and
a resin spacer member (35) that is located around the support portion and sandwiched between the inner handle and the bracket.

FIG.1

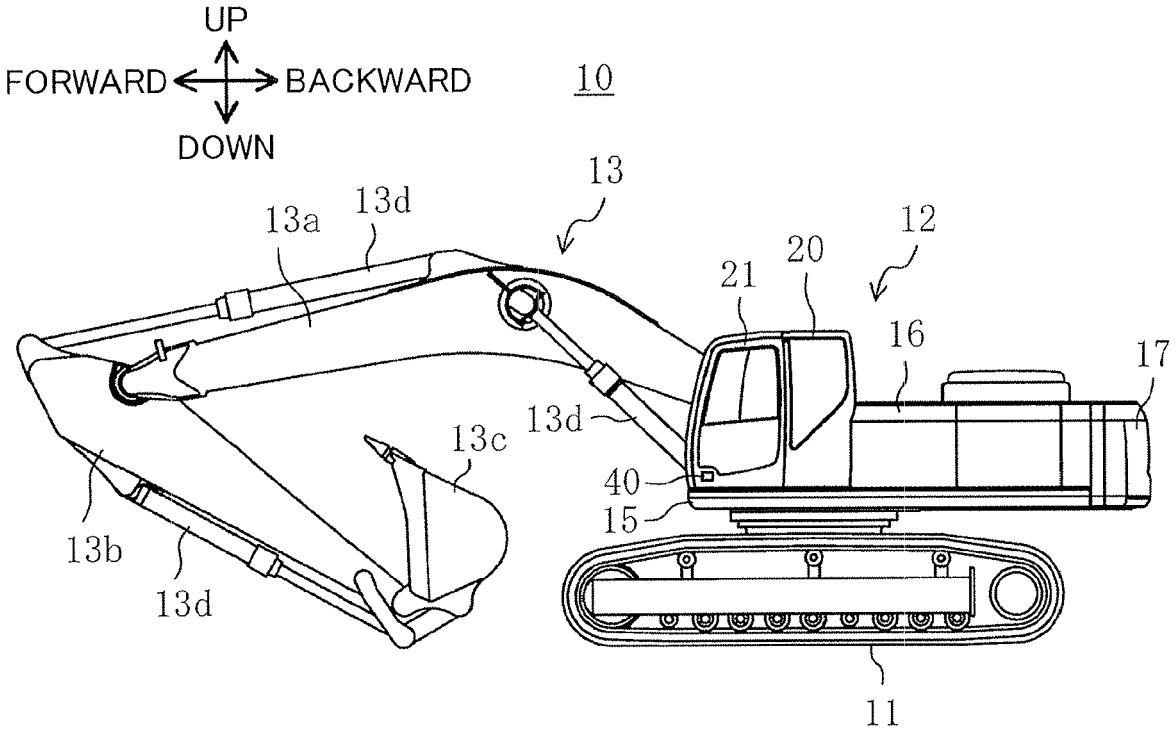

UP
FORWARD
BACKWARD
DOWN
10
13
13a
13d
12
21
20
16
17
13d
13c
40
15
13b
13d
11

FIG.2

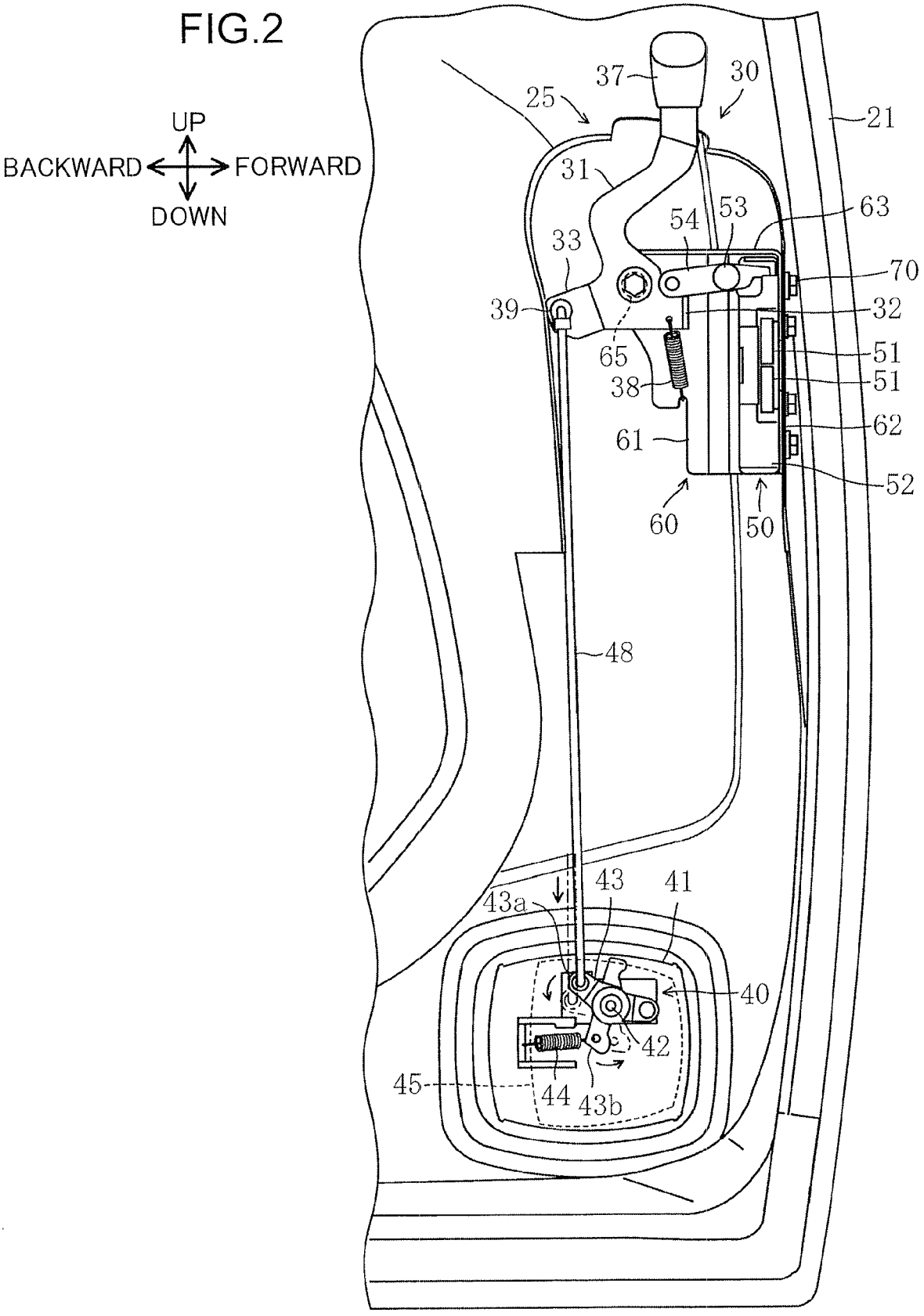

