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

(72) Inventor: **KUMATA, Daisuke**
Tsuchiura-shi, Ibaraki 300-0013 (JP)

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

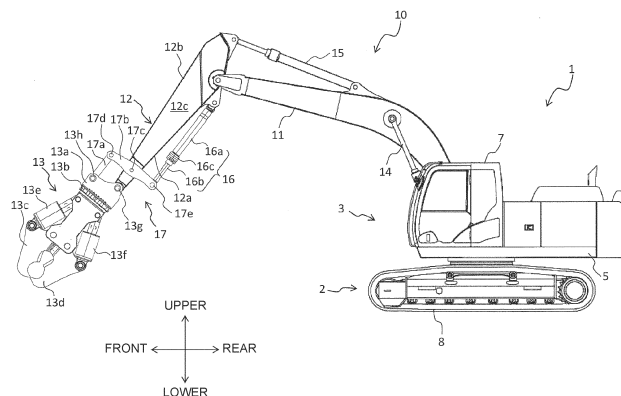
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(54) **WORK MACHINE**

(57) Provided is a work machine capable of rotating an attachment while appropriately supporting a load applied to the attachment. A work machine comprising: a hydraulic cylinder attached to a body side surface of an arm and extending and contracting; a first link rod extending along a back side surface of the arm; and a second link rod rotatably supported on a side surface of the arm via a first pin extending in the width direction of a front working device, the second link rod having one end which projects toward the back side surface of the arm

and the other end which projects toward the body side surface of the arm, one end of the first link rod being rotatably connected to the attachment, the one end of the second link rod being rotatably connected to the other end of the first link rod via a second pin extending in the width direction of the front working device, and the other end of the second link rod being rotatably connected to a distal end of a cylinder rod of the hydraulic cylinder via a third pin extending in the width direction of the front working device.

FIG. 1



Description

TECHNICAL FIELD

5 **[0001]** The present invention relates to a work machine equipped with a heavy attachment.

BACKGROUND ART

10 **[0002]** Conventionally, there has been known a hydraulic excavator comprising a boom supported on an upperstructure so as to be raised and lowered, an arm rotatably supported at the distal end of the boom, and an attachment (for example, bucket) rotatably supported at the distal end of the arm (for example, see Patent Literature 1).

15 **[0003]** In the hydraulic excavator configured as above, generally, the attachment operates in the gravity direction in accordance with the extension of a hydraulic cylinder supported on the back of the arm, and operates in the direction opposite to the gravity direction in accordance with the contraction of the hydraulic cylinder.

CITATION LIST

PATENT LITERATURE

20 **[0004]** Patent Literature 1: JP-A-2020-26782

SUMMARY OF INVENTION

TECHNICAL PROBLEM

25 **[0005]** However, when the attachment that is performing a crowd operation is held by the hydraulic cylinder with a rod thereof extending, a large load is applied on the hydraulic cylinder. This problem would be remarkable as the weight of the attachment increases.

30 **[0006]** Therefore, an object of the present invention is to provide a work machine capable of rotating an attachment while appropriately supporting a load applied to the attachment.

SOLUTION TO PROBLEM

35 **[0007]** In order to achieve the object described above, the present invention provides a work machine comprising: an undercarriage; an upperstructure supported on the undercarriage so as to turn thereon; a front working device including a boom supported on the upperstructure so as to be raised and lowered, an arm rotatably supported at a distal end of the boom, and an attachment rotatably supported at a distal end of the arm, wherein the arm includes: a pair of side surfaces that faces each other in a width direction of the front working device; and a body side surface and a back side surface that face each other in a direction perpendicular to the width direction of the front working device, each of which is connected to ends of the pair of side surfaces, the front working device includes: a hydraulic cylinder that is attached to the body side surface of the arm, and is supplied with and discharges hydraulic oil to extend and contract; and a link mechanism configured to cause the attachment to dump when the hydraulic cylinder extends and cause the attachment to crowd when the hydraulic cylinder contracts, the linkage mechanism includes: a first link rod that extends along the back side surface of the arm; a second link rod that is rotatably supported on the side surfaces of the arm via a first pin extending in the width direction of the front working device, the second link rod having one end which projects toward the back side surface of the arm and the other end which projects toward the body side surface of the arm, one end of the first link rod is rotatably connected to the attachment, the one end of the second link rod is rotatably connected to the other end of the first link rod via a second pin extending in the width direction of the front working device, and the other end of the second link rod is rotatably connected to a distal end of a cylinder rod of the hydraulic cylinder via a third pin extending in the width direction of the front working device.

ADVANTAGEOUS EFFECTS OF INVENTION

55 **[0008]** According to the present invention, it is possible to rotate an attachment while appropriately supporting a load applied to the attachment. The problems, configurations, and advantageous effects other than those described above will be clarified by explanation of an embodiment below.

BRIEF DESCRIPTION OF DRAWINGS

[0009]

- 5 [FIG. 1] FIG. 1 is a side view of a work machine according to the present invention.
 [FIG. 2] FIG. 2 is a perspective view of an arm and cutter.
 [FIG. 3] FIG. 3 illustrates an attitude of the cutter when a hydraulic cylinder contracts.
 [FIG. 4] FIG. 4 illustrates an attitude of the cutter when the hydraulic cylinder extends.

