



(11)

EP 4 467 724 A1

(12)

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

(43) Date of publication:
27.11.2024 Bulletin 2024/48

(51) International Patent Classification (IPC):
E02F 3/34 (2006.01) E02F 3/36 (2006.01)

(21) Application number: **22922042.1**

(52) Cooperative Patent Classification (CPC):
E02F 3/34; E02F 3/36

(22) Date of filing: **08.11.2022**

(86) International application number:
PCT/JP2022/041543

(87) International publication number:
WO 2023/139891 (27.07.2023 Gazette 2023/30)

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

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(30) Priority: **19.01.2022 JP 2022006576**

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(54) **FRONT LOADER**

(57) Provided is a front loader capable of easily holding a stand at a support position. Provided are: a stand 50 provided on a boom 30 and rockable to a support position where a front loader 10 can be supported and a storage position where the front loader is stored; a link mechanism 60 that couples the lock plate 70 boom 30 and the lock plate 70 stand 50 and is movable in conjunction with rocking of the lock plate 70 stand 50; and a lock plate 70 that is rockably provided on the lock plate 70 boom 30 and holds the lock plate 70 stand 50 at the lock plate 70 support position by locking the lock plate 70 link mechanism 60 at a predetermined position.

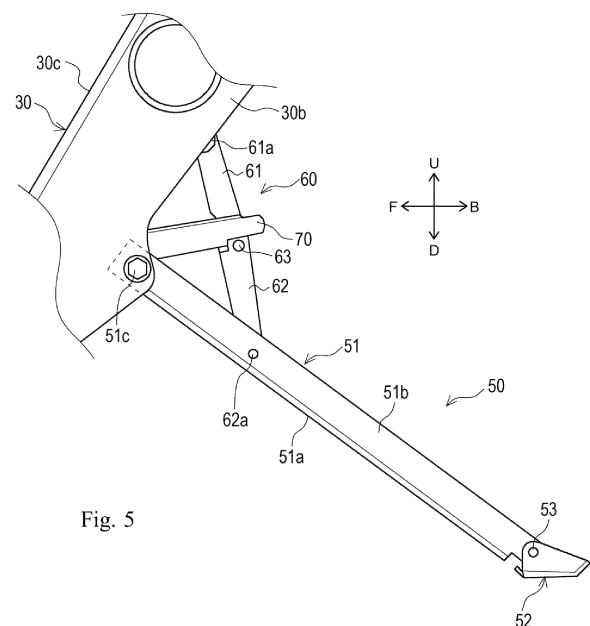


Fig. 5

Description

Technical field

[0001] The present invention relates to a technique of a front loader mounted on a working vehicle such as a tractor.

Background art

[0002] Conventionally, a technique related to a front loader mounted on a working vehicle such as a tractor has been known. For example, Patent Literature 1 discloses such a technique.

[0003] Patent Literature 1 describes a stand for making a front loader stand by itself when the front loader is detached from a working vehicle. The stand is rockably coupled to a boom, and can be switched between a support attitude capable of supporting the boom and a storage attitude stored in the boom.

[0004] However, in order to hold the stand described in Patent Literature 1 in a support attitude, it is necessary to fix the stand using a fixing pin, which is troublesome.

Citation list

Patent literature

[0005] Patent Literature 1: JP 2000-110190 A

Summary of invention

Technical problem

[0006] One aspect of the present disclosure has been made in view of the above circumstances, and an object of the present disclosure is to provide a front loader capable of easily holding a stand at a support position.

Solution to problem

[0007] The problem to be solved by one aspect of the present disclosure is as described above, and means for solving the problem will be described below.

[0008] That is, one aspect of the present disclosure includes: a stand provided on a boom and rockable to a support position where the front loader can be supported and a storage position where the front loader is stored; a link mechanism that couples the boom and the stand and is movable in conjunction with rocking of the stand; and a lock member that is rockably provided on the boom and holds the stand at the support position by locking the link mechanism at a predetermined position.

[0009] According to one aspect of the present disclosure, the stand can be easily held at the support position by rocking the lock member.

[0010] In one aspect of the present disclosure, the link mechanism includes: a first link member coupled to the

boom; and a second link member coupled to the stand, and the lock member locks the link mechanism in a state where the first link member and the second link member are overcentered.

[0011] According to one aspect of the present disclosure, the link mechanism can be firmly locked by the lock member.

[0012] In one aspect of the present disclosure, a rocking shaft of the lock member is disposed on the same axis as a rocking shaft of the stand.

[0013] According to one aspect of the present disclosure, the rocking shafts of the lock member and the stand can be arranged on the same axis, and space saving can be achieved.

[0014] In one aspect of the present disclosure, at least a part of the link mechanism and the lock member is stored in the stand and the boom in a state where the stand is rocked to the storage position.

[0015] According to one aspect of the present disclosure, space saving can be achieved by storing the link mechanism and the lock member in the stand and the boom.

[0016] In one aspect of the present disclosure, the lock member is formed in a shape capable of storing at least a part of the link mechanism in a state where the stand is rocked to the storage position.

[0017] According to one aspect of the present disclosure, space saving can be achieved by storing the link mechanism in the lock member.

[0018] According to an aspect of the present disclosure, the stand includes: a main body rockably supported by the boom; and a grounding part that is rockable with respect to the main body and is in contact with a ground when supporting the front loader, and a rocking shaft of the grounding part is movable to an engagement position capable of engaging with the boom and a release position capable of releasing the engagement with the boom by moving with respect to the main body.

[0019] According to one aspect of the present disclosure, engagement and disengagement between the rocking shaft of the grounding part and the boom can be easily performed by moving the rocking shaft of the grounding part.

[0020] In one aspect of the present disclosure, the stand further includes a biasing part that biases the grounding part such that the grounding part rocks in one direction in a rocking direction and the rocking shaft of the grounding part moves toward the engagement position.

[0021] According to one aspect of the present disclosure, the biasing part can hold the rocking shaft of the grounding part at the engagement position while holding the grounding part in a predetermined attitude.

[0022] In one aspect of the present disclosure, the boom and the stand are disposed such that outer edge portions of the boom and the stand are continuous in a straight line in a side view in a state where the stand is rocked to the storage position.

[0023] According to one aspect of the present disclosure, the sense of unity between the boom and the stand can be provided, and the aesthetic appearance can be improved.

Advantageous effects of invention

[0024] According to one aspect of the present disclosure, the stand can be easily held in the support position.

Brief description of drawings

[0025]

- FIG. 1 is a side view illustrating an overall configuration of a tractor including a front loader according to an embodiment of the present invention.
- FIG. 2 is a side view illustrating the front loader.
- FIG. 3 is a cross-sectional view taken along line A1-A1.
- FIG. 4 is a perspective view illustrating a stand.
- FIG. 5 is a side view of the same.
- FIG. 6 is a side sectional view illustrating a grounding part.
- FIG. 7 is a side sectional view illustrating a link mechanism.
- FIG. 8 is an enlarged perspective view illustrating a lock plate.
- FIG. 9 is a side view illustrating the front loader in a case where the stand is at a storage position.
- FIG. 10 is a side cross-sectional view illustrating the grounding part in a case where the stand is at the storage position.
- FIG. 11 is a side sectional view illustrating the link mechanism in a case where the stand is at the storage position.
- FIG. 12 is a cross-sectional view taken along line A2-A2.
- FIG. 13(a) is a schematic view illustrating a state before the lock plate is pushed downward.
- FIG. 13(b) is a schematic view illustrating a state after the lock plate is pushed downward.

Description of embodiment

[0026] In the following description, directions indicated by arrows U, D, F, B, L, and R in the drawings are defined as an upward direction, a downward direction, a forward direction, a backward direction, a left direction, and a right direction, respectively.

[0027] Hereinafter, the entire configuration of a tractor 1 including a front loader 10 according to one embodiment of the present invention will be described.

[0028] As illustrated in Fig. 1, the tractor 1 mainly includes a machine body frame 2, an engine 3, a transmission case 4, front wheels 5, rear wheels 6, a bonnet 7,

a cabin 8, a steering wheel 9, and a front loader 10.

[0029] The machine body frame 2 is a frame-shaped member formed by appropriately combining a plurality of panel members. The machine body frame 2 is formed in a substantially rectangular shape in plan view. The machine body frame 2 is disposed with its longitudinal direction oriented in a front-rear direction. The engine 3 is fixed to a rear portion of the machine body frame 2. The transmission case 4 is fixed to a rear portion of the engine 3. A front portion of the machine body frame 2 is supported by the pair of left and right front wheels 5 through a front axle mechanism (not illustrated). A rear portion of the transmission case 4 is supported by the pair of left and right rear wheels 6 through a rear axle mechanism (not illustrated). The engine 3 is covered with the bonnet 7.

[0030] Power of the engine 3 can be transmitted to the front wheels 5 through the front axle mechanism and can be transmitted to the rear wheels 6 through the rear axle mechanism after being shifted by a transmission device (not illustrated) stored in the transmission case 4. The front wheels 5 and the rear wheels 6 are rotationally driven by the power of the engine 3, and the tractor 1 can travel.

[0031] The cabin 8 is provided behind the engine 3. Inside the cabin 8, a living space on which an operator boards is formed. In the living space, the steering wheel 9 for adjusting a turning angle of the front wheels 5, various operation tools, a seat on which the operator sits, and the like are disposed.

[0032] The front loader 10 is mounted to a front portion of the tractor 1. Hereinafter, a detailed configuration of the front loader 10 will be described with reference to Figs. 2 to 8.

[0033] As illustrated in Fig. 2, the front loader 10 includes a side frame 20, a boom 30, a bucket 40, a stand 50, a link mechanism 60, and a lock plate 70.

[0034] The side frame 20 is detachably attached to a vehicle body (the machine body frame 2 and the transmission case 4) of the tractor 1. The side frames 20 are provided on the left and right of the vehicle body.

[0035] The booms 30 are rockably supported by the left and right side frames 20, respectively. The boom 30 is disposed so as to extend forward and downward from an upper portion of the side frame 20. As illustrated in Fig. 3, the boom 30 is formed in a hollow shape having a bottom surface 30a, left and right side surfaces 30b, and an upper surface 30c. Lower end portions of the left and right side surfaces 30b are formed so as to protrude downward from the bottom surface 30a of the boom 30. Furthermore, a distance between the left and right side surfaces 30b (distance along the left-right direction) is formed to be longer than a left-right width of the stand 50 described later. In this way, the lower portion of the boom 30 is formed to be able to store the stand 50. Hereinafter, a space below the boom 30 (a space surrounded by the bottom surface 30a and the left and right side surfaces 30b) is referred to as a "storage space

S30". As illustrated in Fig. 2, the boom 30 includes a cutout portion 30d and an engagement portion 30e.

[0036] The cutout portion 30d is formed in a front-rear middle portion of the boom 30. The cutout portion 30d is formed in a shape in which the boom 30 is cut substantially upward.

[0037] The engagement portion 30e is a portion to be engaged with the stand 50 described later. The engagement portion 30e is formed in a substantially inverted J shape in a side view. The engagement portion 30e is formed in front of the cutout portion 30d in a side view.

[0038] The boom 30 configured as described above is provided with a lamp 31 and a boom cylinder 32. The lamp 31 is provided in the cutout portion 30d so as to be capable of irradiating the front lower side with light. The boom 30 can rock with respect to the side frame 20 by extension and contraction of the boom cylinder 32.

[0039] The bucket 40 is formed to open forward. The bucket 40 is rockably coupled to a front end portion of the boom 30. The bucket 40 is provided with a bucket cylinder 41. The bucket 40 can rock with respect to the boom 30 by extension and contraction of the bucket cylinder 41.

