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

(11) **EP 3 680 396 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
15.07.2020 Bulletin 2020/29

(21) Application number: **18853803.7**

(22) Date of filing: **31.08.2018**

(51) Int Cl.:
E02F 9/24 *(2006.01)* ***E02F 9/26*** *(2006.01)*

(86) International application number:
PCT/JP2018/032395

(87) International publication number:
WO 2019/049787 (14.03.2019 Gazette 2019/11)

(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:
KH MA MD TN

(30) Priority: **08.09.2017 JP 2017173095**

(71) Applicant: **Hitachi Construction Machinery Co., Ltd.**
Taito-ku
Tokyo 110-0015 (JP)

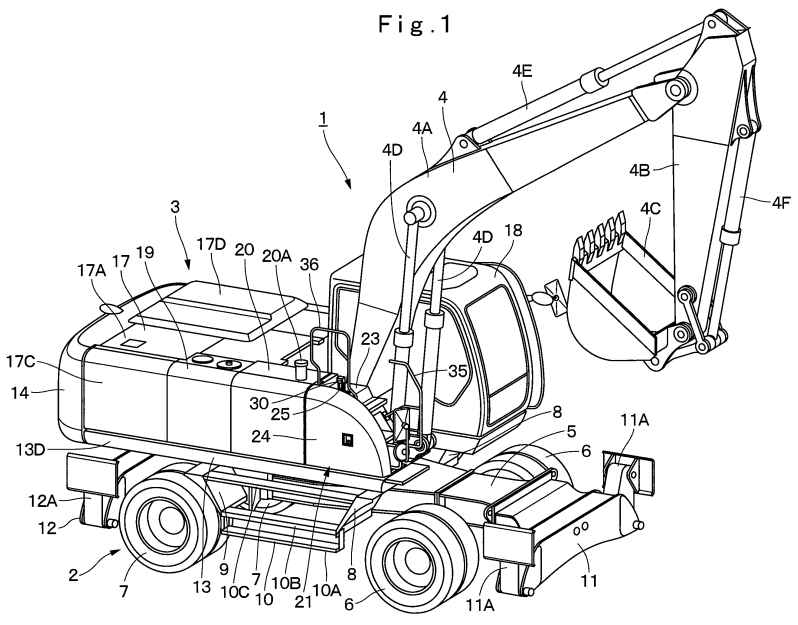
(72) Inventor: **NAKANE, Masashi**
Tsuchiura-shi
Ibaraki 300-0013 (JP)

(74) Representative: **MERH-IP Matias Erny Reichl Hoffmann**
Patentanwälte PartG mbB
Paul-Heyse-Strasse 29
80336 München (DE)

(54) CONSTRUCTION MACHINE

(57) Access steps (23) on the upper revolving structure (3) side are provided with a hinge mechanism (25) as a camera support member for supporting a side monitoring camera (30) monitoring rightward opposite to a cab (18) in a left-and-right direction. The hinge mechanism (25) as a camera support member is configured capable of moving between a monitoring position at which the side monitoring camera (30) monitors rightward by protruding above the access steps (23) and a retreating position at which the side monitoring camera (30) is retreated downward from the monitoring position.

Fig.1



EP 3 680 396 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a construction machine such as a hydraulic excavator, for example, and particularly to a construction machine including a working front device on a front side.

BACKGROUND ART

[0002] In general, a hydraulic excavator as a typical example of construction machine is configured by an automotive lower traveling structure in a front-and-rear direction, an upper revolving structure rotatably mounted on the lower traveling structure, and a front device tiltably provided on a front side of the upper revolving structure.

[0003] The upper revolving structure includes a revolving frame constituted by a support structural body, a counterweight provided on a rear side of the revolving frame to act as a weight balance to the front device, a prime mover such as an engine and the like located on a front side of the counterweight and provided on the revolving frame, a housing cover covering onboard equipment including the prime mover and provided on the revolving frame, and a cab located on a front side of the housing cover and provided on the left side in the left-and-right direction of the revolving frame to define an operator's room.

[0004] Since a front device is disposed on the right side of a cab in a hydraulic excavator, the front device becomes an obstacle for an operator to visually confirm rightward from the cab. To solve such a problem, some hydraulic excavators include a side monitoring camera monitoring rightward opposite to a cab in the left-and-right direction (see Patent Document 1, for example).

[0005] Here, the side monitoring camera is disposed in a case on a lockable revolving frame to protect the side monitoring camera against theft or tampering, for example. A photo-taking opening is provided on a right side surface of the case facing with the side monitoring camera.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0006] Patent Document 1: Japanese Patent Laid-Open No. 2014-206021 A

SUMMARY OF THE INVENTION

[0007] Incidentally, in the above-described Patent Document 1, since a side monitoring camera is disposed in a case, the side monitoring camera takes photos rightward through a photo-taking opening provided in the case. On the contrary, the size of the photo-taking opening is limited, resulting in a problem of narrower shooting range of the side monitoring camera.

[0008] The present invention is made in view of the aforementioned problems of the prior art and the object of the present invention is to provide a construction machine capable of extending a shooting range of a side monitoring camera and improving workability.

[0009] The present invention provides a construction machine comprising: an automotive lower traveling structure in a front-and-rear direction; an upper revolving structure rotatably mounted on the lower traveling structure; and a front device tiltably provided on a front side of the upper revolving structure, wherein the upper revolving structure includes: a revolving frame constituted by a support structural body; a counterweight provided on a rear side of the revolving frame to act as a weight balance to the front device; a prime mover located on a front side of the counterweight and provided on the revolving frame; a housing cover covering onboard equipment including the prime mover and provided on the revolving frame; a cab located on a front side of the housing cover and provided on one side in a left-and-right direction of the revolving frame to define an operator's room; access steps located on the front side of the housing cover and provided on the other side in the left-and-right direction of the revolving frame, and having a foothold for getting on and off the housing cover; and a side monitoring camera monitoring laterally opposite to the cab in the left-and-right direction, characterized in that: a camera support member supporting the side monitoring camera is provided in the access steps, and the camera support member is configured capable of moving between a monitoring position at which the side monitoring camera monitors laterally by protruding above the access steps and a retreating position at which the side monitoring camera is retreated downward from the monitoring position.

[0010] According to the present invention, a shooting range of a side monitoring camera can be extended and workability can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

Fig. 1 is a perspective view showing a wheel-type hydraulic excavator applied to an embodiment of the present invention.

Fig. 2 is a plan view of the wheel-type hydraulic excavator.

Fig. 3 is a plan view of the wheel-type hydraulic excavator in Fig. 2 in a state where a right side surface cover is opened.

Fig. 4 is an enlarged perspective view of an essential part showing a right front side part of the wheel-type hydraulic excavator in Fig. 1.

Fig. 5 is a perspective view showing the wheel-type hydraulic excavator in Fig. 4 in a state where the right side surface cover is opened.

Fig. 6 is an enlarged perspective view of an essential part showing a periphery of a hinge mechanism and a side monitoring camera in Fig. 5 in a state where an outer side handrail is omitted.

Fig. 7 is an enlarged perspective view of an essential part showing the hinge mechanism and the side monitoring camera in an assembled state.

Fig. 8 is an exploded perspective view when seen from the same position as in Fig. 6 in a state where the hinge mechanism is mounted on an uppermost-stage step of access steps.

Fig. 9 is a perspective view showing a state where the hinge mechanism and the side monitoring camera are stored on a lower surface side of the uppermost-stage of the access steps.

MODE FOR CARRYING OUT THE INVENTION

[0012] Hereinafter, a wheel-type hydraulic excavator is exemplified as a construction machine according to an embodiment of the present invention, and will be described below in detail by referring to Figs. 1 to 9.

[0013] A wheel-type hydraulic excavator 1 is configured by an automotive wheel-type lower traveling structure 2 in a front-and-rear direction, an upper revolving structure 3 rotatably mounted on the lower traveling structure 2, and a front device 4 liftably and tiltably provided on a front side of the upper revolving structure 3. The wheel-type hydraulic excavator 1 travels on an ordinary road by the wheel-type lower traveling structure 2, and performs an excavating work of earth and sand using the front device 4 at a work site.

[0014] The front device 4 is configured by a boom 4A whose foot part on a base end side is tiltably mounted in a vertical direction on a front side of a revolving frame 13 of the upper revolving structure 3 which will be described later, an arm 4B rotatably mounted on a front end side of the boom 4A, a bucket 4C rotatably mounted on a front end side of the arm 4B, a boom cylinder 4D driving the boom 4A, the arm 4B, and the bucket 4C, an arm cylinder 4E, and a bucket cylinder 4F. Here, in the front device 4, the boom 4A and the boom cylinder 4D are disposed in the vicinity of the right side of a cab 18 which will be described later. The boom 4A and the boom cylinder 4D become an obstacle for an operator onboard in the cab 18 to visually confirm rightward.

[0015] The lower traveling structure 2 is configured as a wheel-type traveling structure capable of traveling on an ordinary road. The lower traveling structure 2 is configured to include a chassis 5, left and right front wheels 6, left and right rear wheels 7, a front outrigger 11, and a rear outrigger 12 which will be described later.

[0016] The chassis 5 is to be a base of the lower traveling structure 2. The chassis 5 is formed as a box structural body surrounded by upper surface plates, lower surface plates and left and right side surface plates extending in the front-and-rear direction. The upper revolving structure 3 is rotatably mounted on the chassis 5 through a revolving device (not shown).