UP
BACKWARD
FORWARD
DOWN
37
30
25
21
31
63
54
53
33
70
39
32
65
51
38
51
62
61
52
60
50
48
43
41
43a
40
42
45
44
43b

FIG.3

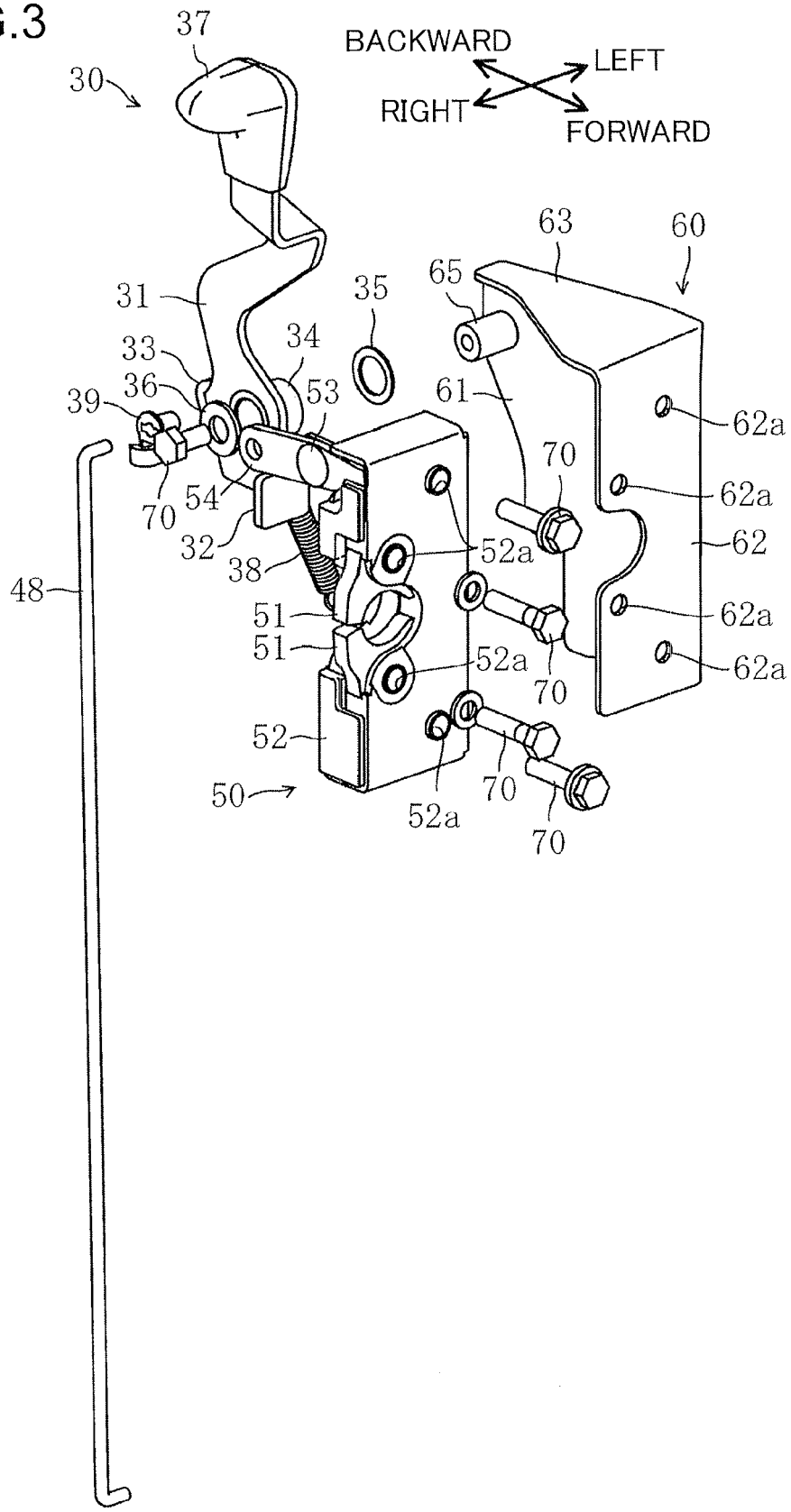

37
30
BACKWARD
LEFT
RIGHT
FORWARD
63
60
65
31
35
34
33
36
53
61
39
62a
70
54
70
62a
32
52a
62
38
48
62a
51
51
52a
70
62a
52
50
70
52a
70