10 DESCRIPTION OF EMBODIMENTS

[0010] An embodiment of a work machine according to the present invention will be described with reference to the drawings. FIG. 1 is a side view of a work machine 1 according to the present invention. In the present specification, the front, rear, left, and right are referred based on the viewpoint of an operator who boards and operates the work machine 1 unless otherwise noted.

15 **[0011]** The work machine 1 includes an undercarriage 2 and an upperstructure 3 supported on the undercarriage 2. The undercarriage 2 includes a pair of left and right crawlers 8. When the rotation of a traveling motor (not illustrated) is transmitted to the pair of left and right crawlers 8, the pair of left and right crawlers 8 rotates in accordance therewith, whereby the work machine 1 can travel. Note that the undercarriage 2 may be a wheel-mounted type undercarriage instead of including the crawlers 8.

20 **[0012]** The upperstructure 3 is supported on the undercarriage 2 so as to turn thereon. The upperstructure 3 mainly includes a turn frame 5 serving as a base, a cab (operator's seat) 7 arranged at the front left side of the turn frame 5, a front working device 10 mounted at the center of the front end of the turn frame 5 so as to rotate in the vertical direction, and a counterweight 6 arranged at the rear of the turn frame 5 to balance the weight between the front working device 10 and the upperstructure 3.

25 **[0013]** In the cab 7, an internal space where an operator who operates the working machine 1 boards is formed. Inside the cab 7, a seat (not illustrated) on which the operator sits and operation devices (steering, pedal, lever, switch, etc.) which are operated by the operator sitting on the seat are arranged. The operator who is boarding the cab 7 operates the operation devices, whereby the undercarriage 2 travels, the upperstructure 3 turns, and the front working device 10 operates.

30 **[0014]** The front working device 10 includes a boom 11 supported on the upperstructure 3 so as to be raised and lowered, an arm 12 rotatably supported at the distal end of the boom 11, a cutter (attachment) 13 rotatably supported at the distal end of the arm 12, hydraulic cylinders 14, 15, 16 for driving the boom 11, the arm 12, and the cutter 13, a link mechanism 17, and a stopper 18 (see FIG. 2).

35 **[0015]** The arm 12 has a body side surface 12a, a back side surface 12b, a left side surface 12c (side surface), and a right side surface (not illustrated). The body side surface 12a and the back side surface 12b face each other in a direction perpendicular to the lateral direction (width direction of the front working device 10). The left side surface 12c and the right side surface (a pair of side surfaces) face each other in the lateral direction. Each of the body side surface 12a and the back side surface 12b is connected to the end portions of the left side surface 12c and right side surface.

40 **[0016]** In particular, when the distal end of the arm 12 is positioned forward of the distal end of the boom 11 (when the hydraulic cylinder 15 contracts to some extent), the body side surface 12a faces downward and the back side surface 12b faces upward. In general, the work machine 1 equipped with the cutter 13 works with the distal end of the arm 12 positioned forward of the distal end of the boom 11 (that is, with the body side surface 12a facing downward and the back side surface 12b facing upward).

45 **[0017]** The cutter 13 is one of the examples of a demolition attachment designed to grasp and destroy an object (for example, buildings). As described later, the cutter 13 has the number of components, and also includes hydraulic actuators (a turn motor 13b, hydraulic cylinders 13e, 13f), and thus the cutter 13 is heavier than other attachments such as a bucket. The cutter 13 mainly includes a mounting bracket 13a, the turn motor 13b, a pair of blades 13c, 13d, and a pair of hydraulic cylinders 13e, 13f.

50 **[0018]** The mounting bracket 13a is rotatably supported at the distal end of the arm 12 via a pin 13g extending in the lateral direction (width direction of the front working device 10). Furthermore, the mounting bracket 13a is rotatably connected to one end of a link rod 17a, which will be described later, via a pin 13h extending in the lateral direction. The pin 13h is arranged closer to the back surface side 12b of the arm 12 than the pin 13g. In other words, in the working attitude of the front working device 10, the pin 13h is arranged above the pin 13g.

55 **[0019]** When the hydraulic oil is supplied to and discharged from the turn motor 13b, the turn motor 13b rotates the components 13c to 13f with respect to the mounting bracket 13a. The turn motor 13b rotates the components 13c to 13f about a rotation axis extending in a direction perpendicular to the pins 13g, 13h. The hydraulic oil is supplied from a hydraulic pump (not illustrated) mounted on the upperstructure 3 to the turn motor 13b, and returns to a hydraulic oil

tank (not illustrated) mounted on the upperstructure 3 from the turn motor 13b.

[0020] The pair of hydraulic cylinders 13e, 13f is supplied with the hydraulic oil, whereby the pair of blades 13c, 13d is opened and closed. More particularly, when the hydraulic oil is supplied to bottom chambers of the hydraulic cylinders 13e, 13f and the hydraulic oil in rod chambers thereof is discharged, the pair of blades 13c, 13d is closed. On the other hand, when the hydraulic oil is supplied to the rod chambers of the hydraulic cylinders 13e, 13f and the hydraulic oil in the bottom chambers is discharged, the pair of blades 13c, 13d is opened.