[0017] The left and right front wheels 6 are steering operably mounted on a front side of the chassis 5 through a front axle (not shown) extending in the left-and-right direction. In addition, the left and right rear wheels 7 are mounted on a rear side of the chassis 5 through a rear axle (not shown) extending in the left-and-right direction.

[0018] The chassis 5 is provided with a front fender 8 located in the vicinity of a rear side of the left and right front wheels 6 and extending in the left-and-right direction so as to cover each of the front wheels 6 from a rear upper side and a rear fender 9 (only right side is shown) located in the vicinity of a front side of the left and right rear wheels 7 and extending in the left-and-right direction so as to cover each of the rear wheels 7 from a front upper side.

[0019] Access steps 10 (only right side is shown) on the lower traveling structure 2 side are provided between the front fender 8 on the left side and the rear fender 9 on the left side, and between the front fender 8 on the right side and the rear fender 9 on the right side, respectively. The access steps 10 constitute a foothold for an operator to get on and off the vehicle between the ground and the upper revolving structure 3. The access steps 10 are configured as a multi-step, for example, 3-step extending in the front-and-rear direction between the front and rear fenders 8, 9 with an interval in the vertical direction. The access steps 10 are configured by a first-stage step 10A located on a lower step, a second-stage step 10B located on an intermediate step, and a third-stage step 10C located on an upper step.

[0020] Here, in a case where an operator, for example, comes up to the upper revolving structure 3 to refuel a fuel tank 20 which will be described later, the operator places a foot on the third-stage step 10C of the access steps 10 on the lower traveling structure 2 side. As a result, the operator can place a foot on a first-stage step 13E on the upper revolving structure 3 side (the revolving frame 13 side) which will be described later.

[0021] Further, the front outrigger 11 located forward from each of the front wheels 6 is mounted on a front end of the chassis 5. On the other hand, the rear outrigger 12 located backward from each of the rear wheels 7 is mounted on a rear end of the chassis 5. Each of the outriggers 11, 12 stabilizes the hydraulic excavator 1 in an excavating operation by pressing the arm parts 11A, 12A provided at left and right positions against the ground, respectively.

[0022] Subsequently, the upper revolving structure 3 of the hydraulic excavator 1 is configured to include a revolving frame 13, a counterweight 14, an engine 15, a housing cover 17, a cab 18, an article accommodating case 21, a hinge mechanism 25, and a side monitoring camera 30 which will be described later.

[0023] As shown in Fig. 2 and Fig. 3, the revolving frame 13 is configured to include a thick flat plate-shaped bottom plate 13A extending in the front-and-rear direction, a left vertical plate 13B and a right vertical plate 13C

installed upright on the bottom plate 13A and extending in the front-and-rear direction at a predetermined interval in the left-and-right direction, a plurality of extension beams (not shown) extending from each of the vertical plates 13B, 13C outward in the left-and-right direction and disposed with an interval in the front-and-rear direction, and a left side frame (not shown) and a right side frame 13D (see Fig. 1) located on an outer side in the left-and-right direction, mounted on a front end of each of the extension beams, and extending in the front-and-rear direction. A foot part of the boom 4A of the front device 4 is tiltably mounted on a front side position of each of the vertical plates 13B, 13C.

[0024] Here, the revolving frame 13 is provided with a first-stage step 13E by protruding forward from a front end edge on the right side. The first-stage step 13E constitutes a foothold of a first stage on the upper revolving structure 3 side. That is, the first-stage step 13E is used for an operator to place a foot at first when the operator moves from the third-stage step 10C of the access steps 10 provided on the lower traveling structure 2 side to the upper revolving structure 3 side.

[0025] The counterweight 14 is provided on a rear side of the revolving frame 13 to act as a weight balance to the front device 4. As shown in Fig. 2 and Fig. 3 (dotted lines), the engine 15 constitutes a prime mover and is located on a front side of the counterweight 14 and provided on the rear side of the revolving frame 13. The hydraulic pump 16 is mounted on the right side of the engine 15. The hydraulic pump 16 is driven by the engine 15 to discharge hydraulic oil as pressurized oil from a hydraulic oil tank 19 which will be described later toward a hydraulic actuator. The engine 15 and the hydraulic pump 16 constitute a part of onboard equipment mounted on the revolving frame 13. It should be noted that the prime mover may be a hybrid-type prime mover having an electric motor in an engine or a single electric motor.

[0026] The housing cover 17 is to cover the engine 15, the hydraulic pump 16 and the like which constitute onboard equipment, and provided on the revolving frame 13. The housing cover 17 is configured to include an upper surface cover part 17A located on the front side of the counterweight 14 and covering the engine 15 and the hydraulic pump 16, a left surface cover part 17B extending downward from a left end of the upper surface cover part 17A, a right surface cover part 17C extending downward from a right end of the upper surface cover part 17A, and an engine cover part 17D capable of being opened and closed provided at the upper surface cover part 17A.

[0027] The cab 18 is located on a front side of the housing cover 17 and provided on the left side as one side in the left-and-right direction of the revolving frame 13, that is, on a left front side of the revolving frame 13. The cab 18 defines an operator's room, inside which an operator's seat, various operating levers, an operating pedal, a monitor device for displaying images by the side monitoring camera 30 which will be described later and the like (each is not shown) are disposed.

[0028] The hydraulic oil tank 19 is disposed on a front side of the hydraulic pump 16 and on the right side of the revolving frame 13 opposite to the cab 18 across a foot part of the boom 4A of the front device 4. The hydraulic oil tank 19 stores hydraulic oil for driving various types of hydraulic actuators, and is formed as a rectangular shaped pressure tight tank extending in the vertical direction.

[0029] The fuel tank 20 is disposed adjacent to a front side of the hydraulic oil tank 19 and on the revolving frame 13. The fuel tank 20 is formed as a rectangular shaped airtight container extending in the vertical direction to store fuels supplied to the engine 15. In addition, a fuel filling port 20A for refueling is provided on an upper surface of the fuel tank 20.

[0030] Subsequently, the configuration of the article accommodating case 21, including the access steps 23 on the upper revolving structure 3 side according to a characterizing part of the present invention, will be described.

[0031] The article accommodating case 21 is provided on the front side of the housing cover 17, and particularly on the right side (the other side) in the left-and-right direction of the revolving frame 13 as a front side of the fuel tank 20. The article accommodating case 21 is disposed opposite to the cab 18 across the foot part of the boom 4A of the front device 4. The article accommodating case 21 accommodates articles such as a control valve and various types of tools (each is not shown), for example. Thus, the article accommodating case 21 has a space to which the right side as the other side in the left-and-right direction is opened. A retreating position of the hinge mechanism 25 which will be described later is located at an upper part in the space of the article accommodating case 21. As shown in Fig. 4 and Fig. 5, the article accommodating case 21 is configured to include a left side surface plate 22, access steps 23, and a right side surface cover 24 which will be described later. It should be noted that in the article accommodating case 21, a front surface of the fuel tank 20 located on a rear side thereof is used as a rear surface plate of a box structure.

[0032] The left side surface plate 22 forms a left side surface of the article accommodating case 21. The left side surface plate 22 is installed upright by extending from a front part of the fuel tank 20 to a front side in the front-and-rear direction so as to be faced with the right vertical plate 13C of the revolving frame 13. A part from an upper side part of the left side surface plate 22 to a front side part thereof inclines to the front side downward in accordance with the inclination of the access steps 23.

[0033] The access steps 23 are located on the front side of the housing cover 17 and provided on the right side of the revolving frame 13 in the left-and-right direction. The access steps 23 are formed as an upper surface closing member closing a front surface thereof from an upper surface of the article accommodating case 21. As

a result, the access steps 23 have a foothold for getting on and off the housing cover 17, for example. The access steps 23 on the upper revolving structure 3 side are formed by extending rightward from an end edge other than a rear end edge and a lower end edge of the left side surface plate 22. The access steps 23 are configured as a multi-stage step constituted by a multi-step foothold with an interval in the vertical direction as a third-stage step, for example. The access steps 23 are located on the front side in the vicinity of the first-stage step 13E of the revolving frame 13, and configured by a second-stage step 23A disposed toward a lower side of an intermediate part in the upper-lower direction, a third-stage step 23B disposed toward an upper side of the intermediate part in the upper-lower direction, and an uppermost-stage step 23C as a fourth-stage step located in the vicinity of the front side of the fuel tank 20.

[0034] An operator can get on, for example, the housing cover 17 by placing a foot in the order of the first-stage step 13E of the revolving frame 13, the second-stage step 23A, the third-stage step 23B, and the uppermost-stage step 23C of the access steps 23. On the other hand, an operator can get off the housing cover 17 by placing a foot in the reverse order.

[0035] Here, the hinge mechanism 25 is mounted on the uppermost-stage step 23C in the access steps 23. Specifically, as shown in Fig. 6 and Fig. 8, the uppermost-stage step 23C is formed as a flat rectangular shaped plate, and an outer side end edge located on the right side of the rectangular shaped plate corresponds to a bending part 23C1 bent and extending downward. A fixing member 26 of the hinge mechanism 25 which will be described later is mounted on the bending part 23C1 as an outer side end edge.

[0036] As shown in Fig. 8, the bending part 23C1 is provided with two screw holes 23C2, for example, with an interval in the front-and-rear direction. The screw holes 23C2 are formed as, for example, a welding nut obtained by welding a nut into a loose hole. A fixing bolt 31 which will be described later fixing the fixing member 26 of the hinge mechanism 25 to the uppermost-stage step 23C is screwed into each of the screw holes 23C2.

