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(71) Applicant: **Shin Caterpillar Mitsubishi Ltd.
Tokyo 158-8530 (JP)**

(72) Inventors:
• **ONO, Meiichi,
SHIN CATERPILLAR MITSUBISHI LTD.
Tokyo 158-8530 (JP)**
• **OBINATA, Shigeru, SEIRYO ENGINEERING K.K.
Kobe-shi, Hyogo 652-0863 (JP)**

(74) Representative: **Shindler, Nigel
Brookes Batchellor LLP
102-108 Clerkenwell Road
London EC1M 5SA (GB)**

(54) **BLADE DEVICE**

(57) At the back face of a main blade body (21) is provided mounting parts (38), each with a box structure having a mounting hole (40), which is opened in the width direction and with which the cross section in the direction intersecting the width direction is non-circular. At the back face of each width expansion blade body (22) is provided a fitting part (54), which is removably inserted into a mounting hole (40) of the main blade body (21). A latching member (23) is provided for latching of the fitting part (54) that has been fitted in the mounting hole (40). For width expansion, a fitting part

(54) is fitted from the outer end side of a mounting hole (40) to position the width expansion blade body (22) at an end part of the main blade body (21). For housing, a fitting part (54) is fitted from the inner end side of a mounting hole (40) to house and position the width expansion blade body (22) at the back face side of the main blade body (21). In the width-expanded state, loads applied to a width expansion blade body (22) are received by the corresponding mounting part (38) with a box structure to lighten the burden placed on the latching member (23) and enable the latching member (23) to be attached and removed readily.

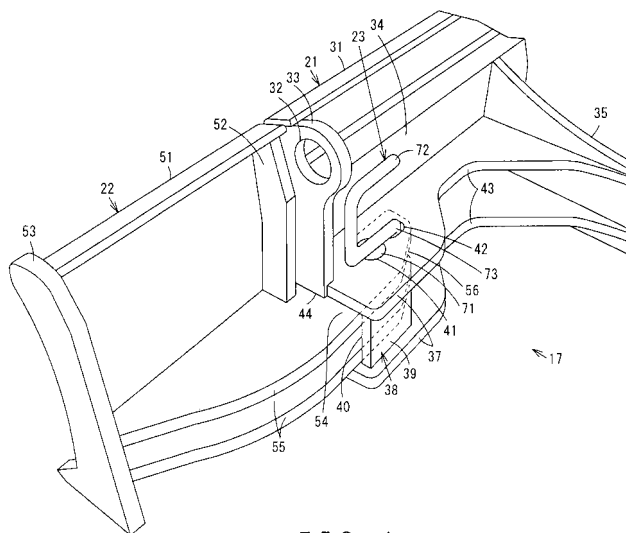


FIG. 1

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Description

Technical Field

[0001] This invention concerns a blade device that can be changed in width.

Background Art

[0002] As examples of conventional working machines equipped with a blade device for use in excavation work, etc., the arrangements disclosed in Japanese Laid-open Patent Publication No. 2000-96602 and Patent No. 2855579 may be cited. With such a working machine, a blade device, mounted to a main machine body, is made variable in width in correspondence to the width variation of travelling devices at the respective sides of the main machine body.

[0003] Among such blade devices that are made variable in width, there is an arrangement wherein a main blade body, which is long in the width direction, has a fixed width dimension, and for width expansion, width expansion blade body are mounted to end parts in the width direction of the main blade body. On the other hand in the width-contracted state in which the width expansion blade body are not used, that is, in the state in which the width expansion blade body are housed, the width expansion blade body are housed by being mounted to the back face side of the main blade body.

[0004] With the blade device described in Japanese Laid-open Patent Publication No. 2000-96602, a pair of upper and lower main blade brackets are disposed at the back face of a main blade body and a pair of upper and lower width expansion blade brackets, which overlap with the upper and lower faces of the main blade brackets, are disposed at the back face of a width expansion blade body. For width expansion, the width expansion blade body is positioned at an end part of the main blade body, the width expansion blade brackets are overlapped with the upper and lower faces of the main blade brackets, and two pins are inserted from above into these width expansion blade brackets and main blade brackets to fix the brackets. For housing, the two pins are pulled out to remove the width expansion blade body from the main blade body, the width expansion blade is positioned at the back face blade of the main blade body upon turning around the front and back faces, the width expansion blade brackets are overlapped with the upper and lower faces of the main blade brackets, and the two pins are inserted from above into these width expansion blade brackets and main blade brackets to fix the brackets. During work in the width-expanded state, loads in the front/back direction of the width expansion blade body are received by the two pins that have been inserted into the width blade brackets and the main blade brackets.

[0005] With the blade device disclosed in Patent No. 2855579, a cylindrical mounting cylinder, which is

opened in the width direction of a main blade body, is provided at the back face of the main blade body, and a columnar mounting shaft, which is inserted into the mounting cylinder, is provided at the back face of a width expansion blade body. For width expansion, the mounting shaft is inserted from the outer end side of the mounting cylinder, the width expansion blade body is positioned at an end part of the main blade body, and a single pin is inserted into mounting holes, which are provided in the mounting cylinder and the mounting shaft and respectively intersect the axial direction, to fix the cylinder and the shaft. For housing, the pin is drawn out and after removing the width expansion blade body from the main blade body, the width expansion blade body is positioned at the back face side of the main blade body upon turning around the front and back faces, the mounting shaft is inserted from the inner end side of the mounting cylinder, and the single pin is inserted into the mounting hole of the mounting cylinder and the mounting hole of the mounting shaft to fix the cylinder and the shaft. Though the mounting shaft that has been inserted into the mounting cylinder is rotatable, by inserting the pin into the mounting hole of the mounting cylinder and the mounting hole of the mounting shaft, the width expansion blade body is prevented from rotating with respect to and falling out from the main blade body.