FIG.4

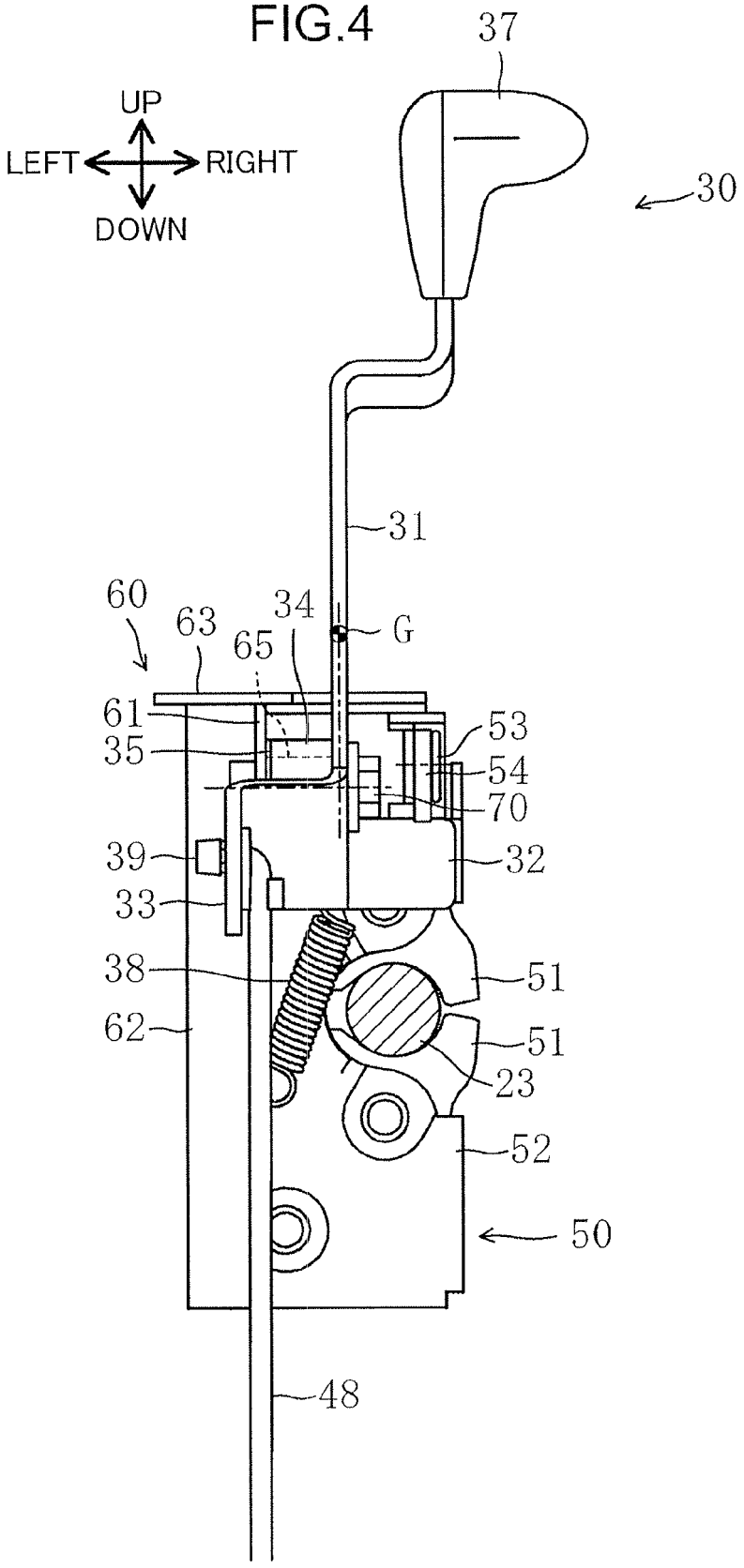

UP
LEFT
RIGHT
DOWN
37
30
31
60
63
65
34
G
61
35
53
54
70