[0037] The uppermost-stage step 23C is provided with two screw holes 23C3, for example, with an interval in the front-and-rear direction at a position separated at a predetermined dimension on the left side from the bending part 23C1. The screw holes 23C3 are formed as, for example, a welding nut, as above described in the screw holes 23C2. A wing bolt 32 which will be described later fixing a rotating member 27 of the hinge mechanism 25 which will be described later to the uppermost-stage step 23C is screwed into each of the screw holes 23C3.

[0038] As shown in Fig. 4 and Fig. 5, a right side surface cover 24 covers the access steps 23 capable of being opened and closed from the right side in the left-and-right direction, and constitute a side surface cover of the article accommodating case 21. The right side surface cover 24 is formed of a side surface part 24A in a fan-shape around a lower end part on the rear side and a peripheral edge part 24B bent and extending from an arcuate part of the side surface part 24A to the access steps 23 side. In the side surface part 24A, an end part located on the rear side is mounted capable of being opened and closed (rotatably) on a structure on the revolving frame 13 side at the time of closing the side surface part 24A. An opening and closing knob 24C including a key cylinder 24C1 for locking is provided at a front side position of the side surface part 24A.

[0039] Here, as shown in Fig. 4, the right side surface cover 24 can cover the fixing bolt 31 having the fixing member 26 of the hinge mechanism 25 mounted in the state where the right side surface cover 24 is closed. In addition, the right side surface cover 24 can be locked in the state where the door is closed by locking the key cylinder 24C1 of the opening and closing knob 24C. The right side surface cover 24 can cover the hinge mechanism 25 and the side monitoring camera 30 in the state where the hinge mechanism 25 is moved to a retreating position.

[0040] On the other hand, as shown in Fig. 5, an internal control valve and the like can be maintained in the state where the right side surface cover 24 is opened. An operator can hold a case internal front side handrail 33 and a case internal rear side handrail 34 which will be described later when the operator is getting on and off. Further, the rotating member 27 of the hinge mechanism 25 can move between a monitoring position and a retreating position which will be described later.

[0041] Subsequently, the configuration of the hinge mechanism 25 and the side monitoring camera 30 as characterizing part of the present invention will be described in detail.

[0042] The hinge mechanism 25 constitutes a camera support member supporting the side monitoring camera 30, and is provided on the access steps 23 of the article accommodating case 21. The hinge mechanism 25 is configured capable of moving between a monitoring position at which the side monitoring camera 30 monitors laterally by protruding above the access steps 23 and a retreating position at which the side monitoring camera 30 is retreated downward from the monitoring position. The hinge mechanism 25 is configured by a fixing member 26 and a rotating member 27 which will be described later.

[0043] The fixing member 26 of the hinge mechanism 25 is mounted on an outer side end edge of the uppermost-stage step 23C of the access steps 23 on the upper revolving structure 3 side as an uppermost-stage foothold, that is, the bending part 23C1 of the uppermost-stage step 23C. As shown in Fig. 7, the fixing member 26 is configured by a gate-shaped (inverted U-shaped) plate body having two branches in the lower side, and an upper position thereof corresponds to a hinge connecting part 26A. In addition, two bolt insertion holes 26B are provided at a position corresponding to each of the screw holes 23C2 of the uppermost-stage step 23C in

the vicinity of a lower side of the hinge connecting part 26A of the fixing member 26.

[0044] Two screw holes 26C are provided at a lower side position of the fixing member 26, that is, on front end side parts of the two branches. Further, there is provided a bracket insertion part 26D between the two branches in the fixing member 26. A bracket 29 inserts through the bracket insertion part 26D when the rotating member 27 is rotated 270 degrees toward the retreating position as shown in Fig. 9.

[0045] The rotating member 27 is rotatably mounted on the fixing member 26. The rotating member 27 is configured by a rotating plate 28 and a bracket 29 which will be described later. The rotating plate 28 constitutes a hinge together with the fixing member 26. The rotating plate 28 is formed as a T-shaped plate body such that an intermediate part in the front-and-rear direction protrudes toward the fixing member 26. In the rotating plate 28, a front end of the protruding part corresponds to a hinge connecting part 28A, and the hinge connecting part 28A is rotatably connected to the hinge connecting part 26A of the fixing member 26. In addition, the rotating plate 28 is provided with two bolt insertion holes 28B so as to correspond to each of the screw holes 23C3 of the uppermost-stage step 23C.

[0046] The bracket 29 of the rotating member 27 is provided so as to rise upward from the rotating plate 28 in the state where the rotating plate 28 is fixed on the uppermost-stage step 23C. The bracket 29 is formed as an inverted L-shaped groove structural body, and a lower end part thereof is integrally secured to an upper surface of the rotating plate 28. On the other hand, an upper part of the bracket 29 corresponds to a camera accommodating part 29A protruding rightward in the left-and-right direction. A height dimension of the bracket 29 (height position of the camera accommodating part 29A) is set at a position capable of capturing images in a wide rightward range so as not to be interfered with the right side surface cover 24 in the state where the camera is disposed at the monitoring position.

[0047] Here, the bracket 29 is formed as a groove structural body constituted by a metal material, thereby providing strength high enough to withstand external minor impacts such as collision with falling small stone, branches and reinforcing bars. In addition, the camera accommodating part 29A, which is formed by being protruded on the right side, can thus protect the accommodated side monitoring camera 30.

[0048] The side monitoring camera 30 monitors rightward opposite to the cab 18 in the left-and-right direction. The side monitoring camera 30 is configured by a CCD camera and the like, for example, and can capture images of the outside through a photographic lens 30A. The side monitoring camera 30 is configured to capture rightward images that are hard for an operator in the cab 18 to visually confirm. The images captured by the side monitoring camera 30 can be displayed on a monitor device (not shown) disposed in the cab 18. As a result, the operator can monitor (confirm) rightward by the images displayed on the monitor device while operating the hydraulic excavator 1 in the cab 18.

[0049] Subsequently, the operation for mounting the hinge mechanism 25 including the side monitoring camera 30 to the access steps 23 and moving the hinge mechanism 25 between the monitoring position and the retreating position will be described.

[0050] The fixing member 26 is abutted on the bending part 23C1 of the uppermost-stage step 23C from the right side and the fixing bolt 31 inserted through each of the bolt insertion holes 26B of the fixing member 26 is screwed into the screw hole 23C2 of the bending part 23C1 in the case where the hinge mechanism 25 is mounted on the access steps 23. As a result, the hinge mechanism 25 can be mounted on the bending part 23C1 of the uppermost-stage step 23C as an outer side end edge of the access steps 23.

[0051] As described above, the rotating member 27 (rotating plate 28) is rotatable around the axis line of each of the hinge connecting parts 26A, 28A extending in the front-and-rear direction in the state where the fixing member 26 is mounted to the uppermost-stage step 23C using a fixing bolt 31.

[0052] A case where the hinge mechanism 25 is fixed to the monitoring position as shown in Fig. 5 and Fig. 6 will be described. First, the rotating member 27 is rotated on an upper side of the uppermost-stage step 23C to bring the rotating plate 28 in contact with an upper surface of the uppermost-stage step 23C. In this state, the wing bolt 32 inserted through the bolt insertion hole 28B of the rotating plate 28 is screwed into the screw hole 23C3 of the uppermost-stage step 23C. As a result, the rotating plate 28 can be fixed to the uppermost-stage step 23C. In the state where the rotating plate 28 is fixed, the bracket 29 can be raised to capture images in a wide rightward range by the side monitoring camera 30. In addition, the use of the wing bolt 32 for fixing the rotating plate 28 to the uppermost-stage step 23C saves use of a tool such as a wrench and the like, resulting in easy work.

[0053] Subsequently, a case where the hinge mechanism 25 is fixed to the retreating position shown in Fig. 9 will be described. First, the wing bolt 32 fixing the rotating plate 28 to the uppermost-stage step 23C is loosened and removed to render the rotating member 27 rotatable. In this state, the rotating member 27 is rotated 270 degrees in an arrow A direction in Fig. 6 together with the side monitoring camera 30. The bracket 29 can be inserted through the bracket insertion part 26D of the fixing member 26 when a rotation of the rotating member 27 in the arrow A direction at 270 degrees is completed to retreat the rotating member 27 from the monitoring position downward. Accordingly, the bracket 29 can be disposed on a lower surface side of the uppermost-stage step 23C together with the side monitoring camera 30.

[0054] The rotating plate 28 is disposed to be faced with the fixing member 26 in the state where the bracket 29 is disposed on the lower surface side of the upper-

most-stage step 23C. Thus, the wing bolt 32 inserted through the bolt insertion hole 28B of the rotating plate 28 is screwed into the screw hole 26C of the fixing member 26. As a result, the bracket 29 and the side monitoring camera 30 can be accommodated (stored) on the lower surface side of the uppermost-stage step 23C.

[0055] As described above, the rotating member 27 and the side monitoring camera 30 can be retreated to a lower side position apart from above the uppermost-stage step 23C in the state where the bracket 29 and the side monitoring camera 30 are accommodated on the lower surface side of the uppermost-stage step 23C. That is, the uppermost-stage step 23C can be used widely, and allows an operator to get on and off the vehicle easily.

[0056] It should be noted that as shown in Fig. 5, the case internal front side handrail 33 is provided by extending in the vertical direction on a front side of the article accommodating case 21. In addition, the case internal rear side handrail 34 is provided by extending in the vertical direction on a rear side of the article accommodating case 21. The handrails 33, 34 allow an operator to get on and off the vehicle stably when the operator places a foot on the access steps 10 on the lower traveling structure 2 side by holding the handrails 33, 34 in the state where the right side surface cover 24 is opened.