[0006] With the blade device disclosed in Japanese Laid-open Patent Publication No. 2000-96602, two pins are required to receive loads in the front/back direction that are applied to the width expansion blade body, the insertion/extraction operations of these two pins are not easy, and since loads in the front/back direction that are applied to the width expansion blade body must be received by the pins, a large burden is placed on the pin parts.

[0007] Also with the blade device disclosed in Patent No. 2855579, since by the insertion of the mounting shaft into the mounting cylinder, loads in the front/back direction that are applied to the width expansion blade body are received by the mounting cylinder, a single pin suffices for preventing rotation and fall-out. However, since loads in the direction of rotation of the width expansion blade about the mounting shaft must be received by the pin, a large burden is placed on the pin part. Also, with the width expansion blade body, the mounting shaft is rotatable with respect to the mounting cylinder and the center-of-gravity balance is such that the width expansion blade body is directed downwards about the mounting shaft. Thus in inserting the pin, the pin must be inserted upon matching the positions of the mounting hole of the mounting cylinder and the mounting hole of the mounting shaft while supporting the width expansion blade body against the center-of-gravity balance. The pin therefore cannot be inserted readily. Also in extracting the pin, the edge part of the mounting hole of the mounting shaft, which tends to rotate in accordance with the center-of-gravity balance of the width expansion blade body, presses against the pin. The pin

therefore cannot be extracted readily.

[0008] This invention has been made in view of such points and an object thereof is to provide a blade device, which is lightened in the burden placed on a latching member and with which the attachment and detachment of the latching member can be carried out readily.

Disclosure of the Invention

[0009] This invention's blade device comprises: a main blade body, in turn comprising a main blade, which is long in the width direction, and mounting parts, each disposed at an end part in the width direction of the back face of the main blade and having formed therein a mounting hole, which is opened in the width direction and with which the cross section in the direction intersecting the width direction is non-circular; width expansion blade bodies, each in turn comprising a width expansion blade, which can be positioned at an end part in the width direction of the main blade, and a fitting part, which is disposed at the back face of the width expansion blade and inserts removably into a mounting hole of the main blade body, the width expansion blade being positioned at the end part of the main blade by the fitting of the fitting part from the outer end side of the mounting hole; and latching members, each detachably latching the fitting part of a width expansion blade body that has been fitted into a mounting hole of the main blade body. With this blade device, in the width-expanded state, in which a width expansion blade body is positioned at an end part of the main blade body upon fitting of a fitting part into a mounting hole from the outer end side, loads placed on the width expansion blade body can be received by the mounting part with a box structure, and the latching member that latches the fitting part, fitted in the mounting hole of the mounting part, functions only to prevent the falling out of the fitting part. The burden placed on the latching member is thus lightened and the latching member can also be attached or detached readily.

[0010] Also with this invention's blade device, each width expansion blade body is arranged so that the width expansion blade is positioned at the back face side of the main blade by the fitting of the fitting part from the inner end side of a mounting hole of the main blade body. A width expansion blade can thus be housed at the back face side of the main blade body when it is not used.

[0011] Also with this invention's blade device, the main blade body is equipped with supporting arms, each of which supports an intermediate part in the width direction of the back face of the main blade body, the length in the width direction, including the fitting part, of each width expansion blade body is longer than the interval between a supporting arm and the inner end side of a mounting hole, and each fitting part is enabled to be inserted and removed from the inner end side of a mounting hole by a change of orientation of the width

expansion blade body. Thus even when there is a restriction in regard to the width direction, the fitting part of a width expansion blade body can be inserted and removed from the inner end side of a mounting hole.

Also with this invention's blade device, each mounting part of the main blade body comprises a back face plate of the main blade, a pair of main blade brackets, extending from the back face plate to the supporting arm and spaced apart from each other, and a supporting part, disposed opposite the back face plate and between the pair of main blade brackets, and by shared use of the back face plate equipped by the main blade body and the main blade brackets, each mounting part can be arranged in a simple manner.

[0012] Also with this invention's blade device, the fitting part of each width expansion blade body has a notched part, which allows changing, with respect to the supporting part of a mounting part of the main blade body, of the orientation of the width expansion blade body that is inserted and removed from the inner end side of the corresponding mounting hole. The orientation of the width expansion blade body that is inserted and removed from the inner end side of the mounting hole can thus be changed readily.

[0013] Also with this invention's blade device, each latching member has a single pin, which is inserted into a mounting part of the main blade body and into the fitting part of the width expansion blade body that has been fitted into the mounting hole of the mounting part. The fitting part of the width expansion blade body that has been fitted into the mounting hole of the main blade body can thus be latched with a single pin and the latching member can be attached and detached readily.

[0014] Also with this invention's blade device, each latching member has a single pin, which is inserted into a mounting part of the main blade body and into the fitting part of the width expansion blade body that has been fitted into the mounting hole of the mounting part, and a rotation stopping part, which is inserted into the mounting part of the main blade body and into the fitting part of the width expansion blade body that has been fitted from the inner end side of the mounting hole of the mounting part. The fitting part of the width expansion blade body that is fitted into a mounting hole of the main blade body can thus be latched with a single pin and the latching member can be attached and detached readily. Furthermore, the rotation of the fitting part of the width expansion blade body that has been fitted from the inner end side of the mounting hole is prevented by the rotation stopping part, enabling prevention of the jittering of the width expansion blade body in the housed state.

Brief Description of the Drawings

[0015]

Fig. 1 is a perspective view showing a first embodiment of a blade device by this invention in the

width-expanded state in which a width expansion blade body is used, Fig. 2 is a plan view of the blade device in the width-expanded state, Fig. 3 is a plan view of the housed state in which the width expansion blade body of the blade device is housed, Fig. 4 is a rear view of the blade device in the width-expanded state, Fig. 5 is a side view of a main blade body of the blade device, Fig. 6 is a side view of a working machine to which the blade device is applied, and Fig. 7 is a plan view of the working machine.