39
32
33
38
51
62
51
23
52
50
48

FIG.5

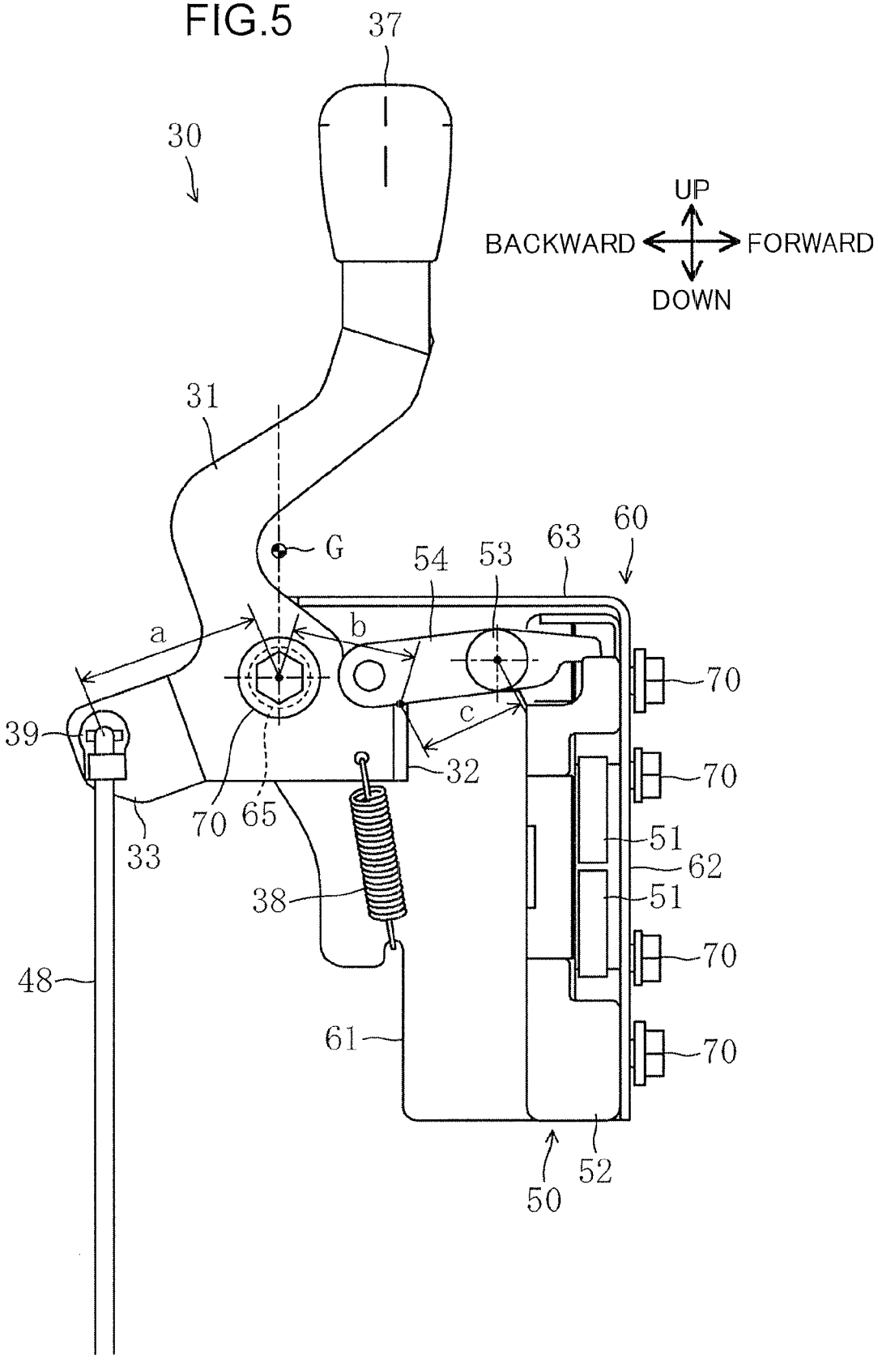

37
30
UP
BACKWARD
FORWARD