[0057] The inner side handrail 35 is disposed on the inner side in the left-and-right direction of the access steps 23 on the upper revolving structure 3 side, that is, on the left side. The outer side handrail 36 is disposed on the right side as the outer side in the left-and-right direction of the access steps 23. For example, the inner side handrail 35 is used for an operator to hold when the operator places a foot on the first-stage step 13E of the revolving frame 13 and the second-stage step 23A of the access steps 23, and is disposed on a front side of the access steps 23. In addition, the outer side handrail 36 is used for an operator to hold when the operator places a foot on the third-stage step 23B and the uppermost-stage step 23C of the access steps 23, and is disposed on a rear side of the access steps 23. The handrails 35, 36 are used for an operator to hold when the operator places a foot on each of the steps 13E, 23A, 23B, 23C and allow the operator to get on and off the vehicle stably.

[0058] Here, the outer side handrail 36 is provided so as to cross over the hinge mechanism 25 and the side monitoring camera 30 disposed at the monitoring position. As a result, the outer side handrail 36 can function as a protecting member to protect the hinge mechanism 25 and the side monitoring camera 30 from external impacts.

[0059] The hydraulic excavator 1 according to the embodiment is configured as above described, and subsequently, the operation of the hydraulic excavator 1 will be described.

[0060] An operator rides on a cab 18 and is seated on an operator's seat. In this state, the lower traveling structure 2 can be driven to allow the hydraulic excavator 1 to travel by starting an engine 15 and operating a traveling operating lever. In addition, the operator seated in the operator's seat can tilt a front device 4 and perform an excavating work of earth and sand by operating a working operating lever.

[0061] Here, the front device 4 located on the right side of the cab 18 becomes an obstacle for an operator to visually confirm rightward from a cab 18 when the hydraulic excavator 1 travels and works. However, the hydraulic excavator 1 is provided with the side monitoring camera 30 located on the access steps 23 on a right front side thereof. As a result, rightward images captured by the side monitoring camera 30 can be visually confirmed by a monitor device in the cab 18 and workability can be improved.

[0062] Particularly, at the monitoring position, the side monitoring camera 30 is provided by the hinge mechanism 25 in the state where the side monitoring camera 30 is installed upright on the uppermost-stage step 23C of the access steps 23. As a result, a rightward shooting range can be extended compared to a case where a camera captures images through a photo-taking opening.

[0063] On the other hand, the rotating member 27 and the side monitoring camera 30 can be retreated to a position apart from above the uppermost-stage step 23C, at a retreating position where the rotating member 27 of the hinge mechanism 25 is rotated toward the lower surface side of the uppermost-stage step 23C. That is, the uppermost-stage step 23C can be used widely.

[0064] Therefore, according to the embodiment, the access steps 23 on the upper revolving structure 3 side is provided with the hinge mechanism 25 as a camera support member for supporting the side monitoring camera 30 monitoring rightward opposite to the cab 18 in the left-and-right direction. The hinge mechanism 25 as a camera support member is configured capable of moving between a monitoring position at which the side monitoring camera 30 monitors rightward by protruding above the access steps 23 and a retreating position at which the camera is retreated downward from above the access steps 23.

[0065] Accordingly, the side monitoring camera 30 can be disposed outside of the article accommodating case 21 at a monitoring position by the hinge mechanism 25 (at the positions shown in Fig. 4 to Fig. 6). Thereby, since the shooting range can be extended by the side monitoring camera 30, an operator in the cab 18 can be provided with a broad rightward field of view. As a result, workability for the hydraulic excavator 1 can be improved.

[0066] On the other hand, the rotating member 27 and the side monitoring camera 30 of the hinge mechanism 25 can be retreated to a lower side position apart from above the uppermost-stage step 23C at a retreating position by the hinge mechanism 25 (position shown in Fig. 9). Thereby, the hinge mechanism 25 and the side monitoring camera 30, which can become an obstacle for an operator to place a foot on the uppermost-stage step 23C, can be removed from the uppermost-stage step 23C. As a result, an operator can get on and off the access steps

23 easily.

[0067] In addition, a right side surface cover 24 covering the access steps 23 capable of being opened and closed from the right side as the other side in the left-and-right direction is provided on a front side of the revolving frame 13. The right side surface cover 24 can cover the hinge mechanism 25 and the side monitoring camera 30 when the hinge mechanism 25 is moved to the retreating position. Thereby, the right side surface cover 24 can prevent theft of the side monitoring camera 30 and the like. Specifically, the right side surface cover 24 can cover the fixing bolt 31 fixing the fixing member 26 to the access steps 23 in the state where the side monitoring camera 30 is disposed at a monitoring position at which the access steps 23 protrude upward. As a result, theft of the side monitoring camera 30 can be prevented by locking the key cylinder 24C1 of the opening and closing knob 24C of the right side surface cover 24.

[0068] The access steps 23 on the upper revolving structure 3 side are formed as a multi-step foothold, that is, a multi-stage step constituted by third-stage steps 23A, 23B, 23C. In addition, the side monitoring camera 30 is provided on the upper surface of the uppermost-stage step 23C as an uppermost-stage foothold of the access steps 23 through the hinge mechanism 25. Thereby, the side monitoring camera 30 can be disposed at a high position and thus obstacles can be decreased and a broader shooting field of view can be obtained.

[0069] On the other hand, the hinge mechanism 25 as a camera support member is configured by a fixing member 26 fixed to the outer side end edge of the uppermost-stage step 23C as an uppermost-stage foothold of the access steps 23, that is, the bending part 23C1 of the uppermost-stage step 23C and a rotating member 27 rotatably mounted on the fixing member 26. The side monitoring camera 30 is mounted on the rotating member 27 of the hinge mechanism 25. Accordingly, the side monitoring camera 30 can move the side monitoring camera 30 between the monitoring position and the retreating position by an easy operation of rotating the rotating member 27 of the hinge mechanism 25 with respect to the fixing member 26.

[0070] Further, in the embodiment, the rotating member 27 of the hinge mechanism 25 can be disposed at a retreating position on the lower surface side of the uppermost-stage step 23C by rotating the rotating member 27 by 270 degrees in an arrow A direction in Fig. 6 from the upright position of the uppermost-stage step 23C at a monitoring position. In this case, the bracket 29 and the side monitoring camera 30 of the rotating member 27 can be disposed in proximity to the uppermost-stage step 23C. Thereby, a wider space in the article accommodating case 21 can be provided even if the bracket 29 and the side monitoring camera 30 of the rotating member 27 are accommodated in the article accommodating case 21.

[0071] Further, the rotating member 27 of the hinge mechanism 25 has a bracket 29 rotating between a monitoring position at which the rotating member 27 rises upward from the uppermost-stage step 23C and a retreating position at which the rotating member 27 is accommodated on the lower surface side of the uppermost-stage step 23C. The side monitoring camera 30 is mounted on the bracket 29. Thereby, the bracket 29 allows the side monitoring camera 30 to move between the monitoring position and the retreating position.

[0072] It should be noted that in the embodiment, the side monitoring camera 30 is disposed at a retreating position on the lower surface side of the uppermost-stage step 23C together with the rotating member 27 of the hinge mechanism 25. A case where the side monitoring camera 30 is configured to be accommodated in the article accommodating case 21 together with the rotating member 27 by closing the right side surface cover 24 at the retreating position is exemplified. However, the present invention is not limited to that, and for example, the rotating member 27 and the side monitoring camera 30 may be retreated downward from a monitoring position, and the rotating member 27 and the side monitoring camera 30 may be retreated to the outside of the article accommodating case 21.

[0073] The embodiment is explained by taking a wheel-type hydraulic excavator 1 as a construction machine as an example. However, the present invention is not limited to that, and can also widely be applied to other construction machines such as a crawler-type hydraulic excavator and a hydraulic crane and the like.

DESCRIPTION OF REFERENCE NUMERALS

[0074]

1:	Hydraulic excavator (Construction machine)
2:	Lower traveling structure
3:	Upper revolving structure
4:	Front device
13:	Revolving frame
14:	Counterweight
15:	Engine (Prime mover)
17:	Housing cover
18:	Cab
21:	Article accommodating case
23:	Access steps
23A:	Second-stage step
23B:	Third-stage step
23C:	Uppermost-stage step (Uppermost-stage foothold)
23C1:	Bending part (Outer side end edge)
24:	Right side surface cover (Side surface cover)
25:	Hinge mechanism (Camera support member)
26:	Fixing member
27:	Rotating member
28:	Rotating plate
29:	Bracket
30:	Side monitoring camera

Claims

1. A construction machine comprising:

an automotive lower traveling structure in a front-and-rear direction;
an upper revolving structure rotatably mounted on the lower traveling structure; and
a front device tiltably provided on a front side of the upper revolving structure, wherein
the upper revolving structure includes:

a revolving frame constituted by a support structural body;
a counterweight provided on a rear side of the revolving frame to act as a weight balance to the front device;
a prime mover located on a front side of the counterweight and provided on the revolving frame;
a housing cover covering onboard equipment including the prime mover and provided on the revolving frame;
a cab located on a front side of the housing cover and provided on one side in a left-and-right direction of the revolving frame to define an operator's room;
access steps located on the front side of the housing cover and provided on the other side in the left-and-right direction of the revolving frame, and having a foothold for getting on and off the housing cover; and
a side monitoring camera monitoring laterally opposite to the cab in the left-and-right direction, **characterized in that**:

a camera support member supporting the side monitoring camera is provided in the access steps, and
the camera support member is configured capable of moving between a monitoring position at which the side monitoring camera monitors laterally by protruding above the access steps and a retreating position at which the side monitoring camera is retreated downward from the monitoring position.