Best Mode for Carrying Out the Invention

[0016] This invention shall be described in detail with reference to an embodiment illustrated in Fig. 1 through Fig. 7. Fig. 6 and Fig. 7 show a hydraulic shovel 11 as an example of a working machine. This hydraulic shovel 11 comprises a main machine body 12 and travelling devices 13, disposed at the respective sides in the width direction of main machine body 12.

[0017] Main machine body 12 has an upper rotating body 16 mounted, in a manner enabling rotation via a rotating part 15, to a lower travelling body 14, which can be made to travel by travelling devices 13 at both sides. A driving seat 18 is mounted to an upper part of upper rotating body 16, and a working device 19 for excavation is mounted to the front face of upper rotating body 16.

[0018] Lower travelling body 14 has an unillustrated travelling base, travelling devices 13 are positioned at both sides of this travelling base, and rotating part 15 is positioned at the upper face of the travelling base. Travelling devices 13 at both sides may be of a type that can be expanded or contracted in the width direction by means of a width varying device or of a type that does not have a width varying device and is not expanded or contracted in the width direction. With this embodiment, expansion and contraction in the width direction are enabled.

[0019] A blade device 17 is mounted by being pivotally supported in a manner enabling swinging in the vertical direction with respect to the front side of the travelling base of lower travelling body 14 and is swung in the vertical direction by a hydraulic cylinder 20, disposed between the blade device and the travelling base.

[0020] Blade device 17 is arranged to be changeable in width in an expanding or contracting manner as necessary. That is, as shown in Fig. 7, blade device 17 is equipped with a main blade body 21, which is mounted to main machine body 12, width expansion blade bodies 22, mounted in a detachable manner to the respective end parts in the width direction of main blade body 21, and latching members 23, latching these width expansion blade bodies 22 to main blade body 21. For width expansion, blade device 17 is expanded in width by width expansion blade bodies 22 being mounted to the respective end parts in the width direction of main blade body 21 as indicated by the alternate long and two short

dashed lines in Fig. 7, and for width contraction, that is, for the housing of width expansion blade bodies 22 when they are not used, blade device 17 is contracted in width by width expansion blade bodies 22 being removed from the respective end parts in the width direction of main blade body 21 and housed at the back face side of main blade body 21 as indicated by the solid lines in Fig. 7.

[0021] Blade device 17 is shown in Fig. 1 through Fig. 5. Main blade body 21 of this blade device 17 has a main blade 31, which is an excavation plate that is formed to have a concavely curved cross sectional shape at the front face side and to be long in the width direction, and at both ends of this main blade 31 are mounted end plates 33, each being provided with a suspending hole 32.

[0022] A back face plate 34 is mounted to the back face of main blade 31 and at intermediate parts in the width direction of this back face plate 34 are mounted a pair of supporting arms 35 that are pivotally supported in a swingable manner by main machine body 12, that is, by the travelling base of lower travelling body 14. A connection part 36 is connected between the inner faces of these pair of supporting arms 35 and a hydraulic cylinder 20 is connected to connection part 36. At the outer face side of each supporting arm 35 are mounted a pair of main blade brackets 37, which extend from back face plate 34 to supporting arm 35 and are separated from each other in the vertical direction.

[0023] At the respective end parts of the back face of main blade 31 are formed mounting parts 38 for detachably mounting width expansion plates 22. Each mounting part 38 is formed as a box structure having back face plate 34, the pair of upper and lower main blade brackets 37, and a plate-shaped supporting part 39, which opposes back face plate 34 in parallel between main blade brackets 37. At the inner side of mounting part 38, which is surrounded by back face plate 34, the pair of upper and lower main blade brackets 37, and supporting part 39 is formed a mounting hole 40, which opens through in the width direction and with which the cross section in the direction intersecting the width direction is non-circular, that is, rectangular. Mounting part 38 has formed therein latching holes 41, which pass coaxially through the pair of upper and lower main blade brackets 37 in the vertical direction, and an engaging hole 42, which passes through the upper main blade bracket 37 in the vertical direction alongside latching holes 41. Engaging hole 42 is formed to have a slot-like shape that is long in the direction of latching holes 41.

[0024] With each pair of upper and lower main blade brackets 37, the rear edge parts between supporting arm 35 and mounting part 38 are gouged towards main blade 31 at the front, thereby forming relief parts 43, which allow the housing of a width expansion blade body 22.

[0025] Each end plate 33 has a notched part 44 formed in correspondence to the shape of the opening

of mounting hole 40.

[0026] Each width expansion blade body 22 has a width expansion blade 51, which is formed to have the same cross sectional shape as main blade body 31, that is, a cross sectional shape, which is concavely curved at the front face side, and end plates 52 and 53 are respectively mounted to one end and the other end in the width direction of this width expansion blade 51. A fitting part 54, which is removably inserted into mounting hole 40 of mounting part 38 of main blade body 21, is positioned at the back face of each width expansion blade 51. This fitting part 54 has a pair of upper and lower width expansion blade brackets 55 that are mounted to the back face of width expansion blade 51, and the ends at one side of these width expansion blade brackets 55 protrude from one end side of width expansion blade 51 and fitting part 54 is formed at the protruding parts at the ends at one side of these width expansion blade brackets 55. The cross sectional shape of fitting part 54 is formed to a non-circular shape, that is, a substantially rectangular shape by the upper and lower faces and front and rear faces of the upper and lower width expansion blade brackets 55 and is formed to a shape enabling fitting into mounting hole 40 of mounting part 38.

[0027] As shown in Fig. 2, for width expansion by each width expansion blade body 22, fitting part 54 is fitted from the outer end side of mounting hole 40 of mounting part 38 and width expansion blade 51 is thereby positioned at an end part of main blade 31. Also as shown in Fig. 3, for width contraction, that is, for housing, fitting part 54 is fitted from the inner end side of mounting hole 40 of mounting part 38 and width expansion blade 51 is thereby positioned in a housed manner at the back face side of main blade 31.