[0021] The hydraulic cylinder 16 is supplied with and discharges the hydraulic oil, and extends and contracts in accordance therewith. The hydraulic cylinder 16 has a cylinder tube 16a, a piston (not illustrated), a cylinder rod 16b, and a cap 16c. The hydraulic cylinder 16 extends along the back side surface of the arm 12 in the longitudinal direction of the arm 12. In the hydraulic cylinder 16, the proximal end of the cylinder tube 16a is rotatably supported at the proximal end side of the arm 12, and the distal end of the cylinder rod 16b is rotatably connected to a link rod 17b, which will be described later.

[0022] The cylinder tube 16a is a cylindrical member capable of being supplied with and discharging the hydraulic oil. The cylinder tube 16a is closed at the proximal end side and opened at the distal end side. The piston reciprocates within the cylinder tube 16a. Furthermore, the piston divides the internal space of the cylinder tube 16a into a bottom chamber at the proximal end side and a rod chamber at the cap 16c side.

[0023] One end of the cylinder rod 16b is connected to the piston, and the other end projects to the outside of the cylinder tube 16a passing through the cap 16c. The cap 16c is attached to the distal end of the cylinder tube 16a via a bolt (not illustrated) or the like. The cap 16c includes a through hole for allowing the cylinder rod 16b to project while preventing the piston from projecting.

[0024] When the hydraulic oil is supplied from the hydraulic pump to the bottom chamber and the hydraulic oil in the rod chamber returns to the hydraulic oil tank, the piston moves in a direction for causing the cylinder rod 16b to project from the cylinder tube 16a (hereinafter, this operational action is referred to as "extension of the hydraulic cylinder 16"). On the other hand, when the hydraulic oil is supplied from the hydraulic pump to the rod chamber and the hydraulic oil in the bottom chamber returns to the hydraulic oil tank, the piston moves in a direction for withdrawing the cylinder rod 16b into the cylinder tube 16a (hereinafter, this operational action is referred to as "contraction of the hydraulic cylinder 16").

[0025] FIG. 2 is a perspective view of the arm 12 and cutter 13. The link mechanism 17 is connected to the cutter 13 and the hydraulic cylinder 16. The link mechanism 17 rotates the cutter 13 with respect to the arm 12 in accordance with the extension and contraction of the hydraulic cylinder 16. As illustrated in FIG. 1 and FIG. 2, the link mechanism 17 has a long bar-shaped link rod 17a (first link rod), a pair of long bar-shaped link rods 17b (second link rod), and pins 17c, 17d, 17e (first pin, second pin, third pin) extending in the lateral direction.

[0026] The link rod 17a is arranged at the back side surface 12b side of the arm 12. The link rod 17a extends along the back side surface 12b of the arm 12. Here, the link rod 17a is not necessarily parallel to the back side surface 12b. One end of the link rod 17a is rotatably connected to the mounting bracket 13a via the pin 13h. The other end of the link rod 17a is rotatably connected to each one end of the pair of link rods 17b via the pin 17d.

[0027] The pair of link rods 17b is rotatably supported on the left side surface 12c and right side surface of the arm 12, respectively, via the pin 17c. In each of the pair of link rods 17b, one end thereof projects toward the back side surface 12b of the arm 12, and the other end thereof projects toward the body side surface 12a of the arm 12. The one end of the pair of link rods 17b (end portion at the back side surface 12b side) is rotatably connected to the other end of the link rod 17a via the pin 17d. The other end of the pair of link rods 17b (end portion at the body side surface 12a side) is rotatably connected to the distal end of the cylinder rod 16b via the pin 17e. Furthermore, as illustrated in FIG. 3, a distance A between the pin 17c and the pin 17e is set equal to or more than a distance B between the pin 17c and the pin 17d ($A \geq B$).

[0028] Furthermore, as illustrated in FIG. 2, the stopper 18 is fixed to the back side surface 12b of the arm 12. The stopper 18 is fixed to the back side surface 12b at a position where the other end of the link rod 17a abuts when the hydraulic cylinder 16 extends. The top surface of the stopper 18 has a concave shape so as to be along the other end of the link rod 17a.

[0029] FIG. 3 illustrates an attitude of the cutter 13 when the hydraulic cylinder contacts. When the hydraulic cylinder 16 contracts, the link rod 17b rotates counterclockwise in FIG. 3 about the pin 17c. In other words, the link rod 17b rotates about the pin 17c such that the end portion at the back side surface 12b side moves toward the distal end side of the arm 12 and the end portion at the body side surface 12a side moves toward the proximal end side of the arm 12.

[0030] Thus, the link rod 17a moves in a direction for pushing the cutter 13 at the position of the pin 13h (that is, above the pin 13g). As a result, the cutter 13 rotates in a direction indicated by an arrow in FIG. 3 (that is, crowd operation). The "crowd operation" is an operation for rotating the cutter 13 toward the body side surface 12a of the arm 12. Then, while the distal end of the arm 12 is positioned forward of the distal end of the boom 11, by the crowd operation, the cutter 13 rotates in the gravity direction.