DOWN
31
G
54
53
63
60
a
b
c
70
39
32
70
65
33
51
62
38
51
48
70
61
70
50
52

FIG.6

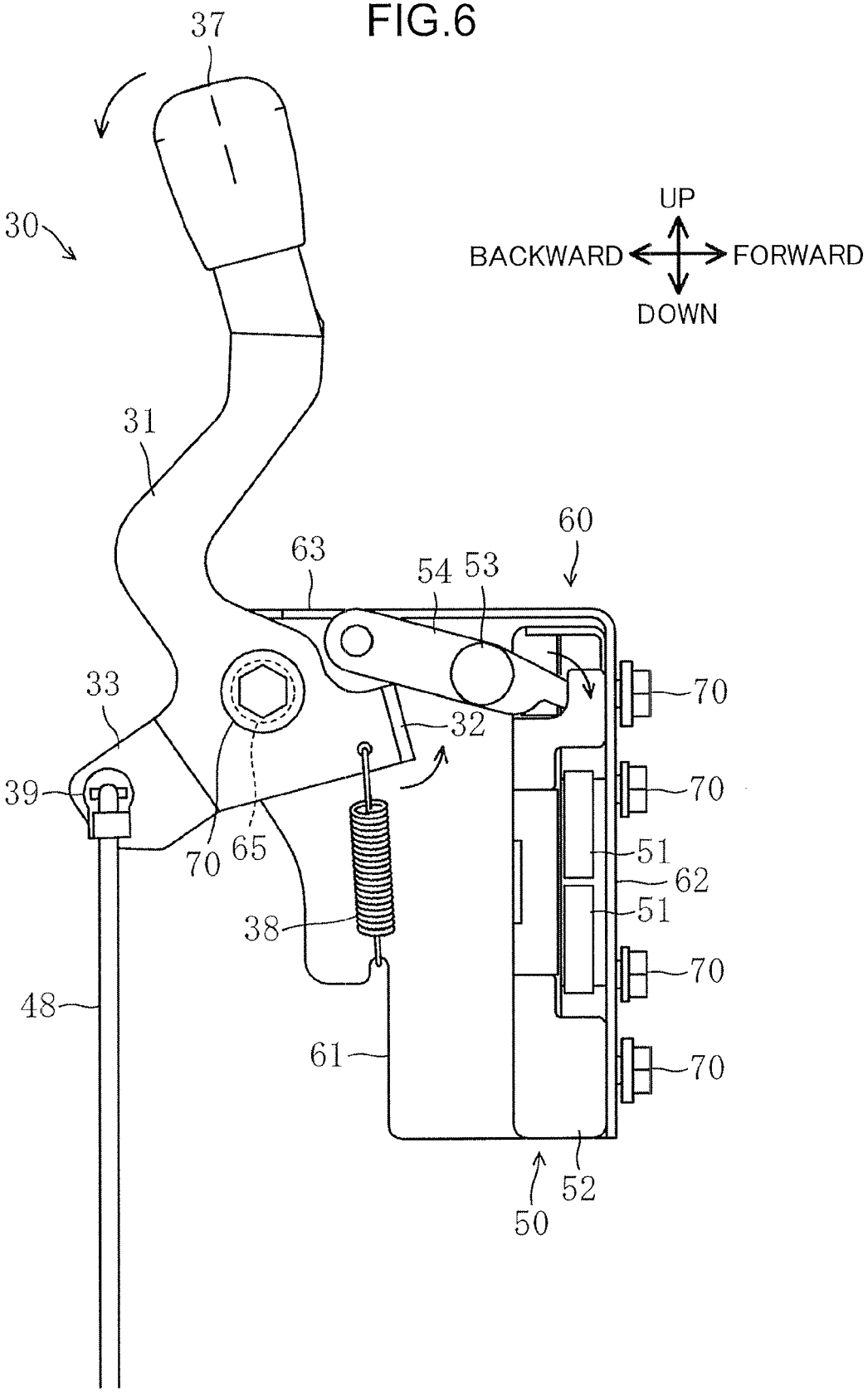

37
30
UP
BACKWARD
FORWARD
DOWN
31
60
63
54
53
33
70
32
39
70
65
70
51
62
51
38
70