[0028] In the state in which fitting part 54 is fitted in mounting hole 40 of mounting part 38, the upper and lower faces of the upper and lower width expansion blade brackets 55 of fitting part 54 are fitted in contact with the mutually opposing faces of the upper and lower main blade brackets 37 of mounting part 38, and the front and rear faces of the upper and lower width expansion blade brackets 55 of fitting part 54 are fitted in contact with mutually opposing faces of back face plate 34 and supporting part 39 of mounting part 38. Thus in the state in which the width is expanded and fitting part 54 is fitted in mounting part 38 and width expansion blade 51 is positioned at the end part of main blade 31, the position of width expansion blade body 22 is set in a restricted manner with respect to main blade body 21 in regard to its position in the front/rear direction, vertical direction, and direction of rotation about the fitted portion, and loads in the front/rear direction, vertical direction, and direction of rotation about the fitted portion that are applied during work can be received by mounting part 38, which has a box structure.

[0029] Though as shown in Fig. 2, the length L1 of width expansion blade body 22, including fitting part 54, is longer than the interval L2 between supporting arm

35 and the inner end side of mounting hole 40 of main blade body 21, by a change of orientation by rotational movement of width expansion blade body 22 as shown in Fig. 3, fitting part 54 can be inserted and removed from the inner end side of mounting hole 40.

[0030] At one rim of fitting part 54 at the side opposite the width expansion blade 51 side at the front end is formed a guide part 56, which has been chamfered obliquely to serve as a guide for insertion of fitting part 54 into mounting hole 40 during width expansion and to prevent interference of fitting part 54 with back face plate 34 of main blade body 21 during the housing process. Also, at the other rim of fitting part 54 at the width expansion blade 51 side at the front end is formed a notched part 57, which, in the housing process, allows a change of orientation by rotational movement of width expansion blade body 22 with respect to supporting part 39 of mounting part 38 for insertion or removal of fitting part 54 from the inner end side of mounting hole 40 as shown in Fig. 3.

[0031] Latching holes 58, which are positioned so as to be coaxial to latching holes 41 of mounting part 38 in the state in which the pair of upper and lower width expansion blade brackets 55 of fitting part 54 are fitted in mounting hole 40 of mounting part 38, are formed through the brackets in the vertical direction, and in the upper width expansion blade bracket 55 are formed engaging holes 59 and 60, which are positioned coaxial to engaging hole 42 of mounting part 38. These engaging holes 59 and 60 are disposed at two locations at the front end side and the base end side of fitting part 54 for the width expansion process, in which fitting part 54 is fitted from the outer end side of mounting hole 40, and for the housing process, in which insertion is performed from the inner end side.

[0032] Latching member 23 has a single, columnar pin 71, which is removably inserted into latching holes 41 of mounting part 38 and latching holes 58 of fitting part 54, and a handle 72 for the insertion and removal operation of pin 71 is fixed to one end of pin 71. Handle 72 is formed by bending a columnar wire rod into a substantially U-like shape, is fixed at one end side to pin 71, and has formed, at the front end of this one end side, a rotation stopping part 73, which is bent so as to be parallel to pin 71 and is inserted into engaging hole 42 of mounting part 38 and engaging hole 59 or engaging hole 60 of fitting part 54.

[0033] Of the upper and lower latching holes 41 of mounting part 38 into which pin 71 is inserted, the inner diameter of the upper latching hole 41 is formed at a dimensional precision that is comparatively high with respect to the outer diameter of pin 71. The dimensional precision of the lower latching hole 41 may be made lower in comparison to that of the upper latching hole 41 to facilitate manufacture.

The operations and effects of the present embodiment shall now be described.

[0034] As shown by the alternate long and two short

dashed lines in Fig. 7, blade device 17 is expanded in width in accompaniment with the width expansion of travelling devices 13 at the respective sides of hydraulic shovel 11.

[0035] To expand the width of blade device 17, fitting part 54 of a width expansion blade body 22 is inserted and fitted from the outer end side of mounting hole 40 of a mounting part 38 of main blade body 21 and width expansion blade body 22 is thereby positioned at an end part of main blade body 21 as shown in Fig. 1, Fig. 2, and Fig. 4. In the state in which fitting part 54 is fitted in mounting hole 40 of mounting part 38, width expansion blade body 22 is set and restricted in position in the front/rear direction, vertical direction, and direction of rotation about the fitted portion with respect to main blade body 21, and thus latching holes 58 and engaging hole 59 of fitting part 54 are respectively positioned coaxial to latching holes 41 and engaging hole 42 of mounting part 38.

[0036] Pin 71 of latching tool 23 is matched to latching holes 41 of mounting part 38 and inserted into these latching holes 41 and latching holes 58 of fitting part 54, and furthermore, rotation stopping part 73 is matched to engaging hole 42 and inserted into this engaging hole 42 and engaging hole 59 of fitting part 54. In this width-expanded state, the position of width expansion blade body 22 in the direction of rotation about pin 71 is set by mounting part 38 with a box structure. Rotation stopping part 73 functions to prevent the rotation of latching member 23, including pin 71.

[0037] In this width-expanded state in which width expansion blade body 22 is positioned at the end part of main blade body 21 with fitting part 54 being fitted from the outer end side of mounting hole 40, loads of the vertical direction, front/rear direction, and direction of rotation about the fitted portion that are applied to width expansion blade body 22 can be received by mounting part 38 with a box structure.

[0038] Latching member 23, which latches fitting part 54 that has been fitted into mounting hole 40 of mounting part 38, thus functions only as a part for preventing the fall-out of fitting part 54 and the burden placed on latching member 23 can thus be lightened. Latching by just the single pin 71 of latching member 23 is thus enabled.