[0031] FIG. 4 illustrates an attitude of the cutter 13 when the hydraulic cylinder extends. When the hydraulic cylinder 16 extends, the link rod 17b rotates clockwise in FIG. 3 about the pin 17c. In other words, the link rod 17b rotates about

the pin 17c such that the end portion at the back side surface 12b side moves toward the proximal end side of the arm 12 and the end portion at the body side surface 12a side moves toward the distal end side of the arm 12.

[0032] Thus, the link rod 17a moves in a direction for pulling the cutter 13 at the position of the pin 13h (that is, above the pin 13g). As a result, the cutter 13 rotates in a direction indicated by an arrow in FIG. 4 (that is, dump operation).

The "dump operation" is an operation for rotating the cutter 13 toward the body side surface 12a of the arm 12. Then, while the distal end of the arm 12 is positioned forward of the distal end of the boom 11, by the dump operation, the cutter 13 rotates in a direction opposite to the gravity direction (hereinafter, referred to as an "antigravity direction").

[0033] Furthermore, the other end of the link rod 17a abuts the stopper 18 just when the hydraulic cylinder 16 extends to the maximum or immediately therebefore (that is, just before the hydraulic cylinder 16 extends to the maximum). Just when the hydraulic cylinder 16 extends to the maximum is, for example, when the piston gets abutted the inner surface of the cap 16c. This prevents the cutter 13 from further rotating in the antigravity direction. As a result, a force in the direction for causing the hydraulic cylinder 16 to further extend is blocked from being transmitted from the cutter 13 to the hydraulic cylinder 16 through the link mechanism 17.

[0034] According to the embodiment described above, for example, the following advantageous effects can be obtained.

[0035] In the hydraulic cylinder 16 according to the embodiment described above, the pressure receiving area at the bottom side of the piston is larger than the pressure receiving area at the rod side thereof to which the cylinder rod 16b is connected. Furthermore, as compared with the case where an amount of projection of the cylinder rod 16b is large, in the case where the amount of projection of the cylinder rod 16b is small, the hydraulic cylinder 16 can stably hold a load.

[0036] Thus, according to the embodiment described above, since the hydraulic cylinder 16 contracts in order to cause the cutter 13 to perform the crowd operation, it is possible to hold the cutter 13 with a large force as compared with the case where the cutter 13 is held while the hydraulic cylinder 16 extends. Therefore, in the work performed while the distal end of the arm 12 projects forward of the distal end of the boom 11, even if an unexpected load is applied to the cutter 13 and thus the cutter 13 nearly rotates further toward the body side surface 12a of the arm 12, the hydraulic cylinder 16 can stably support the cutter 13 with a sufficiently large force.

[0037] Still further, the link rods 17a, 17b are elastically deformed by a load exerted thereto. Therefore, the link mechanism 17 also functions as a cushioning material for absorbing the load applied to the cutter 13 and preventing the load from being transmitted to the hydraulic cylinder 16. That is, according to the embodiment described above, it is possible to reduce the load applied from the cutter 13 to the hydraulic cylinder 16.

[0038] Still further, according to the embodiment described above, since the distance A between the pin 17c and the pin 17e is set to be equal to or more than the distance B between the pin 17c and the pin 17d, a force generated by the hydraulic cylinder 16 can be increased and transmitted to the cutter 13. As a result, it is possible to support the load acting on the cutter 13 more appropriately.

[0039] Still further, according to the embodiment described above, the link rod 17a abuts the stopper 18 before the hydraulic cylinder 16 extends to the maximum. Thus, the force in the direction for causing the hydraulic cylinder 16 to further extend can be prevented from being transmitted from the cutter 13 to the hydraulic cylinder 16 through the link mechanism 17. As a result, it is possible to prevent the cylinder rod 16b from being pulled out more than necessary and then the cap 16c from being detached.

[0040] In the embodiment described above, the cutter 13 has been described as one of the examples of attachments, however, a specific example of the attachments is not limited thereto. As one of other examples, the attachment may be a hanging attachment having a hook for hanging a material to be hung. It should be noted that the present invention can be applied to the work machine 1 equipped with a heavy attachment, thereby achieving particularly advantageous effects.

[0041] The embodiments described above are provided as exemplary embodiments for the purpose of describing the present invention, and it is not intended to limit the scope of the invention to only those embodiments described above.

Those skilled in the art will be able to implement the invention in various other ways as long as they do not depart from the gist of the invention.

REFERENCE SIGNS LIST

[0042]

- | | |
|----|----------------|
| 1: | work machine |
| 2: | undercarriage |
| 3: | upperstructure |
| 5: | turn frame |
| 6: | counterweight |
| 7: | cab |
| 8: | crawler |

10:	front working device
11:	boom
12:	arm
12a:	body side surface
5 12b:	back side surface
12c:	left side surface (side surface)
13:	cutter (attachment)
13a:	mounting bracket
13b:	turn motor
10 13c, 13d:	blade
13g, 13h:	pin
13e, 13f, 14, 15, 16:	hydraulic cylinder
16:	hydraulic cylinder
16a:	cylinder tube
15 16b:	cylinder rod
16c:	cap
17:	link mechanism
17a:	link rod (first link rod)
17b:	link rod (second link rod)
20 17c:	pin (first pin)
17d:	pin (second pin)
17e:	pin (third pin)
18:	stopper