[0040] The stand 50 allows the front loader 10 detached from the vehicle body of the tractor 1 to stand by itself. One stand 50 (a pair of right and left stands) is provided at each lower front portion of the right and left booms 30. The stand 50 can be switched between a storage position where the stand is stored in the boom 30 and a support position where the stand is grounded to support the weight of the front loader 10. One link mechanism 60 and one lock plate 70 are provided on each of the left and right stands 50. Figs. 2 to 8 illustrate the stand 50, the link mechanism 60, and the like switched to the support position. Furthermore, Figs. 9 to 12 illustrate the stand 50, the link mechanism 60, and the like switched to the storage position.

[0041] Hereinafter, the configurations of the stand 50, the link mechanism 60, and the lock plate 70 will be described with reference to a state where the stand 50 is at the support position. Since the stand 50, the link mechanism 60, and the lock plate 70 have the same configuration on the right and left, the configuration of the stand 50 and the like will be described below, taking the stand 50 and the like on the left side as an example. As illustrated in Figs. 4 and 5, the stand 50 includes a main body 51, a grounding part 52, a grounding part rocking shaft 53, and a biasing part 54.

[0042] The main body 51 is provided to be rockable with respect to the boom 30. The main body 51 is formed in a longitudinal shape extending long in one direction. The main body 51 is formed in a substantially U shape with an opening portion facing upward in a longitudinal direction cross-sectional view (see Fig. 12). A front end portion of the main body 51 is disposed in the storage space S30. The main body 51 includes a bottom surface portion 51a, a side surface portion 51b, a rocking shaft 51c, a sliding portion 51d (see Fig. 6), and a bracket 51e.

[0043] The bottom surface portion 51a is a portion

forming a bottom surface of the main body 51. The bottom surface portion 51a is formed in a plate shape with a plate surface oriented in the substantially vertical direction. The bottom surface portion 51a is formed to extend long in the longitudinal direction of the main body 51.

[0044] The side surface portion 51b is a portion forming a side surface of the main body 51. The side surface portion 51b is formed in a plate shape with a plate surface facing the left-right direction. The side surface portion 51b is formed over the entire region in the longitudinal direction of the bottom surface portion 51a. A distance between the left and right side surface portions 51b (distance along the left-right direction) is formed to be longer than a left-right width of the link mechanism 60 and the lock plate 70. In this way, the stand 50 of the present embodiment is formed in a shape capable of storing the link mechanism 60 and the lock plate 70.

[0045] The rocking shaft 51c rockably couples the main body 51 to the boom 30. The rocking shaft 51c is formed in a substantially cylindrical shape with its axis oriented to the left and right. In the present embodiment, a bolt longer than a left-right width of the boom 30 is used as the rocking shaft 51c. The rocking shaft 51c is inserted through a front lower portion of the boom 30 (side surface 30b) and a front end portion of the side surface portion 51b. As a result, the main body 51 is supported by the boom 30 so as to be rockable up and down.

[0046] The sliding portion 51d illustrated in Fig. 6 is a portion that guides the grounding part rocking shaft 53 described later so as to be slidable. The sliding portion 51d is formed by a pair of holes penetrating the main body 51 in the left-right direction. The sliding portion 51d is formed at a rear end portion of the left and right side surface portions 51b. The sliding portion 51d is formed in a long hole shape. A length of the sliding portion 51d is appropriately determined to such a length that the grounding part rocking shaft 53 and the engagement portion 30e (see Fig. 2) can be engaged or disengaged.

[0047] The bracket 51e illustrated in Figs. 4 and 6 is for attaching the biasing part 54 to be described later. The bracket 51e is formed in a substantially plate shape. The bracket 51e is formed in a longitudinal shape extending in substantially the same direction as the longitudinal direction of the main body 51. Both end portions of the bracket 51e in the longitudinal direction extend so as to be orthogonal to the longitudinal direction of the main body 51, and are fixed to the bottom surface portion 51a.

[0048] The grounding part 52 is a portion that comes into contact with the ground when the front loader 10 is supported by the stand 50. The grounding part 52 is formed in a groove steel shape opened upward by bending both left and right end portions of a steel plate upward. The grounding part 52 is disposed so as to overlap the rear end portion of the main body 51 in a side view. As illustrated in Fig. 6, the grounding part 52 includes a bracket 52a.

[0049] The bracket 52a is for attaching the biasing part 54. The bracket 52a is formed in a substantially plate

shape. A rear portion of the bracket 52a is fixed to a bottom surface of the grounding part 52. A front portion of the bracket 52a is formed so as to be inclined forward and upward with respect to the bottom surface of the grounding part 52.

[0050] The grounding part rocking shaft 53 rockably couples the grounding part 52 to the main body 51. The grounding part rocking shaft 53 is formed in a substantially cylindrical shape with its axis oriented to the left and right. The grounding part rocking shaft 53 is formed so as to be engageable with the engagement portion 30e (see Fig. 2) of the boom 30. The grounding part rocking shaft 53 is inserted through the left and right side surfaces of the grounding part 52 and the sliding portion 51d of the main body 51. As a result, the grounding part rocking shaft 53 rockably couples the grounding part 52 to the main body 51. Furthermore, the grounding part rocking shaft 53 can slide in the sliding portion 51d along the longitudinal direction of the sliding portion 51d.

[0051] The grounding part rocking shaft 53 can move to an engagement position and a release position by sliding in the sliding portion 51d. The engagement position is a position where the stand 50 can be engaged with the engagement portion 30e of the boom 30 to be described later in a case where the stand is at the storage position (see the grounding part rocking shaft 53 indicated by a solid line in Fig. 10). The release position is a position where the engagement with the engagement portion 30e can be released in a case where the stand 50 is at the storage position (see the grounding part rocking shaft 53 indicated by a two-dot chain line in Fig. 10).

[0052] The biasing part 54 biases the grounding part 52. The biasing part 54 of the present embodiment is formed of a tension coil spring. One end of the biasing part 54 is attached to the bracket 51e of the main body 51. The other end of the biasing part 54 is attached to the bracket 52a of the grounding part 52. As a result, the biasing part 54 biases the grounding part 52. More specifically, the biasing part 54 biases the grounding part 52 such that the grounding part 52 rocks in one direction (clockwise direction in Fig. 6 in the present embodiment) in a rocking direction. Furthermore, the biasing part 54 biases the grounding part 52 such that the grounding part rocking shaft 53 is directed to one side (the front upper side in Fig. 6 in the present embodiment) of the sliding portion 51d.

[0053] The link mechanism 60 illustrated in Figs. 3, 4, and 7 moves in conjunction with the rocking of the stand 50. The link mechanism 60 is configured to couple the boom 30 and the stand 50. The link mechanism 60 includes a first link member 61, a second link member 62, a coupling member 63, and a stopper 64.

[0054] The first link member 61 is a substantially plate-like member coupled to the boom 30. The first link member 61 is disposed with a plate surface oriented in the substantially left-right direction. The first link member 61 is formed in a linear shape extending long in one direction. An upper end portion of the first link member 61 is

disposed in a lower portion of the boom 30. The upper end portion of the first link member 61 is rockably supported by the boom 30 through a coupling pin 61a whose axis is oriented to the left and right. As illustrated in Fig. 7, the first link member 61 includes a cutout portion 61b. The cutout portion 61b is formed at the lower front portion of the first link member 61. The cutout portion 61b is formed in a recessed shape in which the front end surface of the first link member 61 is cut out rearward.

[0055] The second link member 62 is a substantially plate-like member coupled to the stand 50. As illustrated in Figs. 3, 4, and 7, the second link member 62 is disposed with a plate surface oriented in the substantially left-right direction. The second link member 62 is formed in a linear shape extending long in one direction. A pair of the left and right second link members 62 is provided. The left and right second link members 62 are disposed on the left and right of the first link member. Lower end portions of the left and right second link members 62 are disposed inside the main body 51. The lower end portions of the second link members 62 are rockably supported by the main body 51 of the stand 50 through a coupling pin 62a whose axis is directed to the left and right.

[0056] The coupling member 63 is a member that couples the first link member 61 and the second link members 62. The coupling member 63 is formed in a substantially cylindrical shape with its axis oriented to the left and right. The coupling member 63 is provided so as to laterally penetrate the first link member 61 and the second link members 62. In this way, the coupling member 63 rockably couples the first link member 61 and the second link members 62.

[0057] The stopper 64 illustrated in Fig. 7 is for restricting rocking of the first link member 61 and the second link members 62. The stopper 64 is provided across the left and right second link members 62. The stopper 64 is disposed in front of the coupling member 63. In the state illustrated in Fig. 7, the stopper 64 abuts on the first link member 61. Accordingly, the stopper 64 restricts rocking of the first link member 61 and the like. More specifically, the stopper 64 restricts rocking of the first link member 61 and the second link members 62 such that the lower end portion of the first link member 61 and the upper end portions of the second link members 62 move rearward from the state illustrated in Fig. 7.

[0058] The lock plate 70 illustrated in Figs. 7 and 8 is for holding the stand 50 at the support position. The lock plate 70 is formed in a linear shape extending long in one direction. The lock plate 70 is formed in a substantially U shape with an opening facing downward in a longitudinal direction cross-sectional view (see Fig. 12). The lock plate 70 includes a top plate portion 71 and a side surface portion 72.

[0059] The top plate portion 71 is a portion forming an upper surface of the lock plate 70. The top plate portion 71 is formed in a plate shape with a plate surface facing substantially the vertical direction. The top plate portion 71 is formed to extend substantially in the front-rear

direction (the longitudinal direction of the lock plate 70). The top plate portion 71 includes a cutout portion 71a. The cutout portion 71a is formed at a rear end portion of the top plate portion 71. The cutout portion 71a is formed in a recessed shape in which the top plate portion 71 is cut out substantially forward. A left-right width of the cutout portion 71a is formed to be substantially equal to a left-right width of the first link member 61.

[0060] The side surface portion 72 is a portion forming a side surface of the lock plate 70. The side surface portion 72 is formed in a plate shape with a plate surface facing the left-right direction. A pair of the left and right side surface portions 72 is formed. The left side surface portion 72 is formed to extend substantially rearward more than the right side surface portion 72. A distance between the left and right side surface portions 72 (distance along the left-right direction) is formed to be longer than a left-right width of the link mechanism 60. In this way, the lock plate 70 of the present embodiment is formed in a shape capable of storing the link mechanism 60.

[0061] A front end portion of the lock plate 70 is disposed inside the stand 50. The rocking shaft 51c of the stand 50 is inserted through the side surface portions 72 of the lock plate 70. As a result, the lock plate 70 is rockably provided on the boom 30. As described above, the rocking shafts of the stand 50 and the lock plate 70 of the present embodiment are each configured by the rocking shaft 51c. In this way, the rocking shafts of the stand 50 and the lock plate 70 are formed of a common member, so that an increase in the number of parts can be suppressed. Furthermore, the rocking shafts of the stand 50 and the lock plate 70 are disposed on the same axis, so that the space can be effectively used.

[0062] The lock plate 70 configured as described above can be switched between a locked position and an unlocked position by rocking with respect to the boom 30. The locked position illustrated in Fig. 7 is a position at which the link mechanism 60 is locked at a predetermined position. More specifically, the locked position is a position where the lock plate 70 and the cutout portion 61b of the first link member 61 are engaged with each other. When the lock plate 70 is switched to the locked position, the top plate portion 71 (cutout portion 71a) is fitted in the cutout portion 61b of the first link member 61. Furthermore, the left side surface portion 72 is disposed so as to straddle the link mechanism 60 in the front-rear direction in side view. The unlocked position is a position where the link mechanism 60 is not locked. More specifically, the unlocked position is a position where the engagement between the lock plate 70 and the cutout portion 61b of the first link member 61 is released. When the lock plate 70 is switched to the unlocked position, the top plate portion 71 (cutout portion 71a) is located above the cutout portion 61b of the first link member 61 (see Fig. 13(a)).