[0039] By providing supporting part 39 between the pair of main blade brackets 37 so as to oppose back face plate 34 in addition to back face plate 34 of main blade 31 and the pair of main blade brackets 37, extending in mutually separated manner from back face plate 34 to supporting arm 35, mounting part 38 with a box structure can be arranged simply by shared use of back face plate 34 and main blade brackets 37, which are generally equipped by main blade body 21.

[0040] Also, blade device 17 is contracted in width in accompaniment with the contraction of width of travelling devices 13 at the respective sides of hydraulic shovel 11 as shown in Fig. 7.

[0041] To contract the width of blade device 17, fitting

part 54 of a width expansion blade body 22 is fitted by insertion from the inner end side of a mounting hole 40 of main blade body 21 to position width expansion blade body 22 at the back face side of main blade body 21 as shown in Fig. 3.

[0042] Here, even though there is a restriction in the width direction due to the length L1 of width expansion blade body 22 in the width direction, including fitting part 54, being longer than the interval L2 between supporting arm 35 and the inner end side of mounting hole 40 of main blade body 21, fitting part 54 can be inserted and fitted at the inner end side of mounting hole 40 by a change of orientation by rotational movement of width expansion blade body 22. Furthermore, notched part 57, provided at fitted part 54 of width expansion blade body 22, allows the change of orientation by rotational movement of width expansion blade body 22, which is inserted into the inner end side of mounting hole 40, with respect to supporting part 39 of mounting part 38 of main blade body 21.

[0043] In the state in which fitting part 54 is fitted in mounting hole 40 of mounting part 38, width expansion blade body 22 is set and restricted in position in the front/rear direction, vertical direction, and direction of rotation about the fitted portion with respect to main blade body 21, and thus latching holes 58 and engaging hole 60 of fitting part 54 are respectively positioned coaxial to latching holes 41 and engaging hole 42 of mounting part 38.

[0044] Pin 71 of latching tool 23 is matched to latching holes 41 of mounting part 38 and inserted into these latching holes 41 and latching holes 58 of fitting part 54, and furthermore, rotation stopping part 73 is matched to engaging hole 42 and inserted into this engaging hole 42 and engaging hole 60 of fitting part 54.

[0045] By this fitting of fitting part 54 from the inner end side of mounting hole 40, width expansion blade body 22 can be positioned and housed at the back face side of main blade body 21.

[0046] Also, in housing width expansion blade body 22 from the width-expanded state or in contracting the width from the housed state, the work can be performed by removing fitting part 54 from mounting hole 40 of mounting part 38 by drawing out pin 71 and rotation stopping part 73 of latching member 23 from mounting part 38 and fitting part 54.

[0047] Since loads of the front/rear direction, vertical direction, and direction of rotation about the fitted portion that are applied to width expansion blade body 22 can be received by mounting part 38 with a box structure, a single pin suffices as pin 71 of latching member 23 that functions only to prevent fall-out and attachment/detachment operations of pin 71 can thus be performed readily. Furthermore, the rotation of fitting part 54 of width expansion blade body 22, which has been fitted from the inner end side of mounting hole 40, is prevented by rotation stopping part 73, provided at one end of handle 72 of latching member 23, and the jittering of

width expansion blade body 22 in the housed state can thus be prevented.

[0048] By use of such a blade device 17, a hydraulic shovel 11 or other working machine that exhibits the above-described actions and effects of blade device 17 can be provided. 5

[0049] Though latching member 23 is equipped with a single pin 71 and a rotation stopping part 73, as long as at least pin 71 is equipped, fitting part 54, which has been fitted into mounting hole 40 of mounting part 38 can be latched and prevented from falling out. Though in this case, jittering of width expansion blade body 22 will occur when width expansion blade body 22 is housed, the jittering of width expansion blade body 22 can be prevented by devising the shape of fitting part 54, etc. so that the position in the direction of rotation about pin 71 can be set and fixed. 10 15

[0050] Also, in a case where latching member 23 is not provided with rotation stopping part 73, a fall-out prevention structure may be employed wherein, by rotation of latching member 23 in the state in which pin 71 is inserted in mounting part 38, one end of handle 72 is engaged or released, for example, with respect to an L-shaped metal member provided on mounting part 38 and the falling out of pin 71 is prevented by the engagement of this end of handle 72 and the metal member. 20 25

[0051] Also, latching member 23 is not limited to pin 71, and a tightening means that includes a bolt and a nut may be used instead, and in the case where such a tightening means is used, the latched state of mounting part 38 and fitting part 54 can be maintained securely. 30

[0052] Also, though with the above-mentioned embodiment, blade device 17 is applied to a hydraulic shovel 11, with an arrangement wherein travelling devices 13 at the respective sides of lower travelling body 14 are enabled to expand and contract in the width direction by a width varying device, application to a hydraulic shovel 11, with an arrangement without a width varying device and wherein travelling devices 13 at the respective sides of lower travelling body 14 do not expand or contract in the width direction, is also possible and the same operations and effects are exhibited in such a case as well. 35 40

Industrial Applicability

[0053] This invention's blade device can be applied not only to hydraulic shovels but widely for resolving problems of working machines equipped with a blade device that is enabled to be changed in width. 45 50

Claims

1. A blade device comprising:

a main blade body, in turn comprising a main blade, which is long in the width direction, and mounting parts, each disposed at an end part 55

in the width direction of the back face of the main blade and having formed therein a mounting hole, which is opened in the width direction and with which the cross section in the direction intersecting the width direction is non-circular; width expansion blade bodies, each in turn comprising a width expansion blade, which can be positioned at an end part in the width direction of the main blade, and a fitting part, which is disposed at the back face of the width expansion blade and inserts removably into a mounting hole of the main blade body, the width expansion blade being positioned at the end part of the main blade by the fitting of the fitting part from the outer end side of the mounting hole; and 5 10 15

latching members, each detachably latching the fitting part of a width expansion blade body that has been fitted into a mounting hole of the main blade body.