Claims

1. A work machine comprising:

an undercarriage;
 an upperstructure supported on the undercarriage so as to turn thereon;
 a front working device including a boom supported on the upperstructure so as to be raised and lowered, an arm rotatably supported at a distal end of the boom, and an attachment rotatably supported at a distal end of the arm,
 wherein
 the arm includes:

a pair of side surfaces that faces each other in a width direction of the front working device; and
 a body side surface and a back side surface that face each other in a direction perpendicular to the width direction of the front working device, each of which is connected to ends of the pair of side surfaces,

the front working device includes:

a hydraulic cylinder that is attached to the body side surface of the arm, and is supplied with and discharges hydraulic oil to extend and contract; and
 a link mechanism configured to cause the attachment to dump when the hydraulic cylinder extends and cause the attachment to crowd when the hydraulic cylinder contracts,

the linkage mechanism includes:

a first link rod that extends along the back side surface of the arm;
 a second link rod that is rotatably supported on the side surfaces of the arm via a first pin extending in the width direction of the front working device, the second link rod having one end which projects toward the back side surface of the arm and the other end which projects toward the body side surface of the arm,
 one end of the first link rod is rotatably connected to the attachment,
 the one end of the second link rod is rotatably connected to the other end of the first link rod via a second pin extending in the width direction of the front working device, and
 the other end of the second link rod is rotatably connected to a distal end of a cylinder rod of the hydraulic

cylinder via a third pin extending in the width direction of the front working device.

2. The work machine according to claim 1, wherein
a distance between the first pin and the third pin is equal to or more than a distance between the first pin and the
second pin.
3. The work machine according to claim 1, further comprising a stopper that is fixed to the back side surface of the
arm, wherein the first link rod abuts the stopper before the hydraulic cylinder extends to a maximum so as to prevent
the attachment from further dumping.