2. The construction machine according to claim 1, wherein
a side surface cover covering the access steps capable of being opened and closed from the other side in the left-and-right direction is provided in the revolving frame; and
the camera support member and the side monitoring camera are covered with the side surface cover when the camera support member is moved to the retreating position.

3. The construction machine according to claim 1, wherein
the access steps are formed as an upper surface closing member closing a front surface thereof from an upper surface of an article accommodating case accommodating an article, wherein
the article accommodating case has a space where the other side in the left-and-right direction is opened to the outside; and
the retreating position is in the space formed in the article accommodating case.

4. The construction machine according to claim 1, wherein
the access steps are formed as a multi-stage step constituted by multi-step footholds; and
the side monitoring camera is provided on an upper surface of an uppermost-stage foothold of the access steps.

5. The construction machine according to claim 4, wherein
the camera support member is configured as a hinge mechanism constituted by a fixing member fixed to an outer side end edge of the uppermost-stage foothold and a rotating member rotatably mounted with respect to the fixing member; and
the side monitoring camera is mounted on the rotating member of the hinge mechanism.

6. The construction machine according to claim 5, wherein
the rotating member of the hinge mechanism has a bracket rotating between the monitoring position at which the rotating member rises upward from the uppermost-stage foothold and the retreating position at which the rotating member is accommodated on a lower surface side of the uppermost-stage foothold; and
the side monitoring camera is mounted on the bracket.

Fig.1

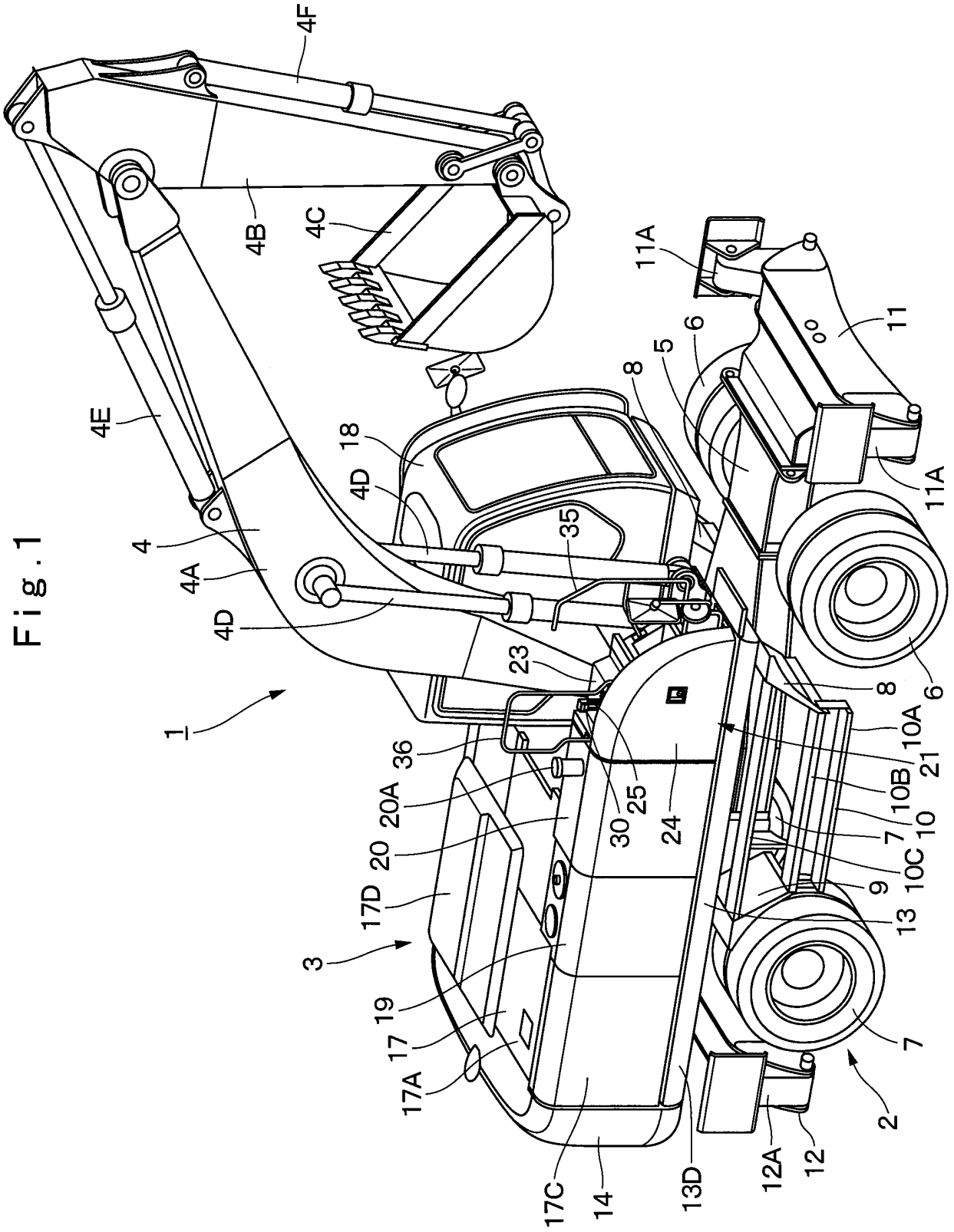

4F
4B
4C
11A
11
6
5
8
4E
18
4D
35
4
4A
4D
23
8
6
1
10A
36
21
10B
20A
25
30
24
7
10
20
10C
17D
9
13
3
19
7
17
17A
2
17C
14
13D
12A
12

Fig.2

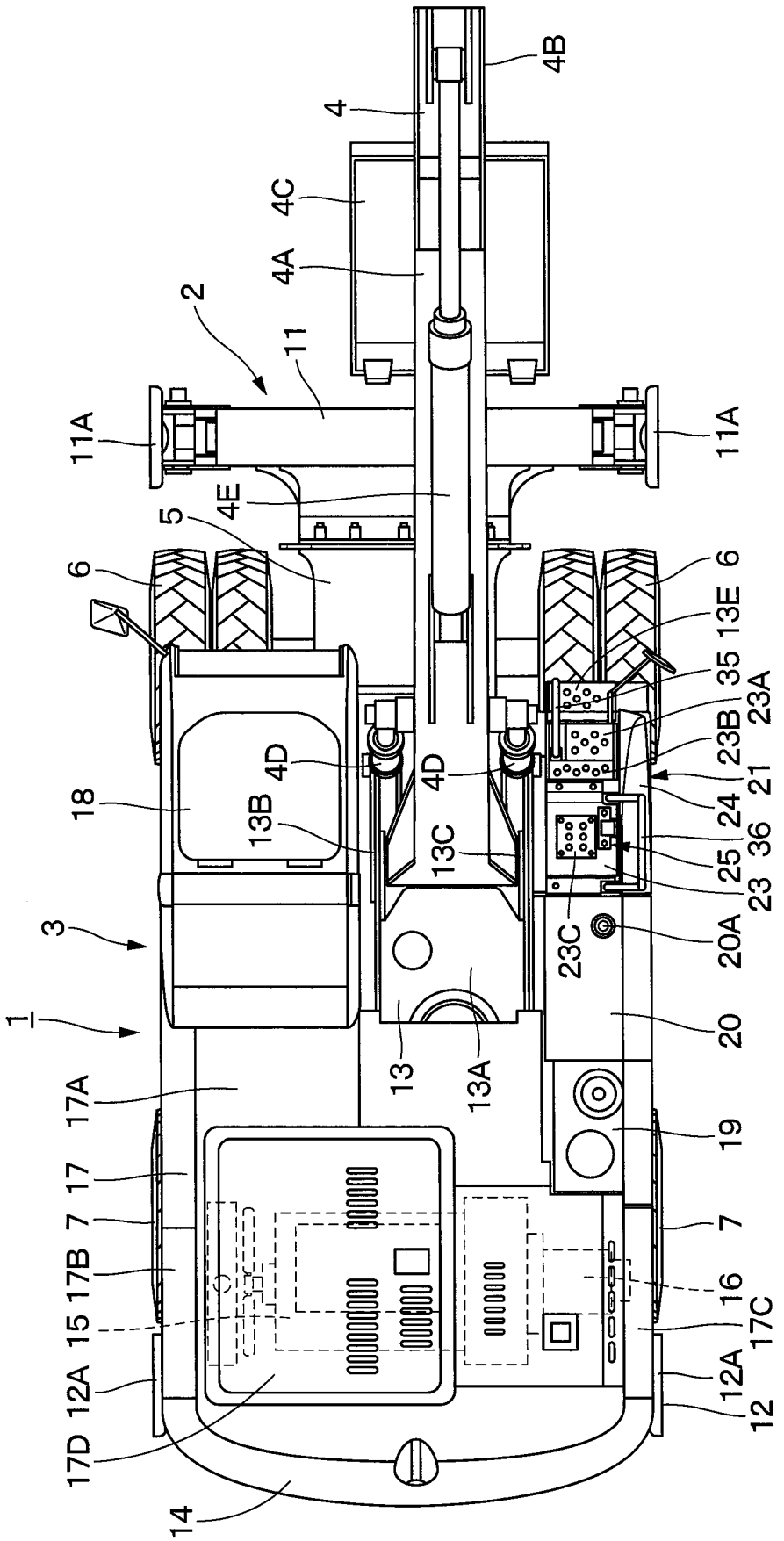

4B
4
4C
4A
2
11
11A
11A
4E
5
6
6
13E
35
23A
23B
21
24
36
25
23
20A
23C
20
19
7
16
17C
12A
12
14
17D
12A
15
17B
7
17
17A
1
3
18
13B
4D
4D
13C
13
13A