[0063] Hereinafter, a state where the stand 50 of the front loader 10 configured as described above is at the storage position will be described. The stand 50 is rocked

upward from the support position illustrated in Fig. 2 to be switched to the storage position illustrated in Fig. 9.

[0064] As illustrated in Fig. 10, the stand 50 is held by the boom 30 at the storage position by the grounding part rocking shaft 53 being engaged with the engagement portion 30e. The grounding part rocking shaft 53 is biased frontward and downward (in a direction to be engaged with the engagement portion 30e) by the biasing part 54. As a result, even if some impact or the like occurs in the front loader 10, the engagement of the grounding part rocking shaft 53 is not released. Furthermore, vibration of the grounding part rocking shaft 53 can be suppressed, and generation of a collision sound between the grounding part rocking shaft 53 and the engagement portion 30e can be prevented.

[0065] Furthermore, the grounding part 52 is biased in one direction (clockwise direction in Fig. 10) in the rocking direction by the biasing part 54. The grounding part 52 is restricted from rocking in one direction by being brought into contact with the main body 51. In this way, the grounding part 52 is held by the boom 30 in a predetermined attitude. More specifically, the grounding part 52 is held in an attitude in which the bottom surface faces the same direction as the bottom surface portion 51a of the main body 51.

[0066] As illustrated in Fig. 9, in a case where the stand 50 is at the storage position, the boom 30 and the stand 50 are disposed such that the outer edge portions are continuous in a straight line in a side view. More specifically, the lower end portion of the boom 30, the bottom surface portion 51a of the main body 51, and the bottom surface of the grounding part 52 are located on a straight line L1 along the longitudinal direction of the stand 50 in a side view, and the lower end portions and the like of the boom 30 and the like are provided so as to be adjacent to each other in the longitudinal direction. As a result, the stand 50 can be assimilated with the boom 30 to give a sense of unity to the boom 30 and the stand 50, and the aesthetic appearance can be improved.

[0067] Furthermore, the stand 50 is disposed so as not to generate a gap with respect to the boom 30 in a side view when being at the storage position. More specifically, the stand 50 is disposed along the lower end of the boom 30 without a gap with respect to the boom 30 in a side view. As a result, it is possible to prevent the appearance of the stand 50 from deteriorating and to improve the aesthetic appearance.

[0068] Furthermore, as illustrated in Figs. 9 and 10, the cutout portion 30d of the boom 30 of the present embodiment is continuous with the bottom surface of the grounding part 52 of the stand 50 in a side view in a case where the stand 50 is at the storage position. The lamp 31 of the front loader 10 is provided in the cutout portion 30d, and is disposed in an attitude capable of emitting light in the longitudinal direction of the stand 50 at the storage position. With such a configuration, it is possible to provide a sense of unity to the stand 50 and the lamp 31, and to improve the aesthetic appearance.

[0069] Furthermore, as illustrated in Figs. 11 and 12, the link mechanism 60 is disposed inside a space surrounded by the boom 30 and the stand 50 in a state where the first link member 61 and the second link members 62 are folded. In this way, the entire link mechanism 60 is stored in the boom 30 and the stand 50 in an invisible manner from the outside in a case where the stand 50 is at the storage position (see Fig. 9). Furthermore, similarly to the link mechanism 60, the entire lock plate 70 is stored in the boom 30 and the stand 50 so as to be invisible from the outside.

[0070] Furthermore, the first link member 61 and the second link members 62 of the link mechanism 60 are bent toward the lock plate 70 and are stored between the left and right side surface portions 72 of the lock plate 70 in a case where the stand 50 is at the storage position. Thus, a part of the link mechanism 60 (first link member 61) is stored in the lock plate 70.

[0071] In this manner, the link mechanism 60 and the lock plate 70 are appropriately stored in the boom 30 or the like, so that the link mechanism 60 and the lock plate 70 can be compactly put together to achieve space saving.

[0072] Next, how the stand 50 is switched from the storage position to the support position will be described.

[0073] In a case where the stand 50 is switched to the support position, the operator first rocks a tip of the grounding part 52 illustrated in Fig. 10 downward. As a result, a force toward the rear upper side acts on the grounding part rocking shaft 53, and the grounding part rocking shaft 53 is moved from the engagement position to the release position (see the grounding part rocking shaft 53 indicated by a two-dot chain line in Fig. 10). Thus, the engagement between the grounding part rocking shaft 53 and the engagement portion 30e is released. In this manner, the operator can easily release the engagement between the grounding part rocking shaft 53 and the engagement portion 30e only by rocking the grounding part 52.

[0074] Next, the operator rocks the main body 51 downward. The first link member 61 and the second link members 62 illustrated in Fig. 11 are rocked with the rocking of the main body 51. The lock plate 70 is rocked downward by its own weight as the first link member 61 and the second link members 62 rock.

[0075] As illustrated in Fig. 13(a), the main body 51 is rocked by its own weight until the first link member 61 and the second link members 62 are arranged in a substantially straight line. More specifically, the main body 51 is rocked to a position where the coupling pins 61a and 62a and the coupling member 63 are aligned in a straight line in a side view. At this time, the lock plate 70 (the cutout portion 71a in Fig. 8) abuts on an upper side of the cutout portion 61b in the first link member 61. As described above, the lock plate 70 of the present embodiment does not move to the locked position even when the operator rocks the main body 51.

[0076] After rocking the main body 51, the operator

presses the lock plate 70 downward (see arrow A1 in Fig. 13(a)). As a result, a rearward force acts on the first link member 61 (see an arrow A2 illustrated in Fig. 13(a)), and the first link member 61 and the second link members 62 are rocked from the state illustrated in Fig. 13(a). Thus, as illustrated in Fig. 13(b), the first link member 61 and the second link members 62 are in an overcentered state. Note that the overcentered state refers to a state in which the coupling member 63 is located behind a straight line L2 connecting the coupling pins 61a and 62a (on the side farther from the rocking shaft 51c of the lock plate 70). The stopper 64 is brought into contact with the first link member 61 in a state where the first link member 61 and the second link members 62 are overcentered.

[0077] Furthermore, the lock plate 70 is rocked downward from the state illustrated in Fig. 13(a) by the rocking of the first link member 61 and the like accompanying the pressing by the operator. As illustrated in Fig. 13(b), the top plate portion 71 of the lock plate 70 is fitted in the cutout portion 61b of the first link member 61. Thus, the lock plate 70 is moved to the locked position. This completes switching of the stand 50 to the support position. Thus, the operator can easily lock the link mechanism 60 only by pressing the lock plate 70 downward.

[0078] When the link mechanism 60 is locked, even if the first link member 61 and the second link member 62 are rocked to release the overcentered state, the lock plate 70 is caught by the cutout portion 61b of the first link member 61, and the rocking of the first link member 61 and the like is restricted. In this way, the lock plate 70 can hold the stand 50 at the support position.

[0079] Here, when the stand 50 is switched from the storage position to the support position, the grounding part 52 comes into contact with a ground contact surface (ground) and rocks with respect to the main body 51. As a result, the grounding part 52 is brought into surface contact with the ground contact surface, and the front loader 10 can be supported by the stand 50 in a stable state. Furthermore, it is possible to prevent the ground contact surface from being scratched.

[0080] Note that the operator can switch the stand 50 from the support position to the storage position by a procedure substantially reverse to the above procedure (procedure for switching the stand 50 from the storage position to the support position).

[0081] More specifically, the operator moves the lock plate 70 to the unlocked position by supporting the stand 50 and rocking the lock plate 70 upward (see Fig. 13(a)). Furthermore, the operator releases the state in which the first link member 61 and the second link members 62 are overcentered. In this state, the operator rocks the stand 50 upward. The first link member 61, the second link members 62, and the lock plate 70 are rocked as the stand 50 rocks upward. When the operator rocks the stand 50 to the storage position illustrated in Fig. 10, the grounding part rocking shaft 53 is engaged with the engagement portion 30e of the boom 30.

[0082] As described above, in the stand 50 of the

present embodiment, when the storage position and the support position are switched, attachment and detachment of a component (a fixing pin or the like for restricting rocking of the main body 51) are unnecessary, and thus, it is possible to easily perform the position switching work. Furthermore, since it is not necessary to attach and detach the component, loss or the like of the component does not occur.

[0083] As described above, the front loader 10 according to the present embodiment includes the stand 50 that is provided in the boom 30 and is rockable to the support position where the front loader 10 can be supported and the storage position where the front loader is stored, the link mechanism 60 that couples the boom 30 and the stand 50 and is movable in conjunction with rocking of the stand 50, and the lock plate 70 (lock member) that is rockably provided in the boom 30 and holds the stand 50 at the support position by locking the link mechanism 60 at a predetermined position.

[0084] With such a configuration, the stand 50 can be easily held at the support position by rocking the lock plate 70.

[0085] Furthermore, the link mechanism 60 includes a first link member 61 coupled to the boom 30 and a second link member 62 coupled to the stand 50, and the lock plate 70 locks the link mechanism 60 in a state where the first link member 61 and the second link members 62 are overcentered (see Fig. 13(b)).

[0086] With such a configuration, the link mechanism 60 can be firmly locked by the lock plate 70.

[0087] Furthermore, the rocking shaft (rocking shaft 51c) of the lock plate 70 is disposed on the same axis as the rocking shaft (rocking shaft 51c) of the stand 50.

[0088] With such a configuration, the rocking shafts of the lock plate 70 and the stand 50 can be arranged on the same axis, and space saving can be achieved.

[0089] Furthermore, at least a part of the link mechanism 60 and the lock plate 70 is stored in the stand 50 and the boom 30 in a state where the stand 50 is rocked to the storage position (see Figs. 11 and 12).

[0090] With such a configuration, space saving can be achieved.

[0091] Furthermore, the lock plate 70 is formed in a shape capable of storing at least a part of the link mechanism 60 in a state where the stand 50 is rocked to the storage position.

[0092] With such a configuration, space saving can be achieved.

[0093] Furthermore, the stand 50 includes the main body 51 rockably supported by the boom 30, and the grounding part 52 rockable with respect to the main body 51 and in contact with the ground when supporting the front loader 10, and a rocking shaft (grounding part rocking shaft 53) of the grounding part 52 is movable to an engagement position capable of engaging with the boom 30 and a release position capable of releasing the engagement with the boom 30 by moving with respect to the main body 51 (see Fig. 10).

[0094] With this configuration, it is possible to easily engage and disengage the rocking shaft of the grounding part 52 and the boom 30.

[0095] Furthermore, the stand 50 further includes the biasing part 54 that biases the grounding part 52 such that the grounding part 52 rocks in one direction in the rocking direction and the rocking shaft (grounding part rocking shaft 53) of the grounding part 52 moves toward the engagement position.

[0096] With this configuration, the biasing part 54 can hold the rocking shaft of the grounding part 52 at the engagement position while holding the grounding part 52 in a predetermined attitude.

[0097] Furthermore, the boom 30 and the stand 50 are disposed such that outer edge portions of the boom 30 and the stand 50 are continuous in a straight line in a side view in a state where the stand 50 is rocked to the storage position (see Fig. 9).

[0098] With such a configuration, it is possible to provide a sense of unity between the boom 30 and the stand 50, and to improve the aesthetic appearance.