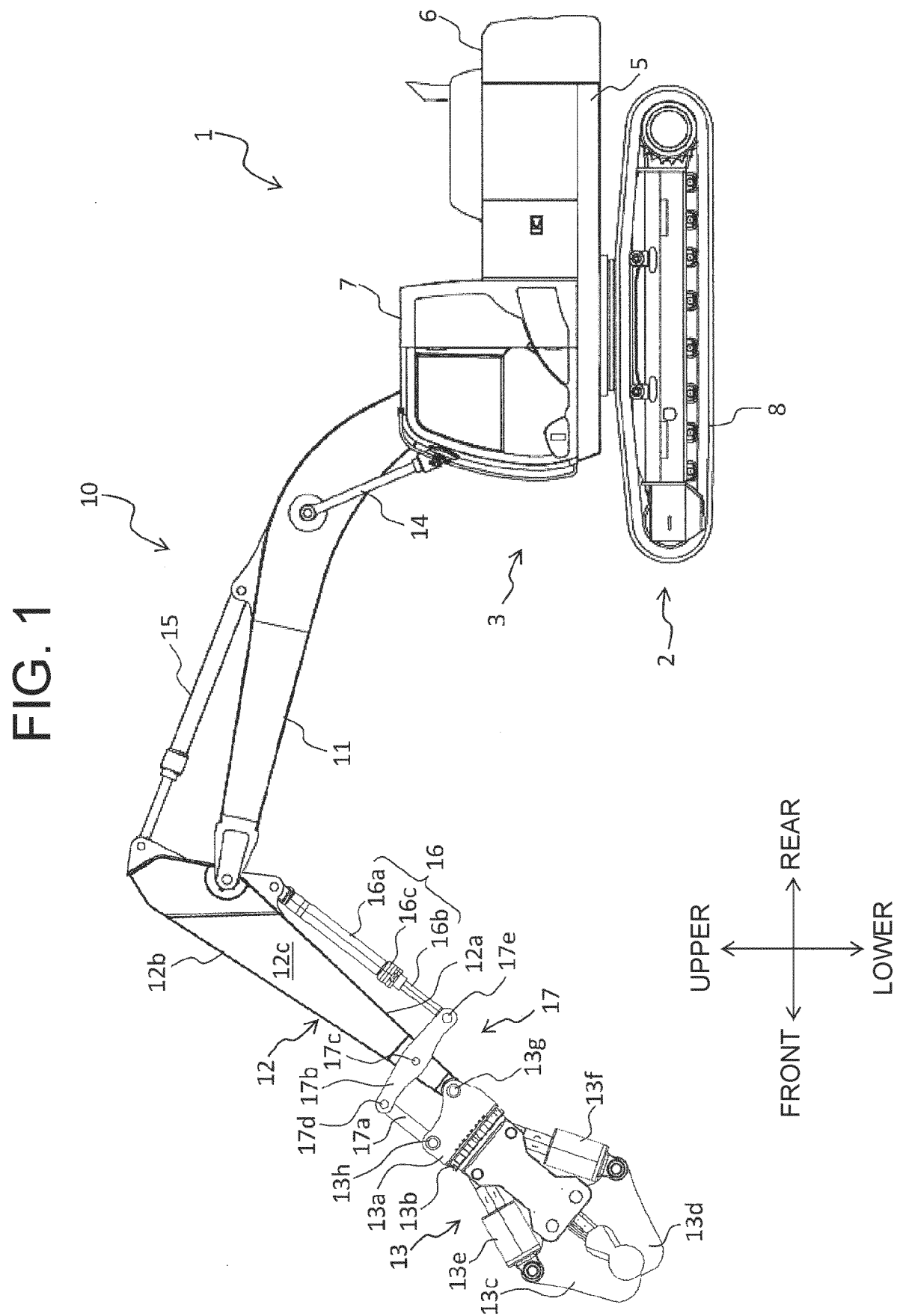


Fig. 2

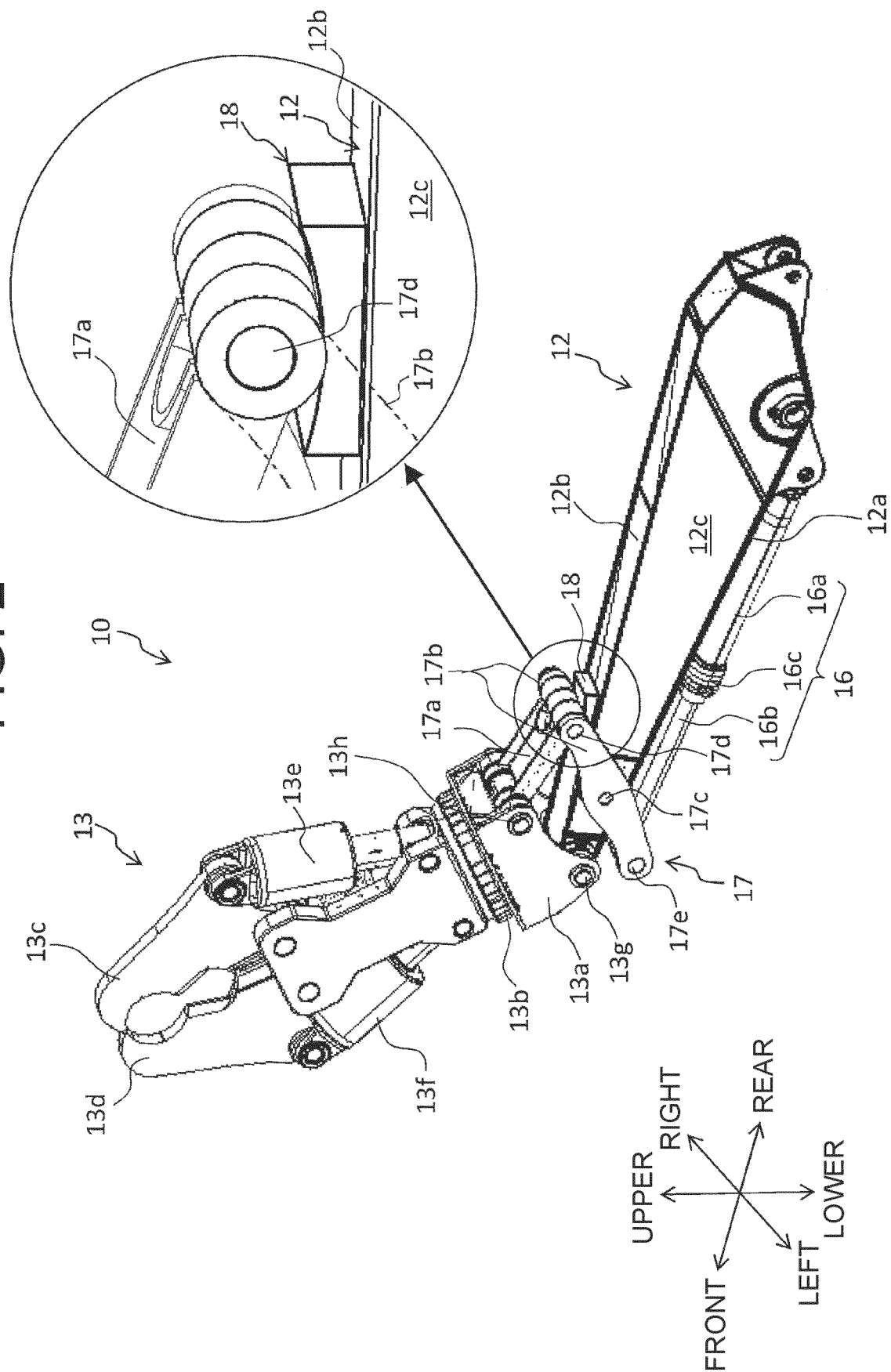