Fig.3

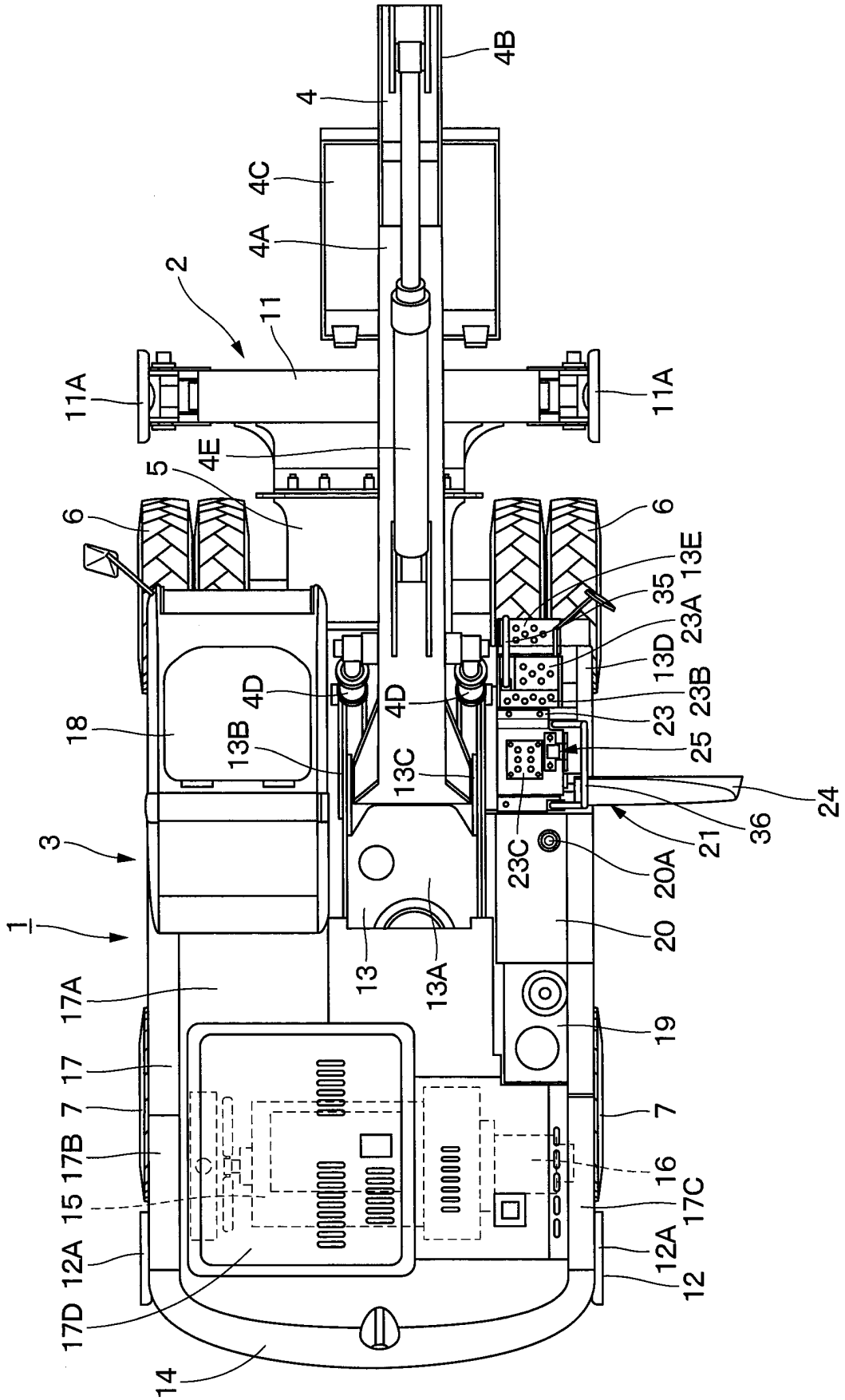

4B
4
4C
4A
2
11
11A
11A
4E
5
6
6
13E
35
23A
13D
23B
23
25
24
36
21
20A
23C
20
19
7
16
17C
12A
12
14
17D
12A
15
17B
7
17
17A
1
3
18
13B
4D
4D
13C
13
13A

Fig.4

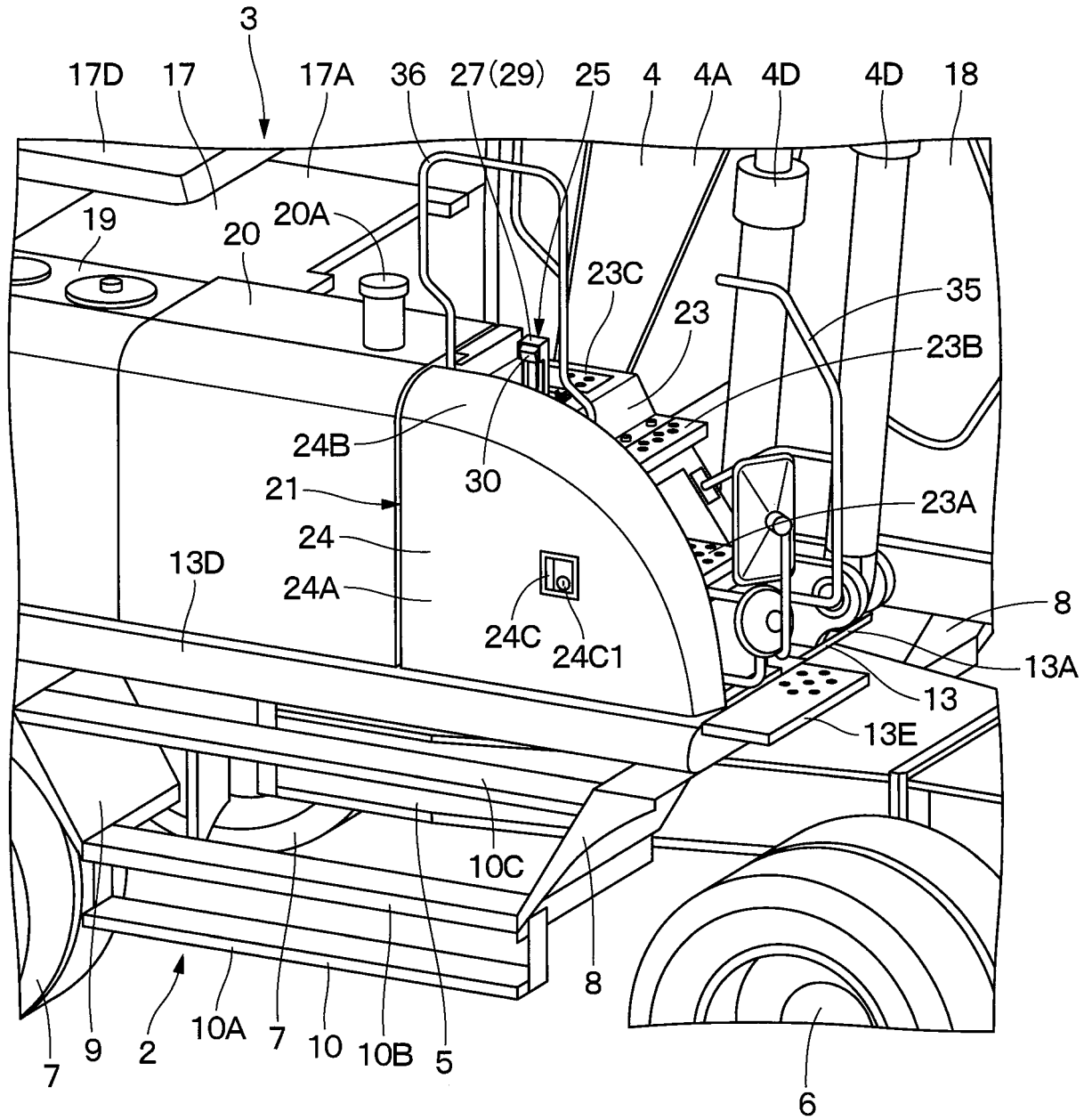

3
17D
17
17A
36
27(29)
25
4
4A
4D
4D
18
19
20
20A
23C
23
35
23B
24B
30
21
24
23A
13D
24A
24C
24C1
8
13A
13
13E
10C
8
7
9
2
10A
7
10
10B
5
6