[0099] Note that the lock plate 70 according to the present embodiment is an embodiment of the lock member according to the present invention.

[0100] Although the embodiment of the present invention has been described above, the present invention is not limited to the above configurations, and various modifications can be made within the scope of the invention described in the claims.

[0101] For example, although the bucket 40 is coupled to the boom 30, the working tool coupled to the boom 30 is not limited to the bucket 40 and can be arbitrarily changed. For example, a snow blower, a snow blade, a sweeper, and the like may be coupled to the boom 30.

[0102] Furthermore, in the present embodiment, two stands 50 (a pair of right and left stands) are provided, but the number of the stands 50 is not limited.

[0103] Furthermore, although the lock plate 70 locks the link mechanism 60 in a state where the first link member 61 and the second link members 62 are overcentered, the state of the first link member 61 and the like at the time of locking is not particularly limited. For example, the lock plate 70 may lock the link mechanism 60 in a state where the first link member 61 and the like are not overcentered.

[0104] Furthermore, the rocking shafts of the lock plate 70 and the stand 50 are formed of the same member (the rocking shaft 51c), but this is merely an example. For example, the rocking shaft of the lock plate 70 and the rocking shaft of the stand 50 may be formed of different members. Furthermore, these rocking shafts may not be disposed coaxially.

[0105] Furthermore, although the lock plate 70 is rocked to the locked position by the pressing of the operator, this is an example, and for example, the lock plate 70 may be automatically rocked to the locked position without being pressed by the operator.

[0106] Furthermore, the link mechanism 60 and the

lock plate 70 are entirely stored in the boom 30 and the stand 50 in a case where the stand 50 is at the storage position, but this is an example, and the link mechanism 60 and the lock plate 70 may be stored in the boom 30 or the like in any manner. For example, only one of the link mechanism 60 and the lock plate 70 may be stored in the boom 30 or the like, or a part of the link mechanism 60 and a part of the lock plate 70 may be stored in the boom 30 or the like.

[0107] Furthermore, the boom 30 does not need to store each of the link mechanism 60 and the lock plate 70, and may store only the link mechanism 60, for example. Furthermore, the stand 50 does not need to store each of the link mechanism 60 and the lock plate 70, and may store only the lock plate 70, for example. By thus storing one of the link mechanism 60 and the lock plate 70 in the boom 30 and storing the other of the link mechanism 60 and the lock plate 70 in the stand 50, the link mechanism 60 and the lock plate 70 can be stored in the boom 30 or the like.

[0108] Furthermore, although the link mechanism 60 is partially stored in the lock plate 70 in a case where the stand 50 is at the storage position, this is an example, and for example, the entire link mechanism 60 may be stored in the lock plate 70.

[0109] Furthermore, although the biasing part 54 is formed of a tension coil spring, this is an example, and the biasing part 54 may be formed of a member other than the tension coil spring.

Industrial applicability

[0110] The present invention can be used for a technique of a front loader mounted on a working vehicle such as a tractor.

Reference signs list

[0111]

10: Front loader
30: Boom
50: Stand
60: Link mechanism
70: Lock plate

Claims

1. A front loader comprising:

- a stand provided on a boom and rockable to a support position where the front loader can be supported and a storage position where the front loader is stored;
- a link mechanism that couples the boom and the stand and is movable in conjunction with rocking of the stand; and
- a lock member that is rockably provided on the

boom and holds the stand at the support position by locking the link mechanism at a predetermined position.

2. The front loader according to claim 1, wherein the link mechanism includes:

- a first link member coupled to the boom; and
- a second link member coupled to the stand, and
- the lock member locks the link mechanism in a state where the first link member and the second link member are overcentered..

3. The front loader according to claim 1 or 2, wherein a rocking shaft of the lock member is disposed on a same axis as a rocking shaft of the stand.

4. The front loader according to any one of claims 1 to 3, wherein at least a part of the link mechanism and the lock member is stored in the stand and the boom in a state where the stand is rocked to the storage position.

5. The front loader according to any one of claims 1 to 3, wherein at least a part of the link mechanism and the lock member is stored in the stand and the boom in a state where the stand is rocked to the storage position..

6. The front loader according to any one of claims 1 to 5, wherein the stand includes:

- a main body rockably supported by the boom; and
- a grounding part that is rockable with respect to the main body and is in contact with a ground when supporting the front loader, and
- a rocking shaft of the grounding part is movable to an engagement position capable of engaging with the boom and a release position capable of releasing the engagement with the boom by moving with respect to the main body.

7. The front loader according to claim 6, wherein the stand further includes a biasing part that biases the grounding part such that the grounding part rocks in one direction in a rocking direction and the rocking shaft of the grounding part moves toward the engagement position.

8. The front loader according to any one of claims 1 to 7, wherein the boom and the stand are disposed such that outer edge portions of the boom and the stand are continuous in a straight line in a side view in a state where the stand is rocked to the storage position.