48
61
70
52
50

FIG.7

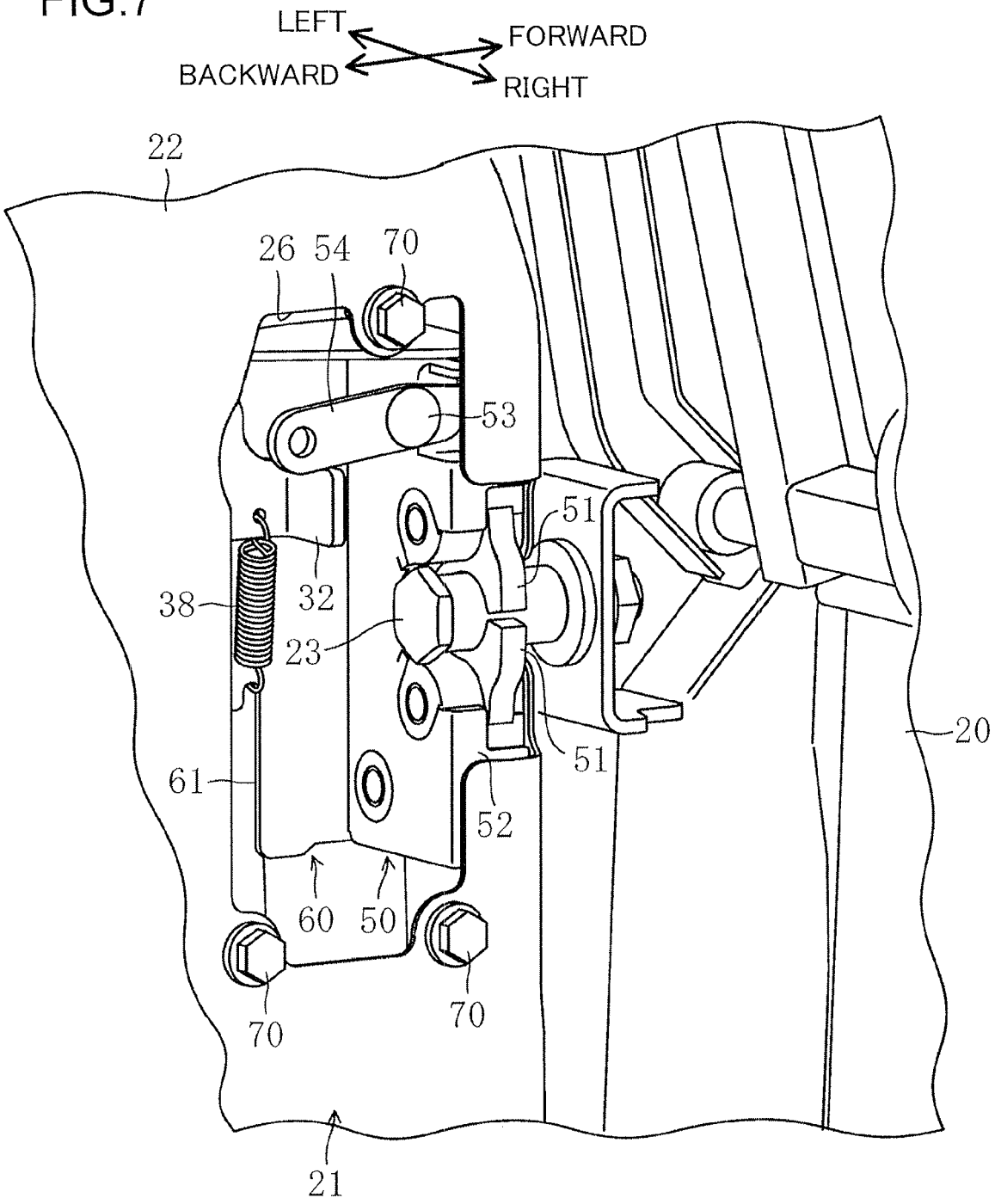
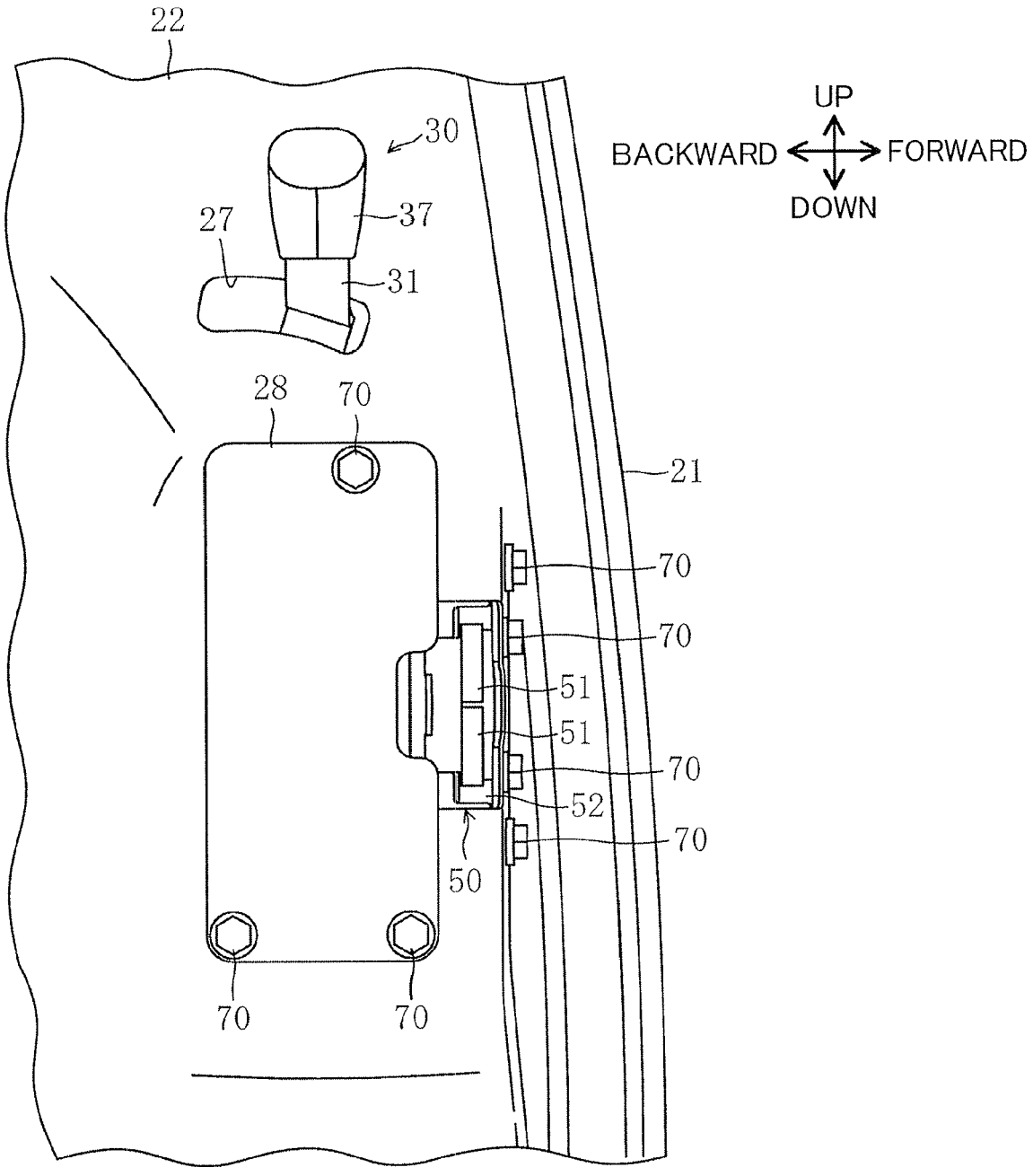