Fig.5

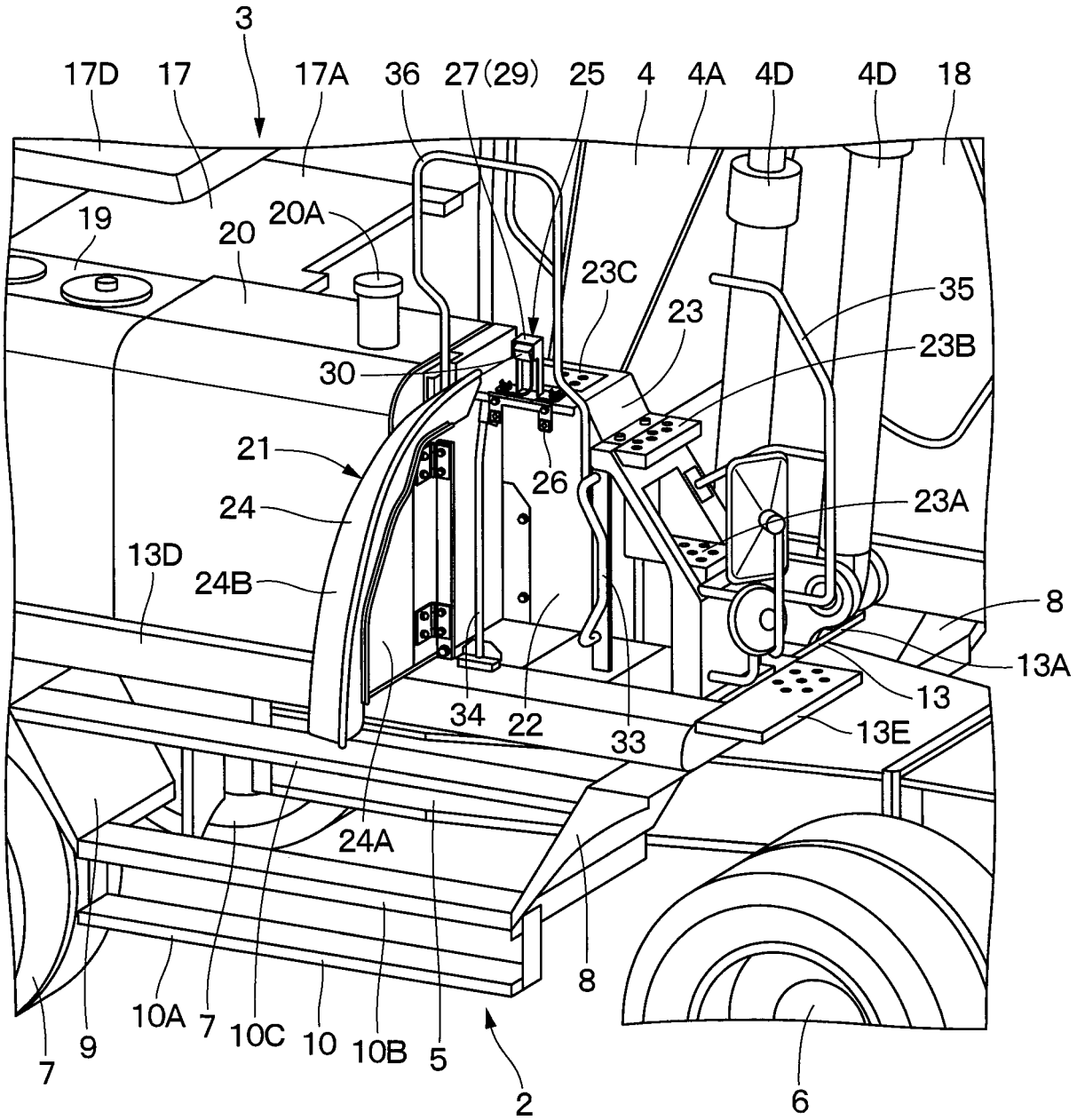

3
17D
17
17A
36
27(29)
25
4
4A
4D
4D
18
19
20
20A
23C
23
35
23B
30
21
26
24
23A
13D
24B
8
13A
13
34
22
33
13E
24A
8
10A
7
10C
10
10B
5
9
7
2
6