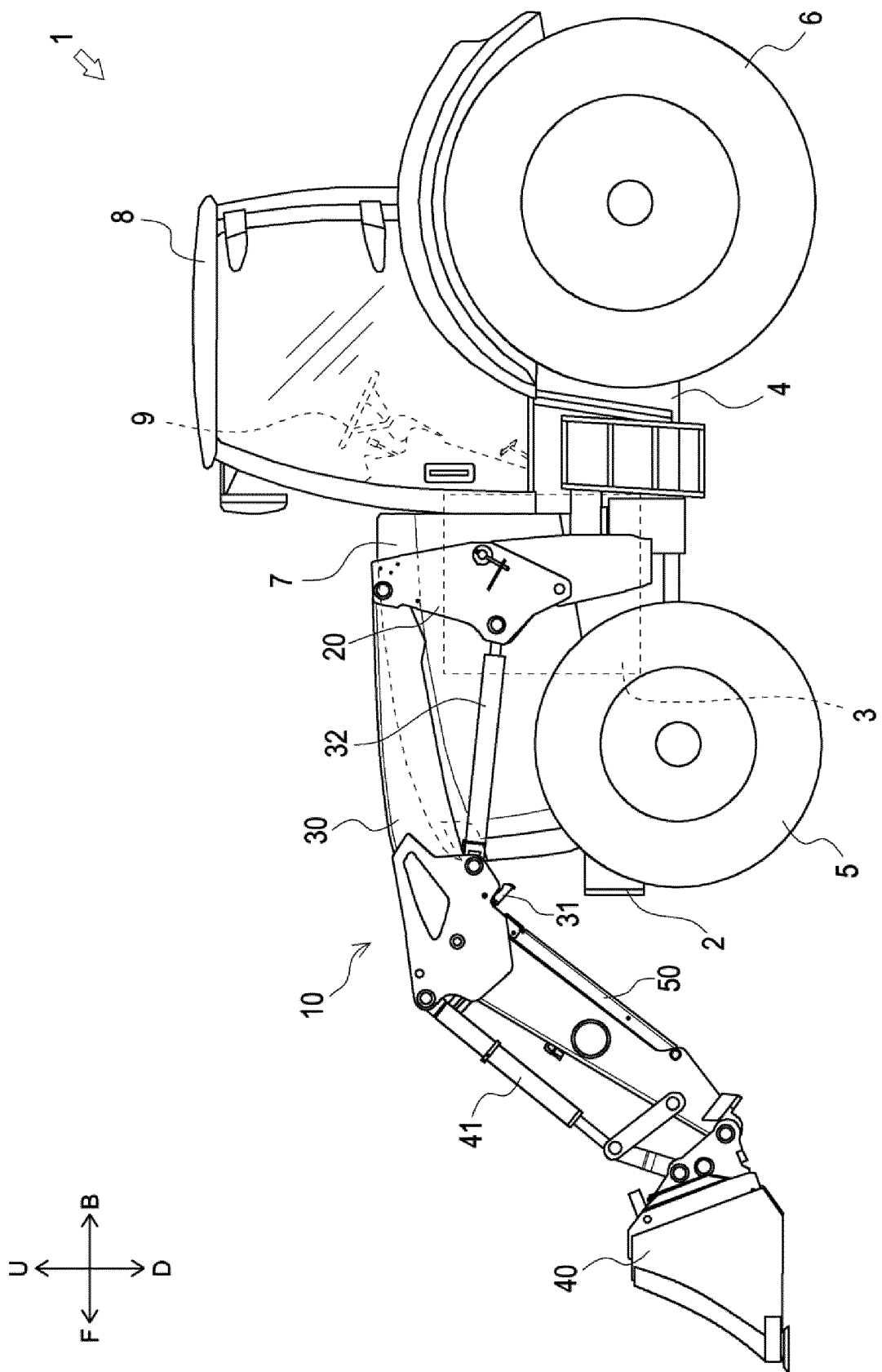


Fig. 1

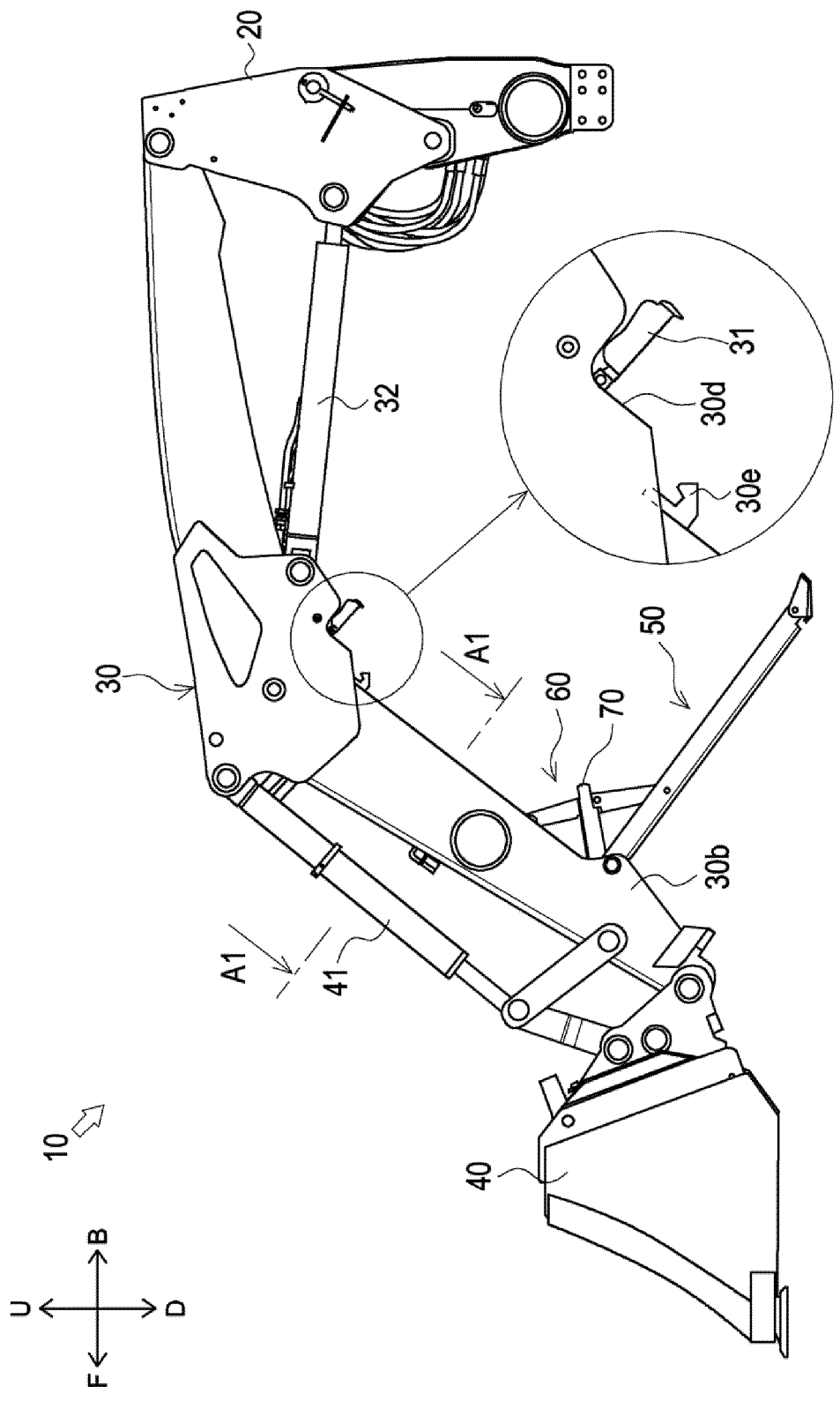
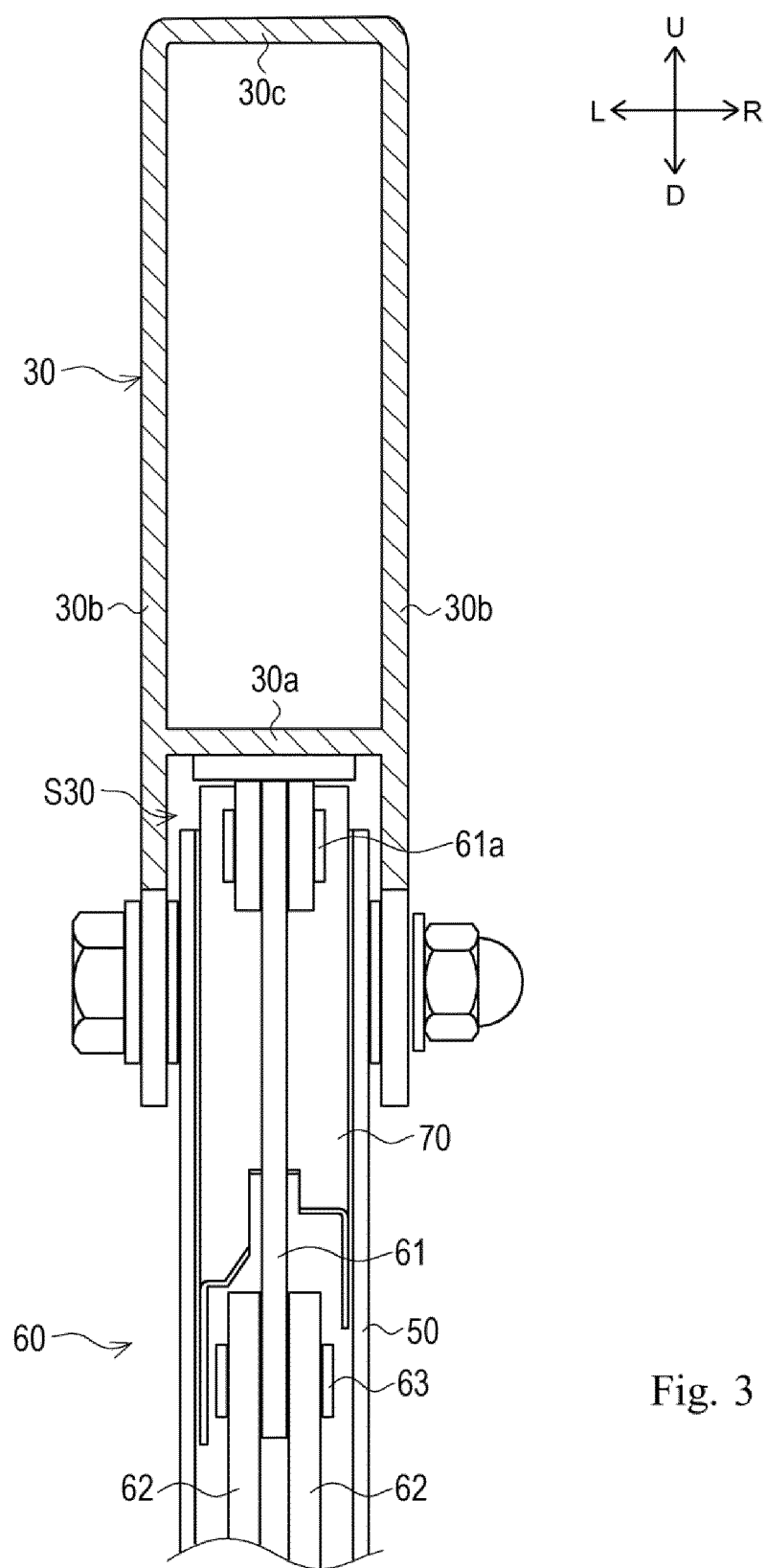