2. The blade device according to Claim 1, wherein each width expansion blade body is arranged so that the width blade is positioned at the back face side of the main blade by the fitting of the fitting part from the inner end side of a mounting hole of the main blade body.

3. The blade device according to Claim 2, wherein the main blade body is equipped with supporting arms, each supporting an intermediate part in the width direction of the back face of the main blade body, the length in the width direction, including the fitting part, of each width expansion blade body is longer than the interval between a supporting arm and the inner end side of a mounting hole of the main blade body, and each fitting part is enabled to be inserted and removed from the inner end side of a mounting hole by a change of orientation of the width expansion blade body.

4. The blade device according to Claim 3, wherein each mounting part of the main blade body comprises a back face plate of the main blade, a pair of main blade brackets, extending from the back face plate to a supporting arm and spaced apart from each other, and a supporting part, disposed opposite the back face plate and between the pair of main blade brackets.

5. The blade device according to Claim 4, wherein the fitting part of each width expansion blade body has a notched part, which allows changing, with respect to the supporting part of a mounting part of the main blade body, of the orientation of the width expansion blade body that is inserted and removed from the inner end side of the corresponding mounting hole.

6. The blade device according to any of Claims 1 through 5, wherein
each latching member has a single pin, which is inserted into a mounting part of the main blade body and into the fitting part of the width expansion blade body has been fitted into the mounting hole of the mounting part. 5
7. The blade device according to any of Claims 2 through 5, wherein 10
each latching member has a single pin, which is inserted into a mounting part of the main blade body and into the fitting part of the width expansion blade body has been fitted into the mounting hole of the mounting part, and a rotation stopping part, 15
which is inserted into the mounting part of the main blade body and into the fitting part of the width expansion blade body has been fitted from the inner end side of the mounting hole of the mounting part. 20
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- 55