Fig.6

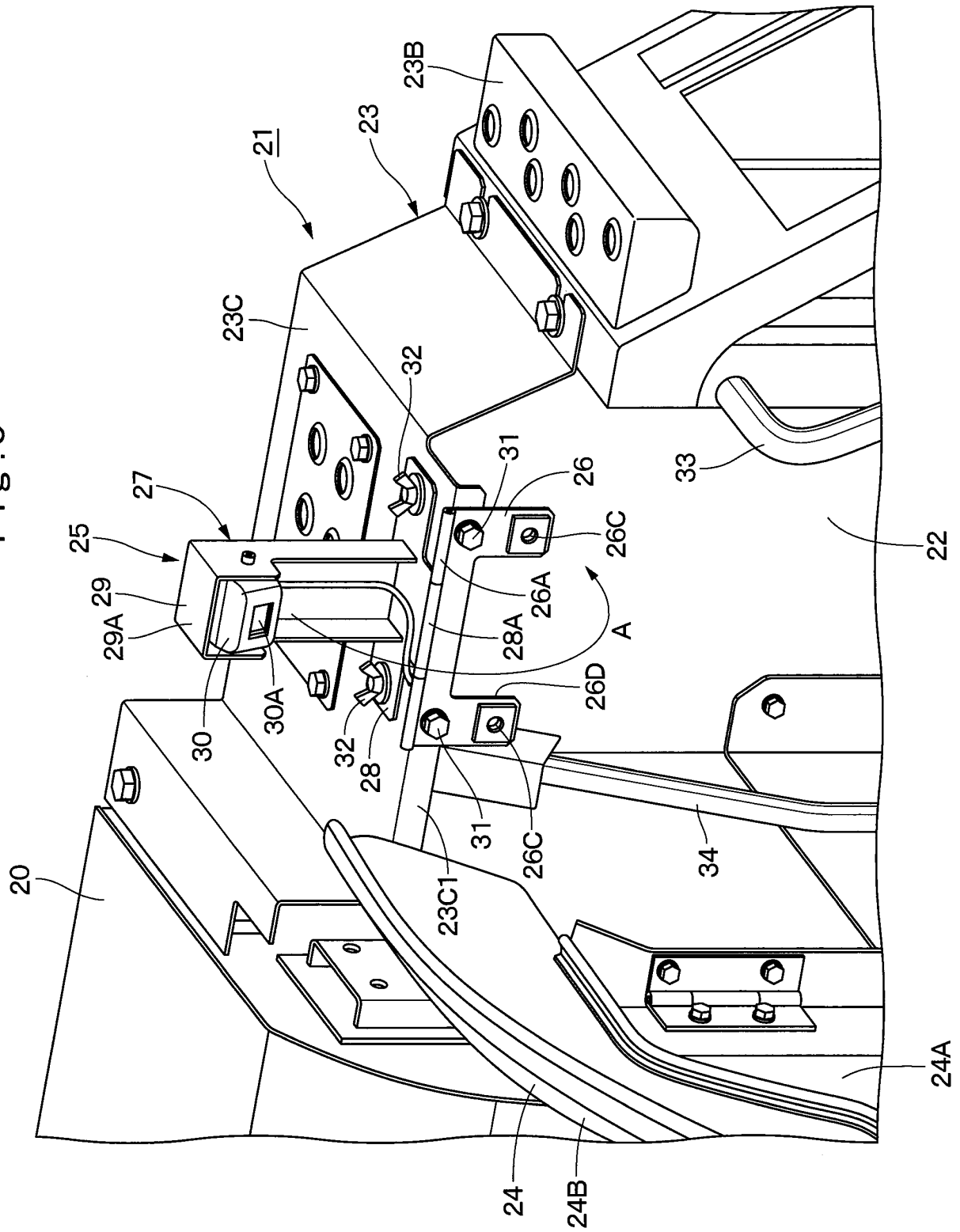

23B
23
21
23C
32
31
26
33
27
25
26C
22
29
26A
29A
28A
A
26D
30
30A
32
28
31
26C
34
20
23C1
24A
24
24B

Fig.7

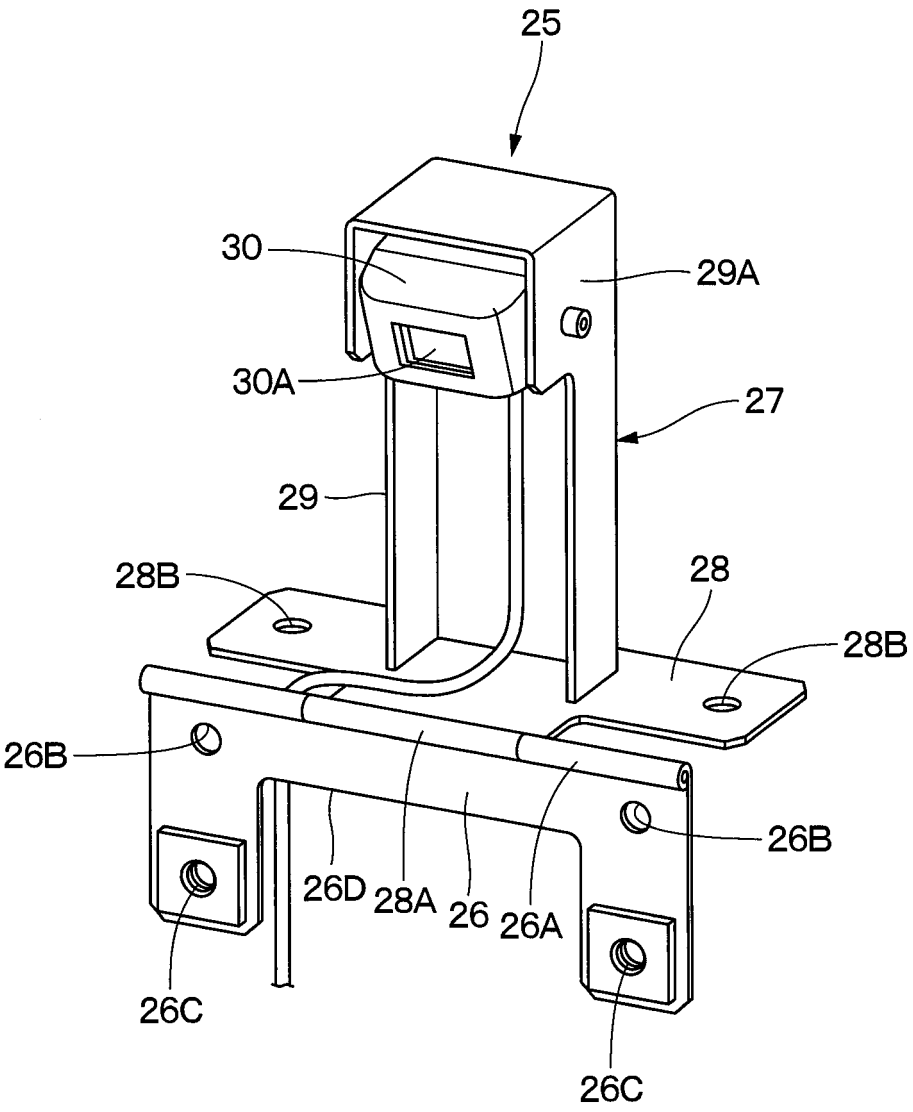


Fig.8

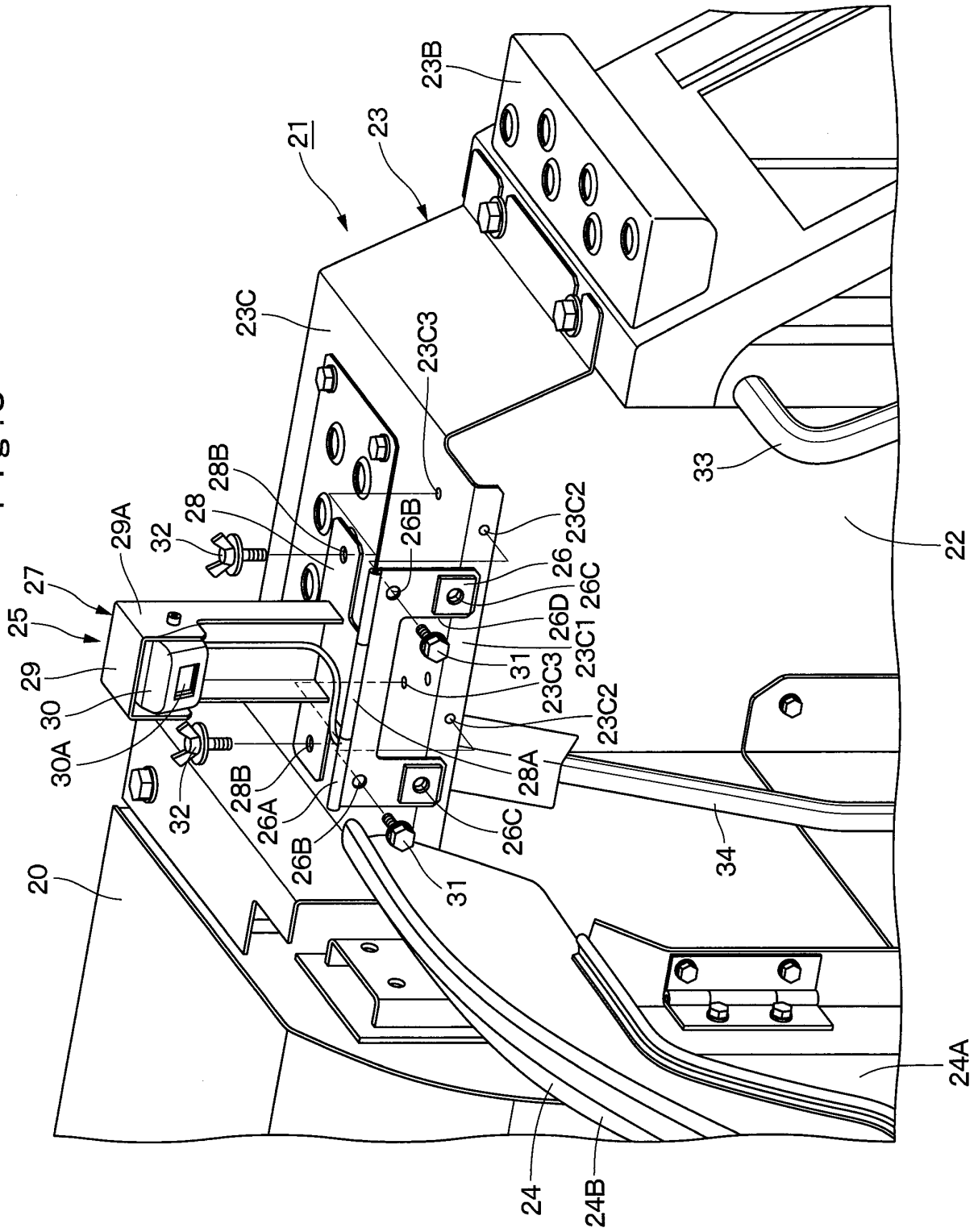
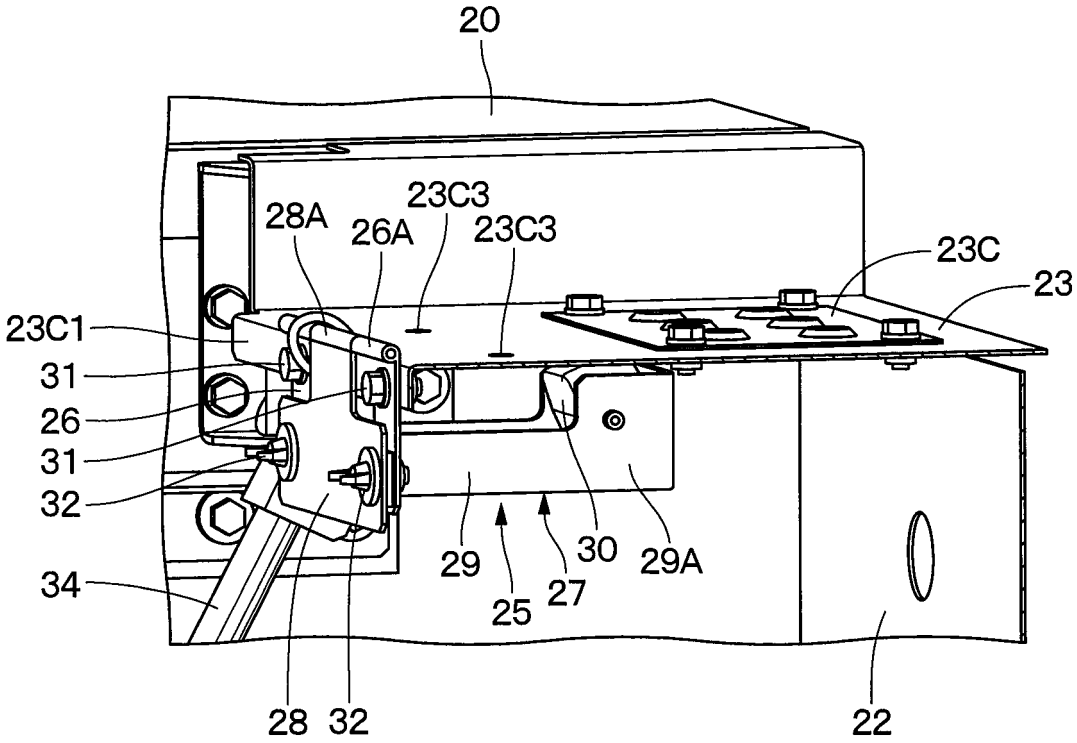

23B
21
23
23C
23C3
33
28B
28
32
29A
27
25
29
30
30A
22
26B
23C2
26
26D
26C
31
23C1
23C3
23C2
28A
26C
34
20
28B
26A
26B
31
24A
24
24B

Fig.9


20
28A
26A
23C3
23C3
23C
23
23C1
31
26
31
32
34
29
25
27
30
29A
28
32
22

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/032395

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. E02F9/24(2006.01)i, E02F9/26(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)
Int.Cl. E02F9/24, E02F9/26

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

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.
X A	JP 2017-040137 A (CATERPILLAR SARL) 23 February 2017, paragraphs [0001], [0023]-[0036], [0040]-[0054], fig. 1-6 & US 2018/0223503 A1, paragraphs [0001], [0034]-[0047], [0051]-[0057], fig. 1-6 & WO 2017/032670 A1	1, 4-5 2-3, 6
A	JP 2012-117225 A (HITACHI CONSTRUCTION MACHINERY CO., LTD.) 21 June 2012, paragraphs [0001]-[0006], fig. 8-9 & WO 2012/073872 A1 & WO 2012/073872 A1 & EP 2647772 A1, paragraphs [0001]-[0006], fig. 8-9 & CN 103228848 A & KR 10-2014-0030110 A	1-6
A	JP 2002-371595 A (KOMATSU LTD.) 26 December 2002, paragraphs [0028]-[0029], fig. 8, 12 & US 2003/0085995 A1, paragraphs [0050]-[0051], fig. 8, 12 & KR 10-2002-0096886 A & KR 10-2008-0110564 A	1-6

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"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	Date of mailing of the international search report
16 November 2018 (16.11.2018)	27 November 2018 (27.11.2018)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

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 2014206021 A **[0006]**