Fig. 2



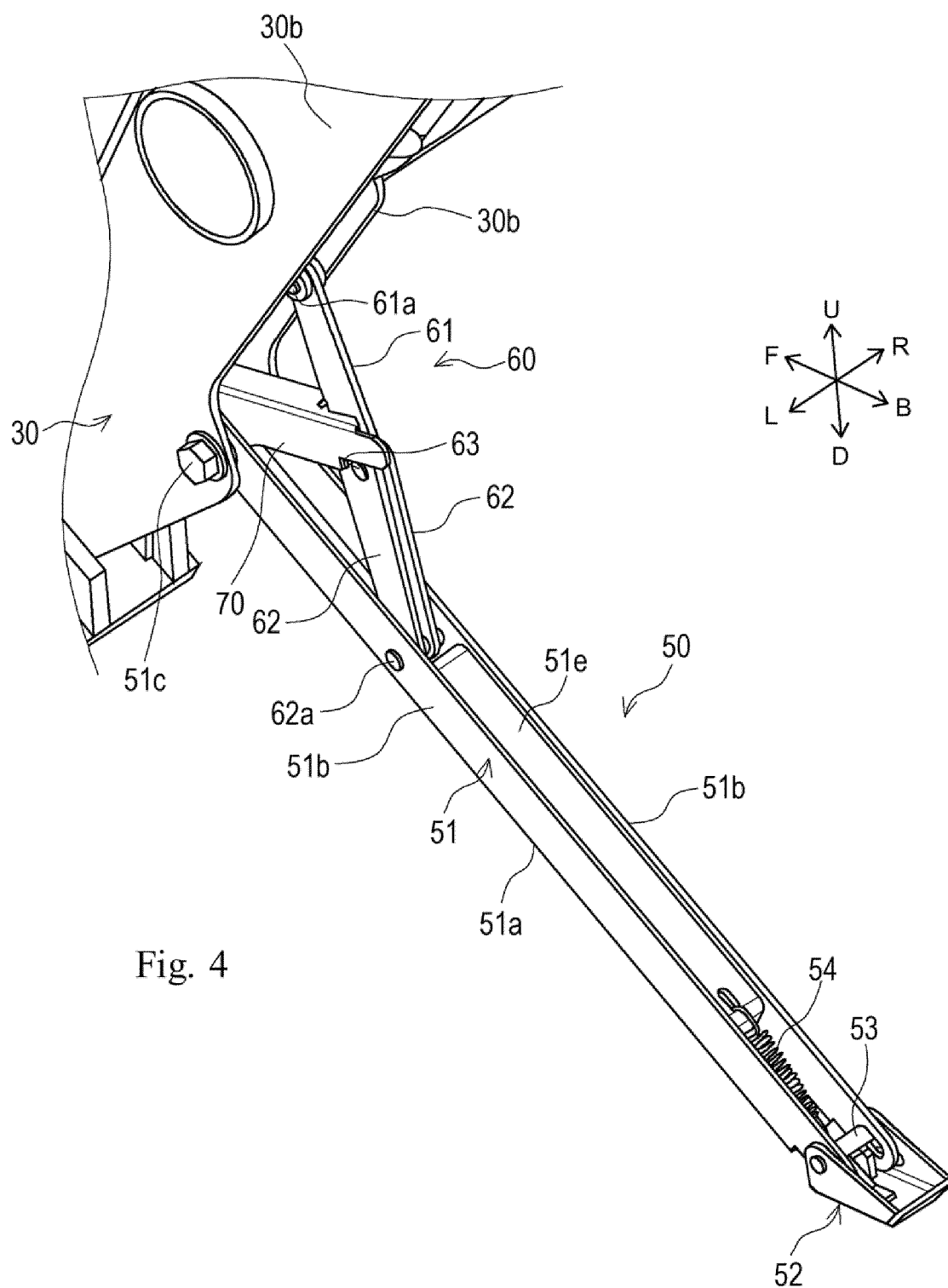


Fig. 4

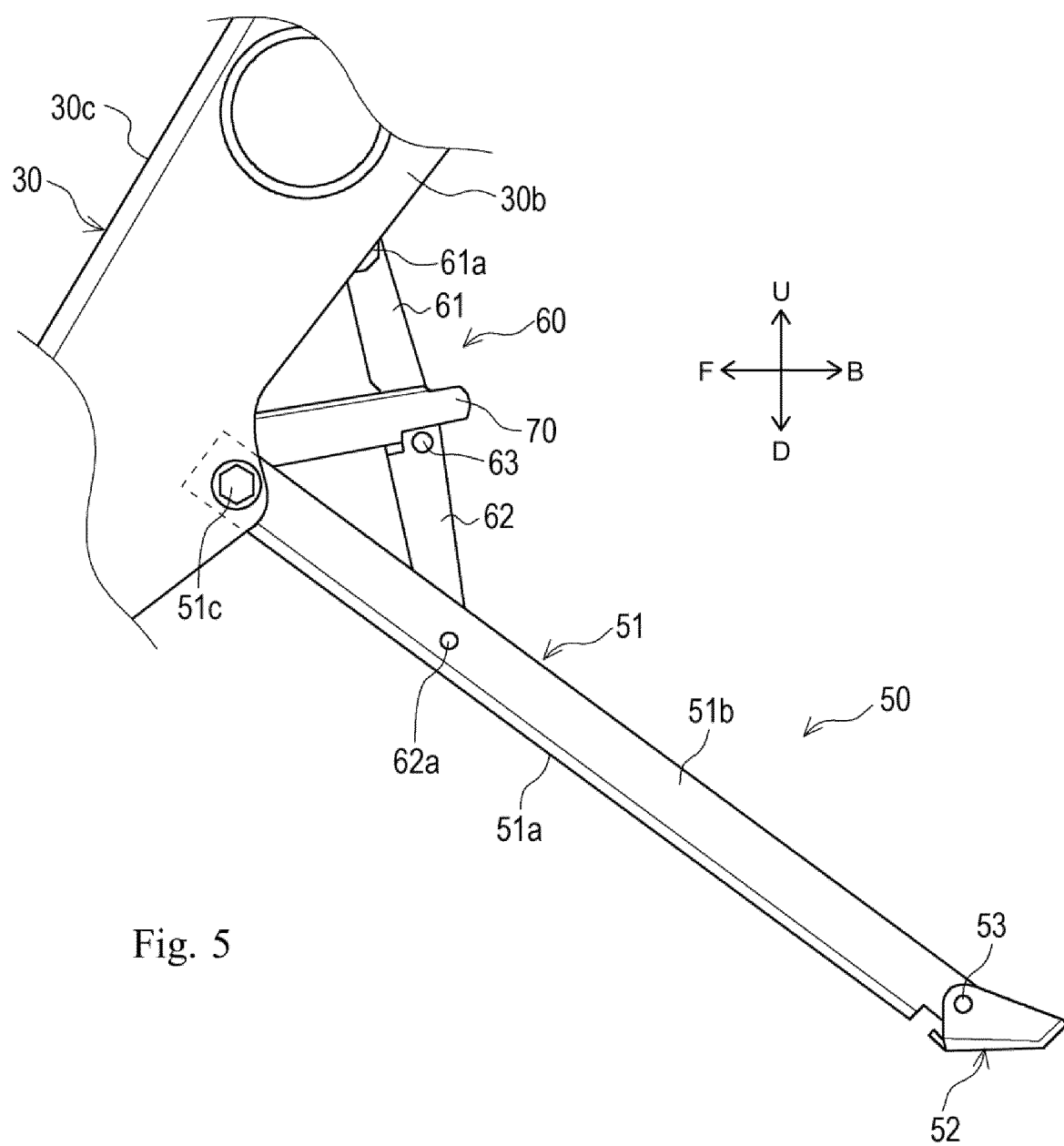


Fig. 5

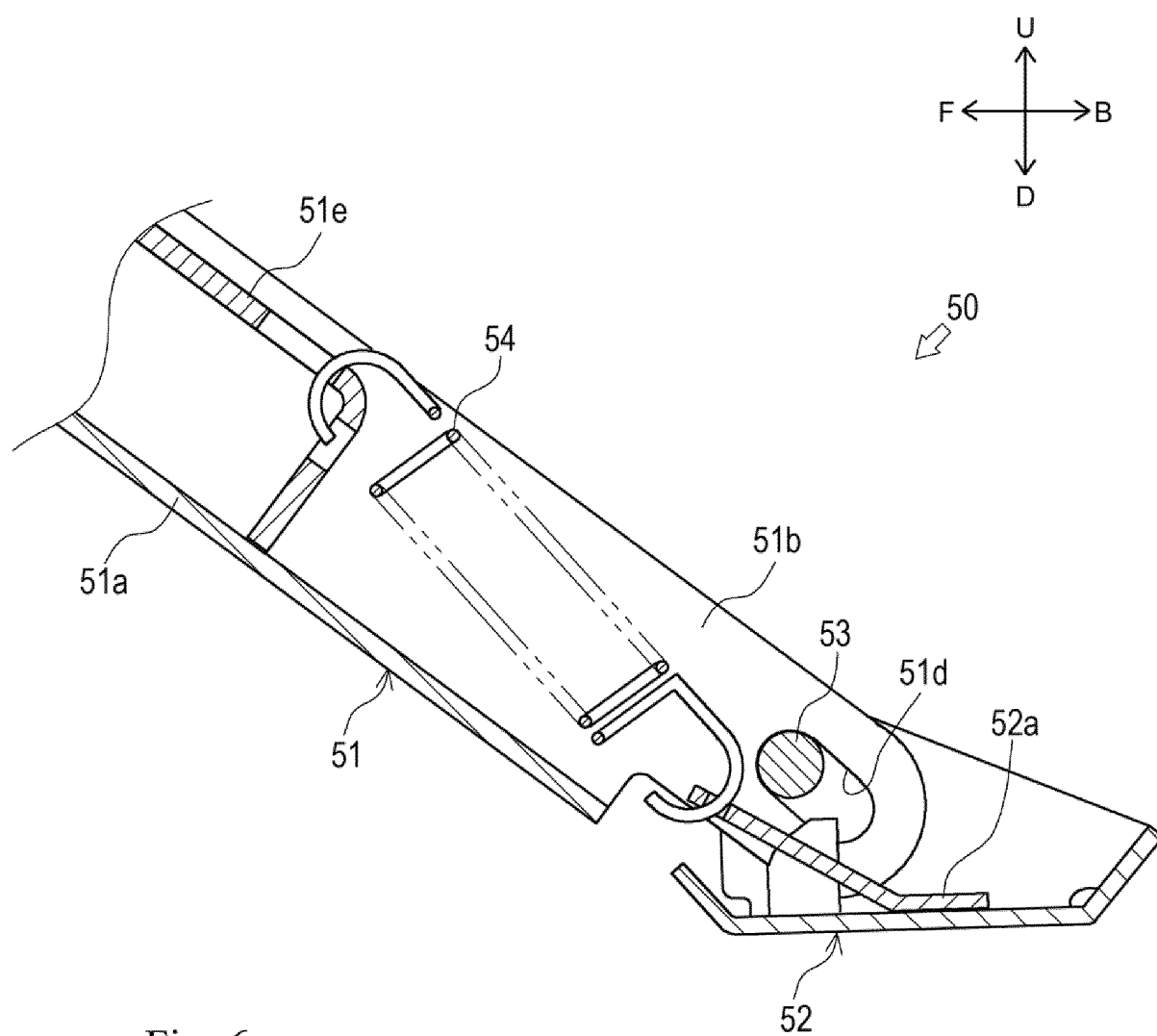
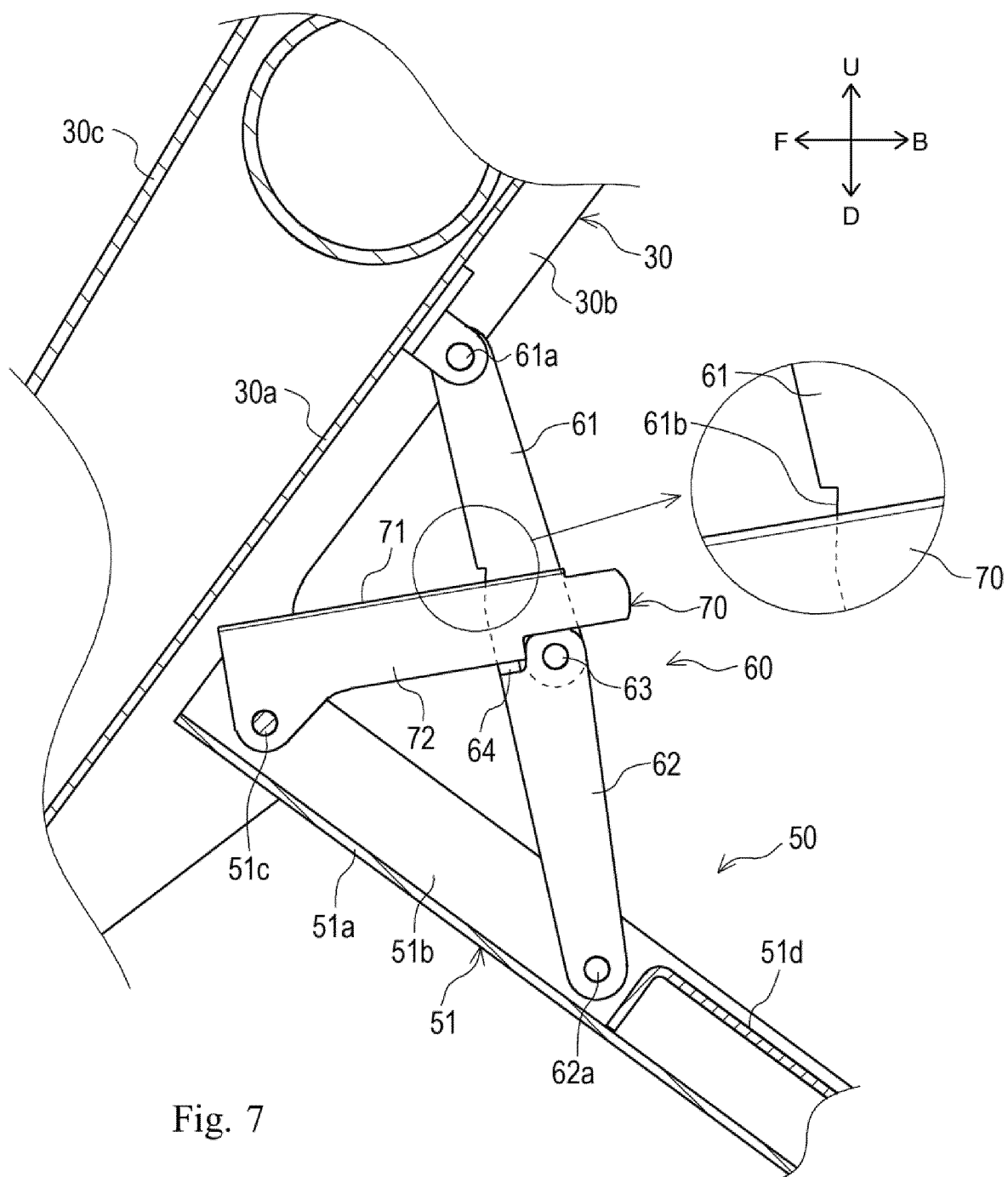