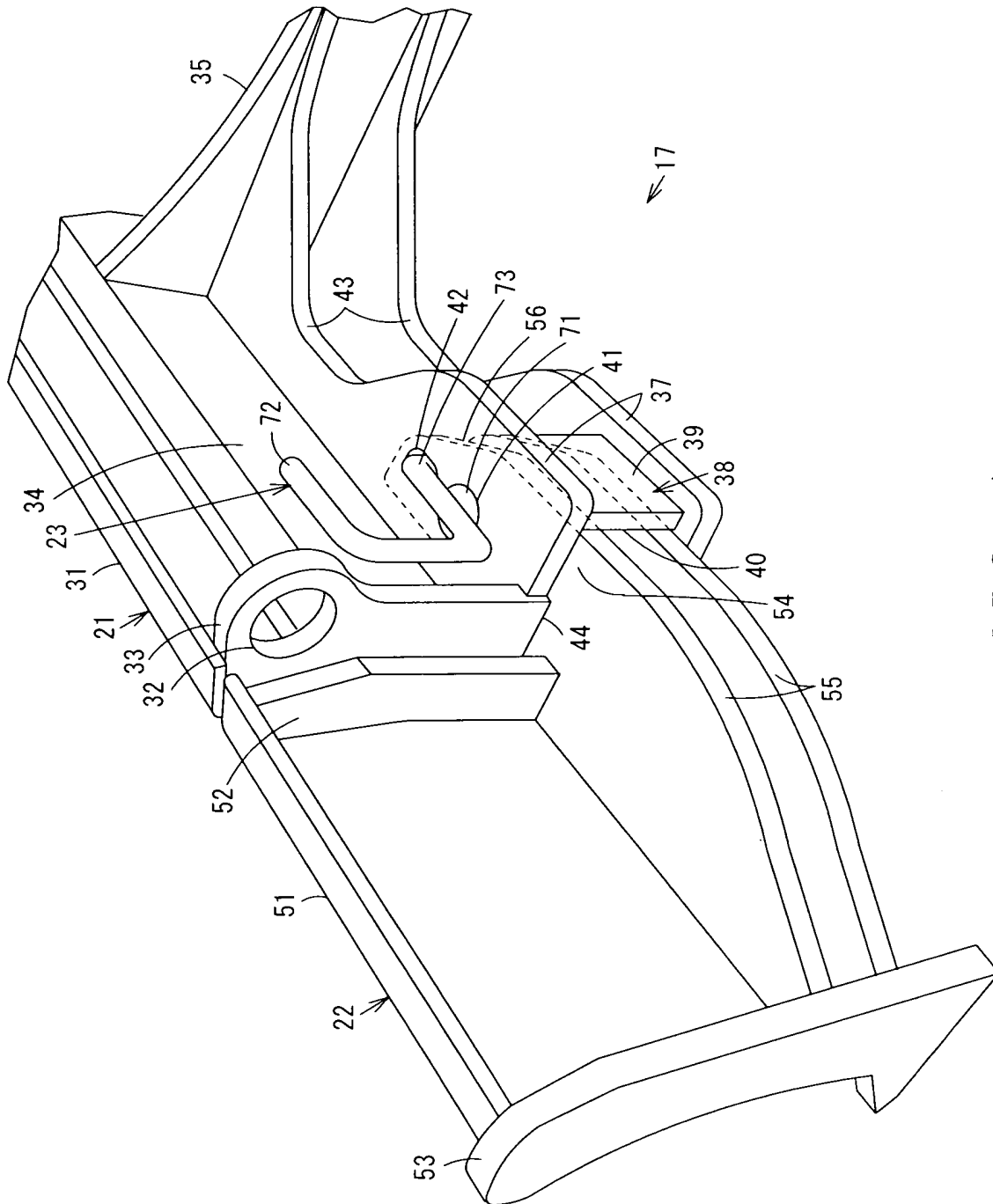


FIG. 1

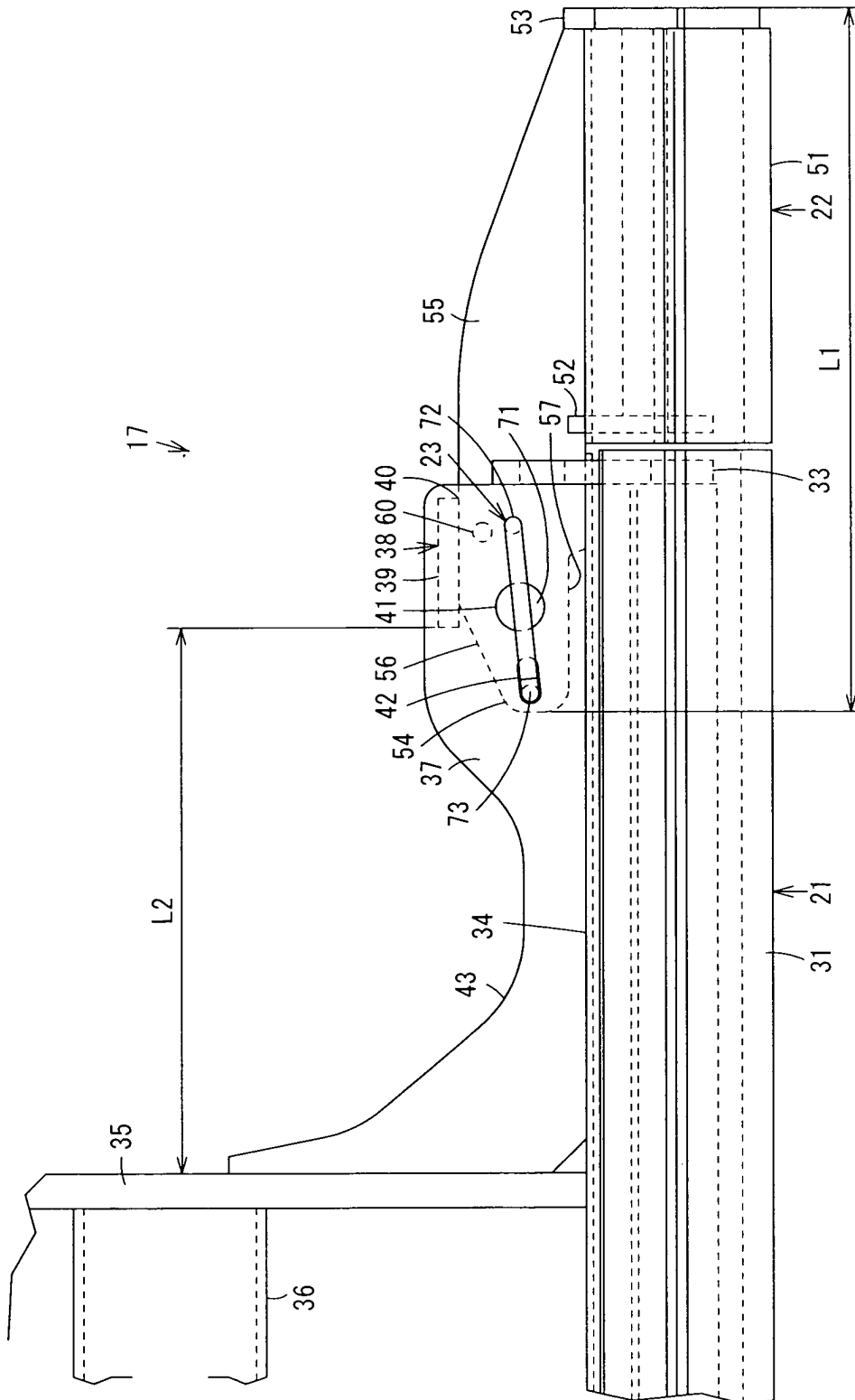


FIG. 2