FIG. 3

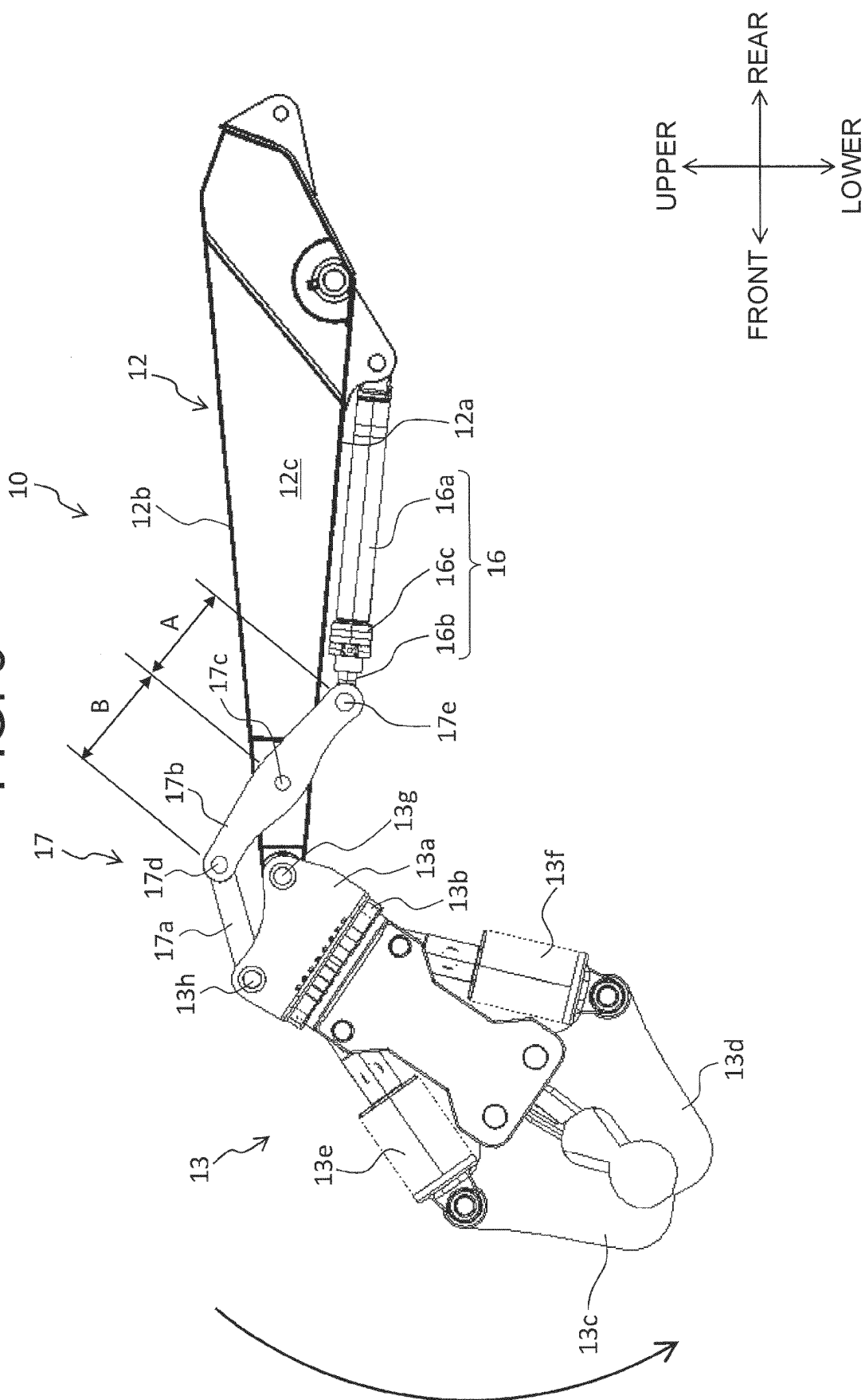
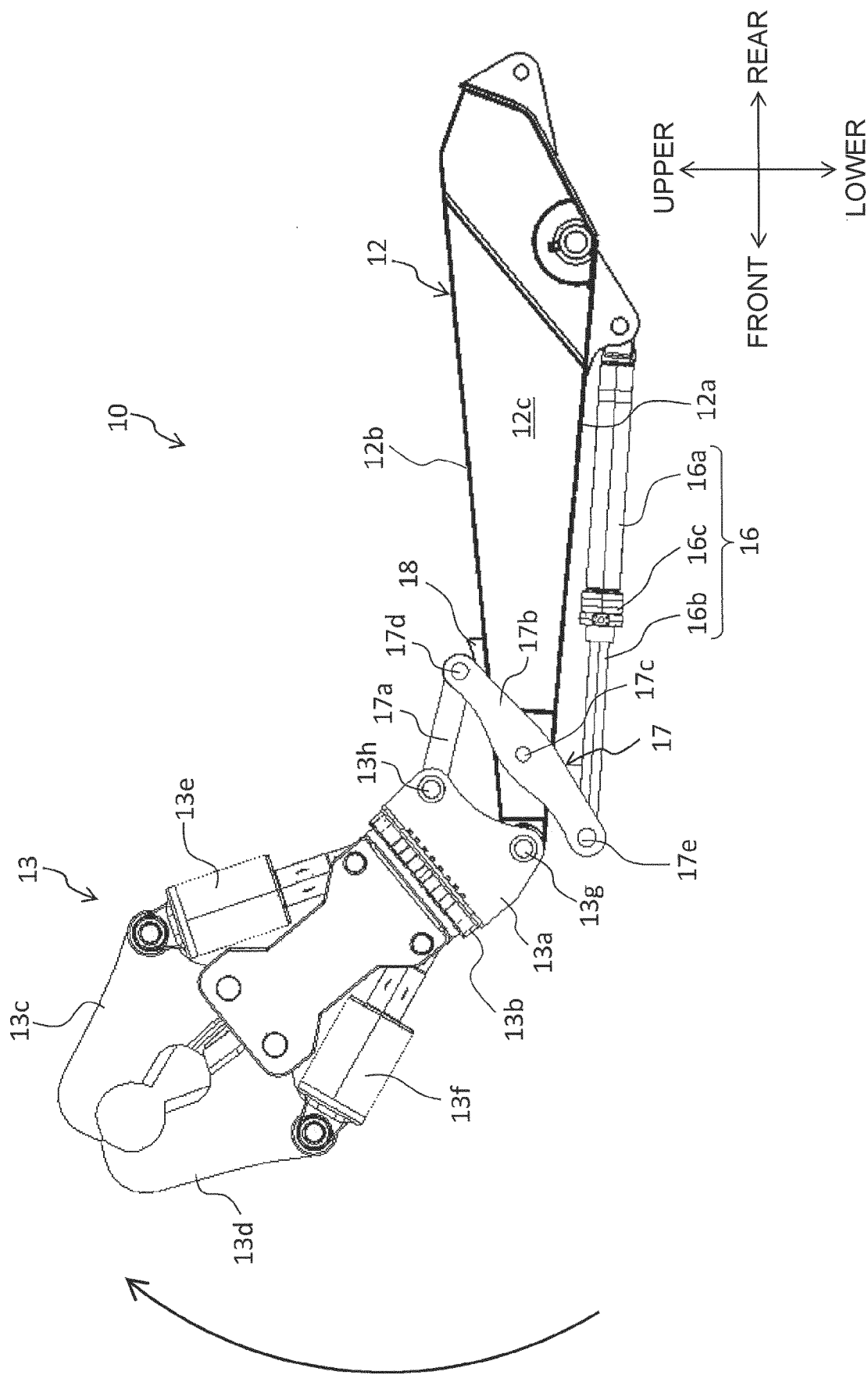