Fig. 6



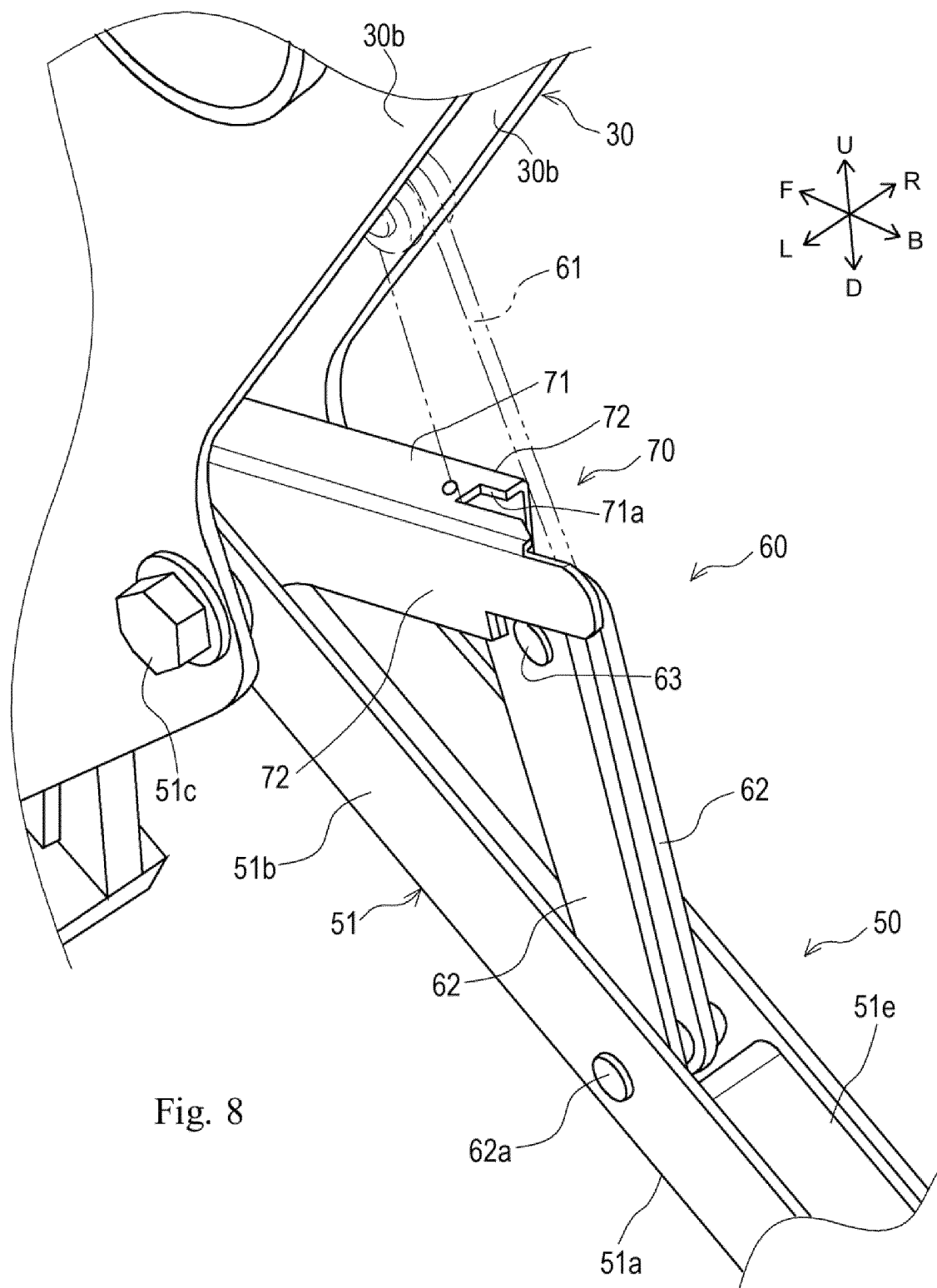
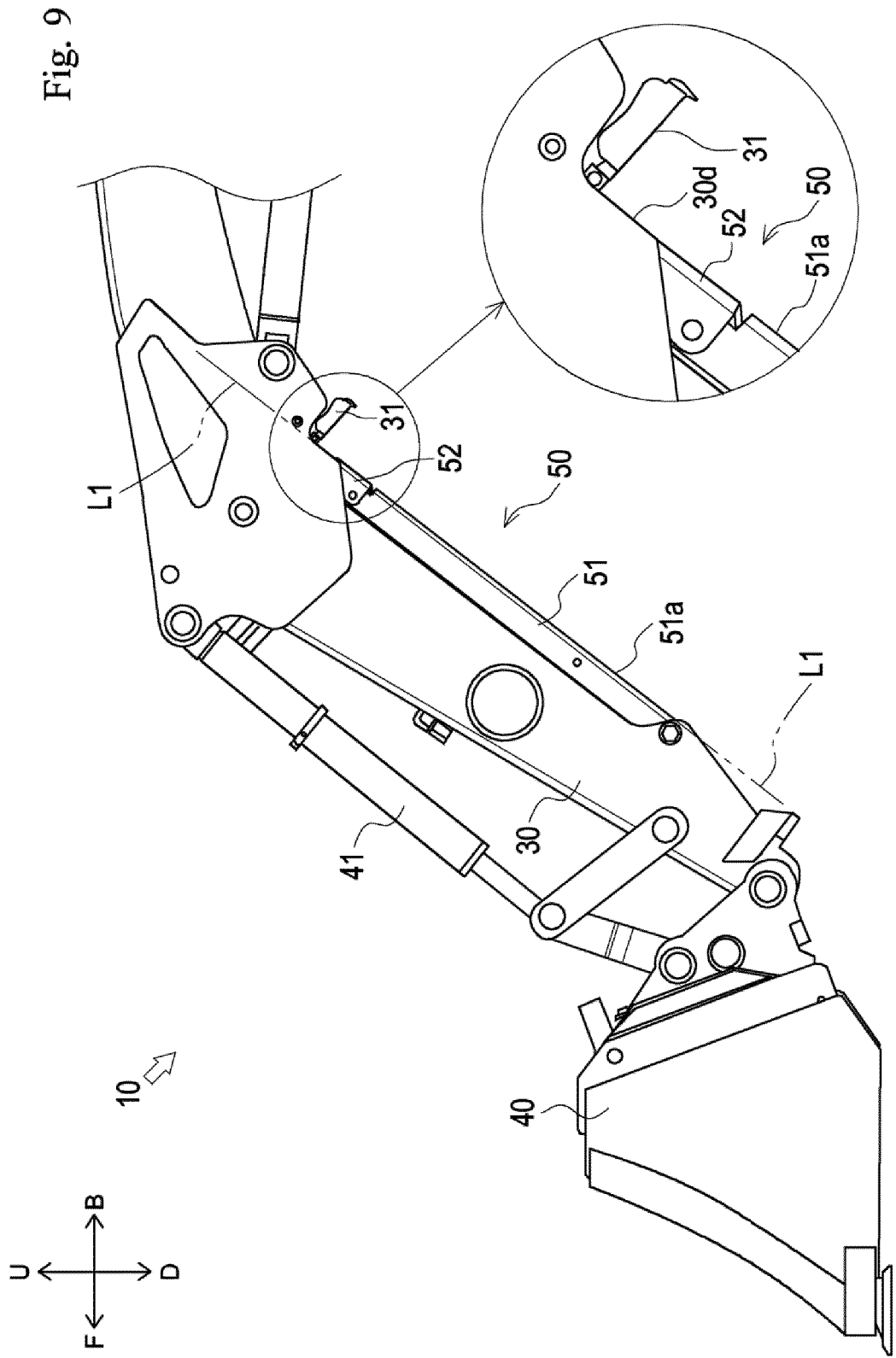