LEFT
FORWARD
BACKWARD
RIGHT
22
26
54
70
53
51
38
32
23
20
61
51
52
60
50
70
70
21

FIG.8


22
30
27
37
31
28
70
21
70
70
51
51
70
52
70
50
70
70
UP
BACKWARD
FORWARD
DOWN

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 17 17 4673

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2000 282730 A (PRESS KOGYO KK) 10 October 2000 (2000-10-10) * paragraph [0014] - paragraph [0022] * * paragraph [0028] - paragraph [0033] * * figures 1-9 *	1,2	INV. E05B53/00 E05B79/12 E05B79/22 E05B83/42
A	JP S60 40768 U (NISSAN MOTOR CO., LTD) 22 March 1985 (1985-03-22) * figure 1 *	1,2	
A	JP H11 50714 A (RYOSEI DENSO KK) 23 February 1999 (1999-02-23) * figures 1-4 *	1,2	
A	WO 2013/090060 A1 (CHRYSLER GROUP LLC [US]) 20 June 2013 (2013-06-20) * paragraph [0025] - paragraph [0031] * * figures 1, 2 *	1,2	
			TECHNICAL FIELDS SEARCHED (IPC) E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 November 2017	Antonov, Ventseslav

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 ON EUROPEAN PATENT APPLICATION NO. EP 17 17 4673

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-11-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2000282730 A	10-10-2000	NONE	
JP S6040768 U	22-03-1985	NONE	
JP H1150714 A	23-02-1999	NONE	
WO 2013090060 A1	20-06-2013	US 2013146382 A1	13-06-2013
		US 2014225386 A1	14-08-2014
		WO 2013090060 A1	20-06-2013

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2004360205 A **[0003]**
- JP 2008014027 A **[0004]**
- JP 2016139110 A **[0049]**