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2021/018759

A. CLASSIFICATION OF SUBJECT MATTER E02F 3/38 (2006.01) i; E02F 3/40 (2006.01) i; E04G 23/08 (2006.01) i FI: E02F3/40 A; E02F3/38 A; E04G23/08 A According to International Patent Classification (IPC) or to both national classification and IPC																		
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched <table border="0"> <tr> <td>Published examined utility model applications of Japan</td> <td>1922-1996</td> </tr> <tr> <td>Published unexamined utility model applications of Japan</td> <td>1971-2021</td> </tr> <tr> <td>Registered utility model specifications of Japan</td> <td>1996-2021</td> </tr> <tr> <td>Published registered utility model applications of Japan</td> <td>1994-2021</td> </tr> </table>	Published examined utility model applications of Japan	1922-1996	Published unexamined utility model applications of Japan	1971-2021	Registered utility model specifications of Japan	1996-2021	Published registered utility model applications of Japan	1994-2021										
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C. DOCUMENTS CONSIDERED TO BE RELEVANT																		
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 174899/1984 (Laid-open No. 90946/1986) (IIDA, Seisho) 13 June 1986 (1986-06-13) page 36, line 14 to page 37, line 8, fig. 39</td> <td>1-3</td> </tr> <tr> <td>A</td> <td>JP 2016-117989 A (CATERPILLAR SARL) 30 June 2016 (2016-06-30) entire text all drawings</td> <td>1-3</td> </tr> <tr> <td>A</td> <td>JP 2006-257839 A (YANMAR CO., LTD.) 28 September 2006 (2006-09-28) entire text all drawings</td> <td>1-3</td> </tr> <tr> <td>A</td> <td>JP 2000-234346 A (KOBELCO CONSTRUCTION MACHINERY CO., LTD.) 29 August 2000 (2000-08-29) entire text all drawings</td> <td>1-3</td> </tr> <tr> <td>A</td> <td>KR 20-2011-0008130 U (CHOI, Chang-Deok) 18 August 2011 (2011-08-18) entire text all drawings</td> <td>1-3</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 174899/1984 (Laid-open No. 90946/1986) (IIDA, Seisho) 13 June 1986 (1986-06-13) page 36, line 14 to page 37, line 8, fig. 39	1-3	A	JP 2016-117989 A (CATERPILLAR SARL) 30 June 2016 (2016-06-30) entire text all drawings	1-3	A	JP 2006-257839 A (YANMAR CO., LTD.) 28 September 2006 (2006-09-28) entire text all drawings	1-3	A	JP 2000-234346 A (KOBELCO CONSTRUCTION MACHINERY CO., LTD.) 29 August 2000 (2000-08-29) entire text all drawings	1-3	A	KR 20-2011-0008130 U (CHOI, Chang-Deok) 18 August 2011 (2011-08-18) entire text all drawings	1-3
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A	KR 20-2011-0008130 U (CHOI, Chang-Deok) 18 August 2011 (2011-08-18) entire text all drawings	1-3																
☐ Further documents are listed in the continuation of Box C.	☒ See patent family annex.																	
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Date of the actual completion of the international search 01 July 2021 (01.07.2021)	Date of mailing of the international search report 13 July 2021 (13.07.2021)																	
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2021/018759

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REFERENCES CITED IN THE DESCRIPTION

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