Fig. 8



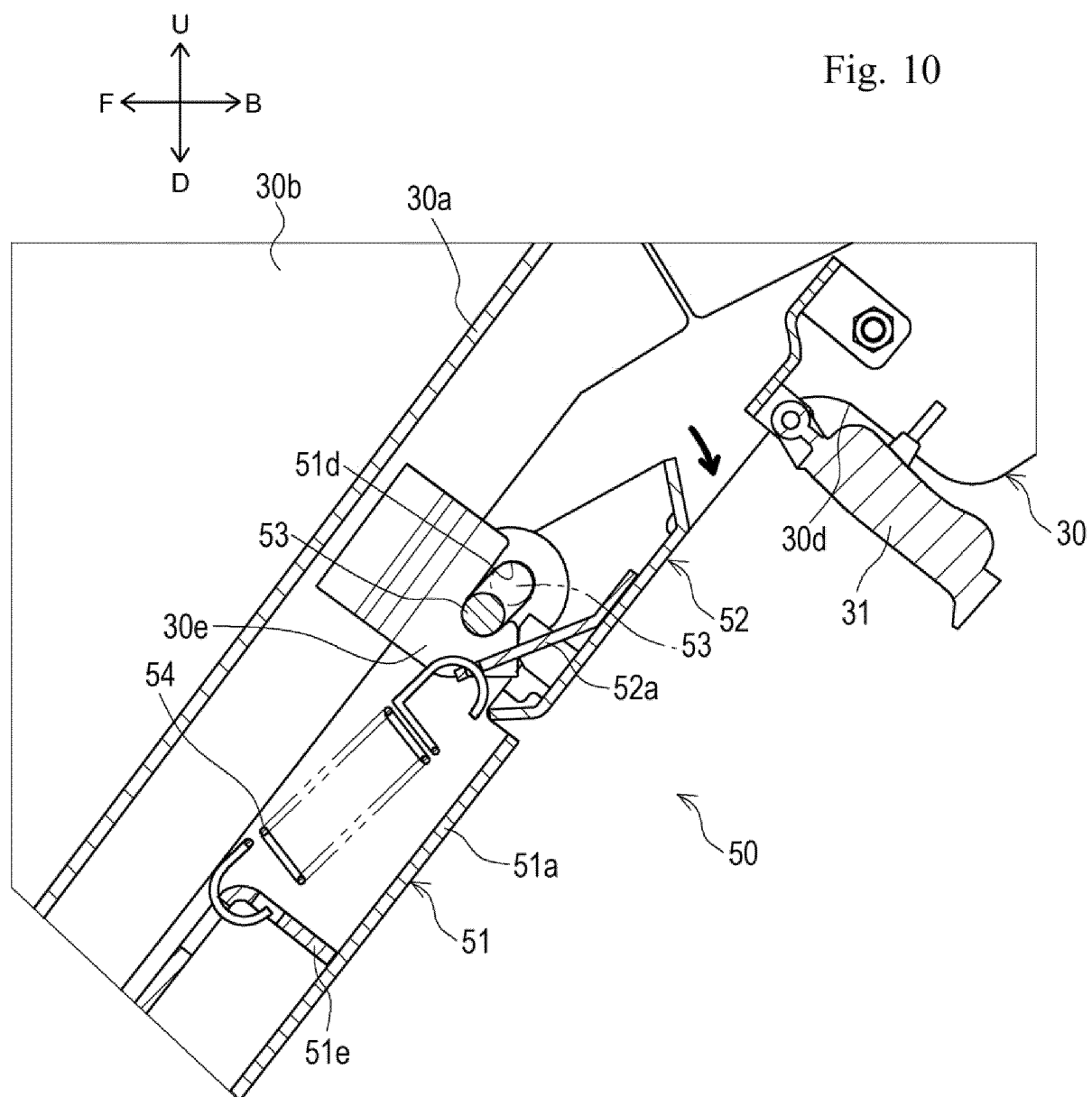


Fig. 11

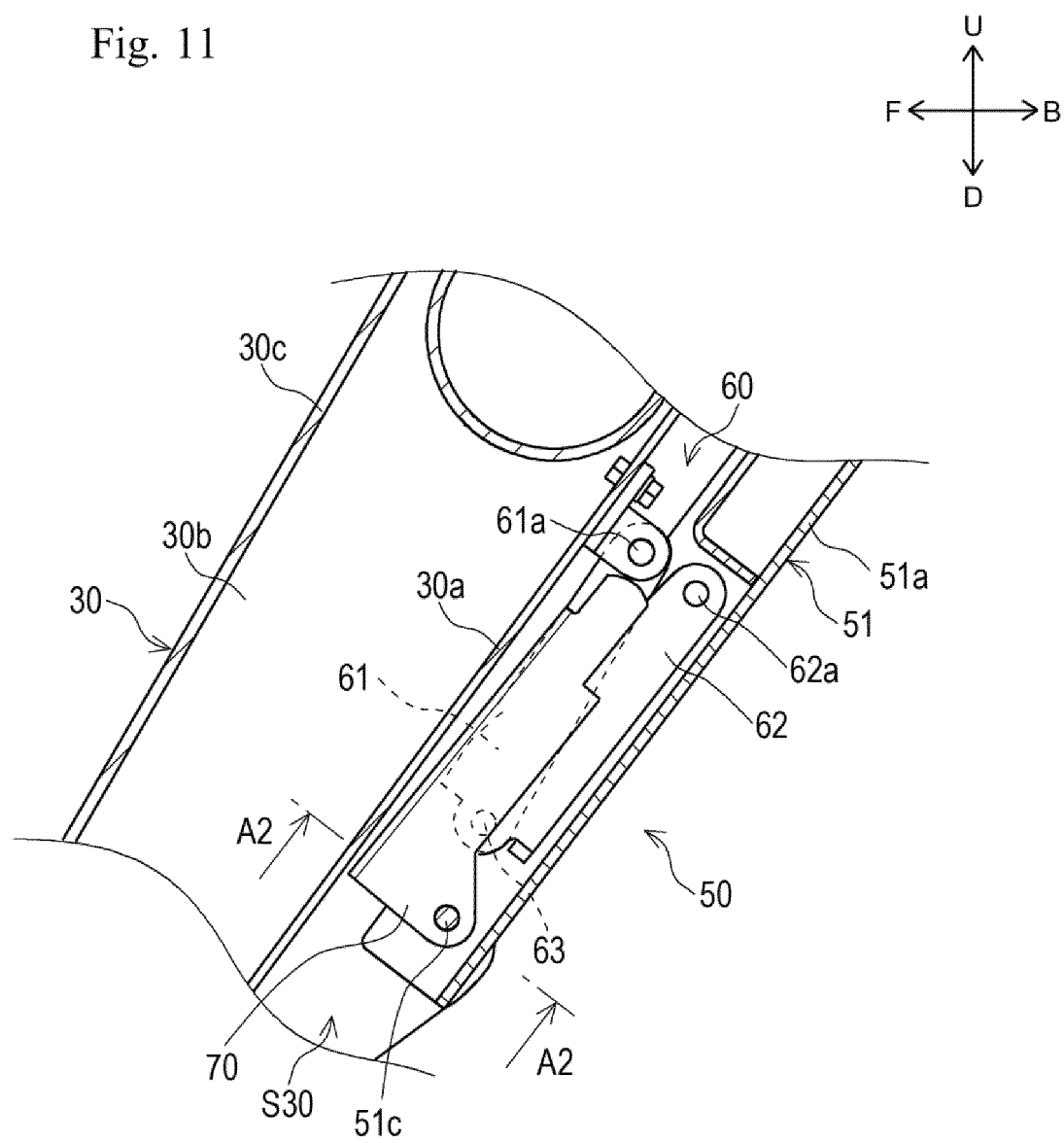


Fig. 12

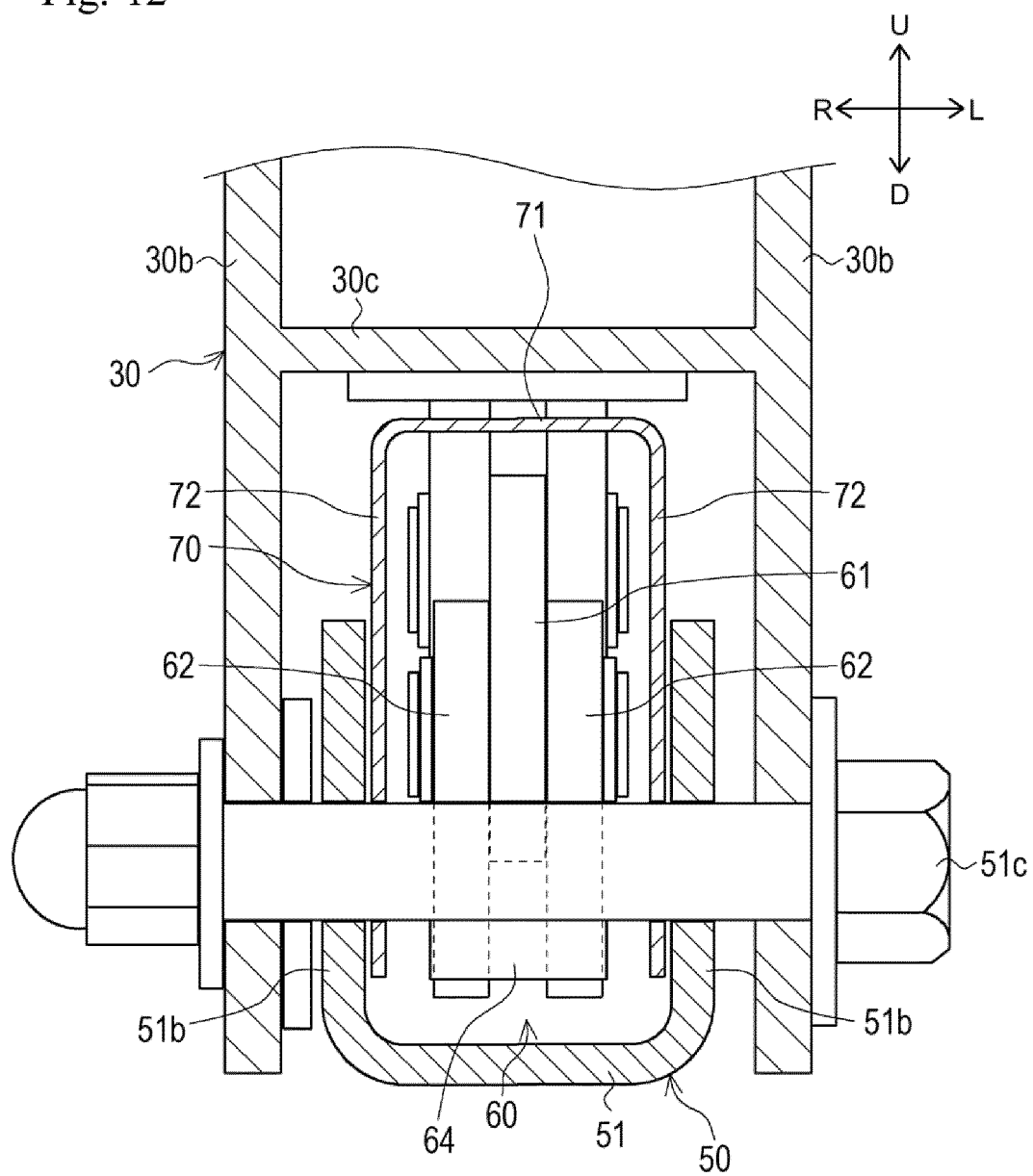


Fig. 13(a)

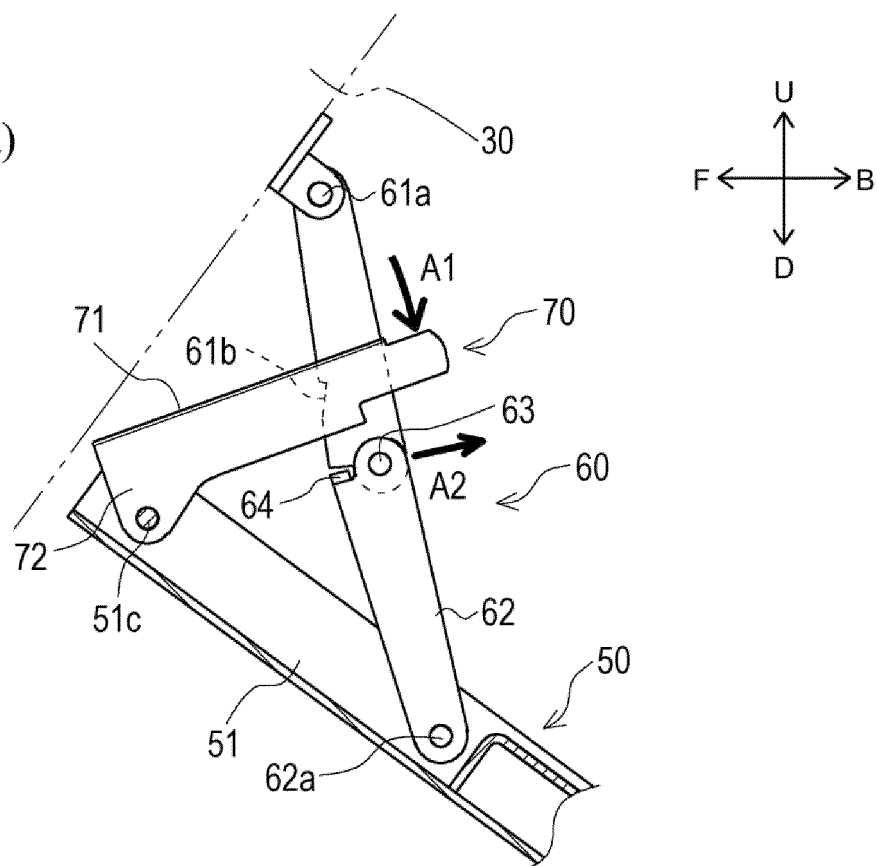
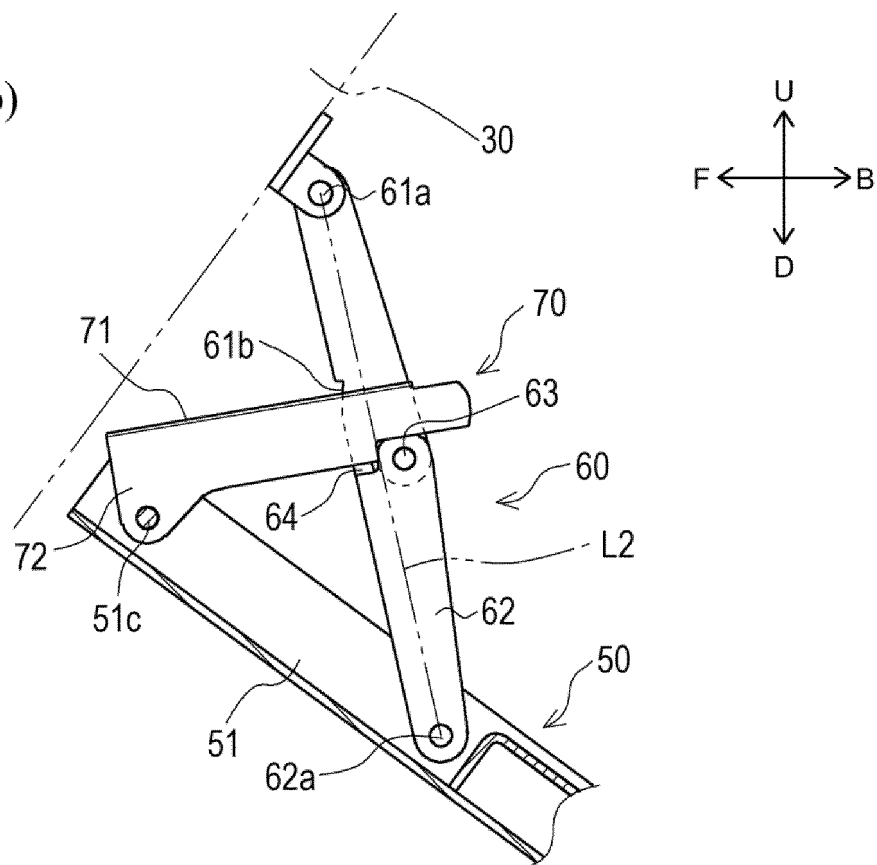


Fig. 13(b)



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2022/041543

A. CLASSIFICATION OF SUBJECT MATTER

E02F 3/34(2006.01)i; *E02F 3/36*(2006.01)i

FI: E02F3/36 D; E02F3/34

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)

E02F3/36; E02F3/34

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 1971-2023
 Registered utility model specifications of Japan 1996-2023
 Published registered utility model applications of Japan 1994-2023

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	JP 2019-116818 A (KUBOTA KK) 18 July 2019 (2019-07-18) paragraphs [0031]-[0079], fig. 4, etc.	1-5, 8
Y	paragraphs [0031]-[0079], fig. 4, etc.	6-7
Y	JP 2019-190024 A (KUBOTA KK) 31 October 2019 (2019-10-31) paragraphs [0168]-[0205], fig. 30, 43, etc.	1-8
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 074852/1976 (Laid-open No. 164306/1977) (YANMAR NOUKI KABUSHIKIGAISSHA) 13 December 1977 (1977-12-13), columns for "fig. 4-6" and "fig. 11-13", etc.	1-8
Y	JP 10-280465 A (KUBOTA KK) 20 October 1998 (1998-10-20) paragraphs [0018]-[0032], fig. 2-4, etc.	1-8

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Date of the actual completion of the international search

10 January 2023

Date of mailing of the international search report

17 January 2023

Name and mailing address of the ISA/JP

Japan Patent Office (ISA/JP)
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Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/JP2022/041543

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 2019-116818 A	18 July 2019	US 2019/0194902 A1 paragraphs [0077]-[0125], fig. 4, etc.	
		US 2019/0194906 A1	
		US 2019/0301128 A1	
		US 2020/0340202 A1	
		US 10036138 B1	
		EP 3505686 A1	
		CN 109972681 A	
JP 2019-190024 A	31 October 2019	US 2019/0323202 A1 paragraphs [0228]-[0265], fig. 30-43, etc.	
		EP 3567164 A2	
JP 52-164306 U1	13 December 1977	(Family: none)	
JP 10-280465 A	20 October 1998	(Family: none)	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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