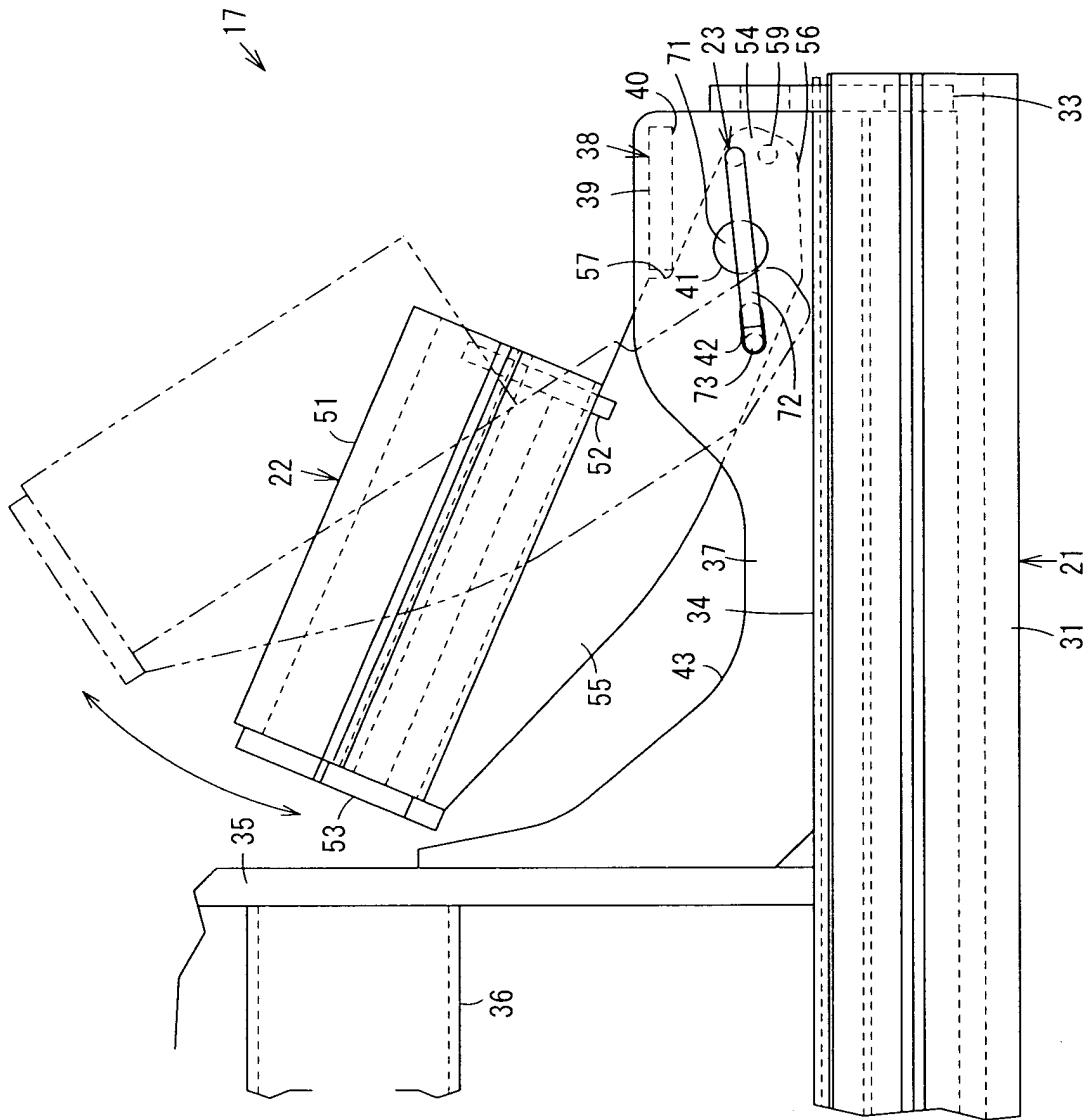


FIG. 3

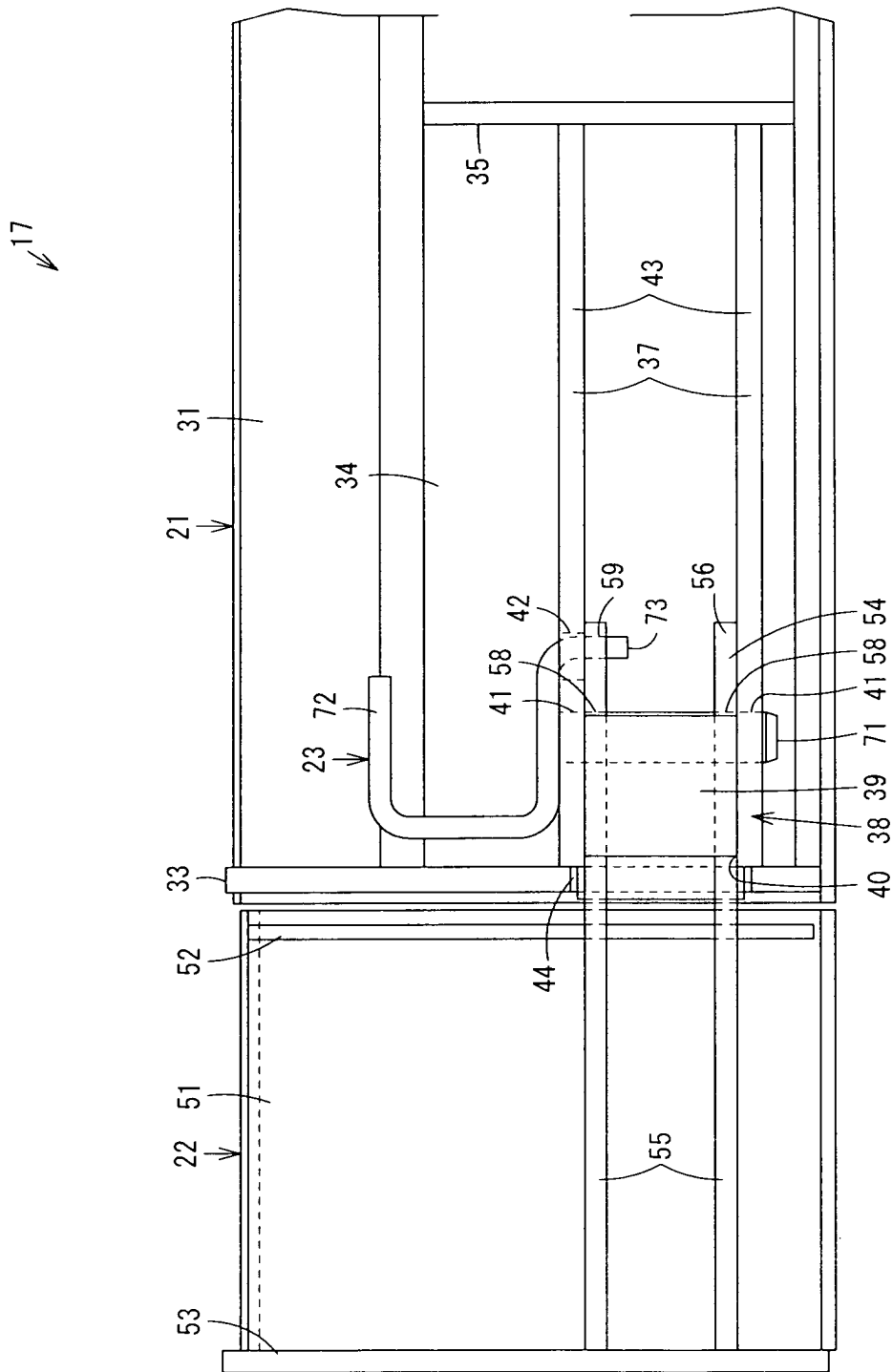


FIG. 4

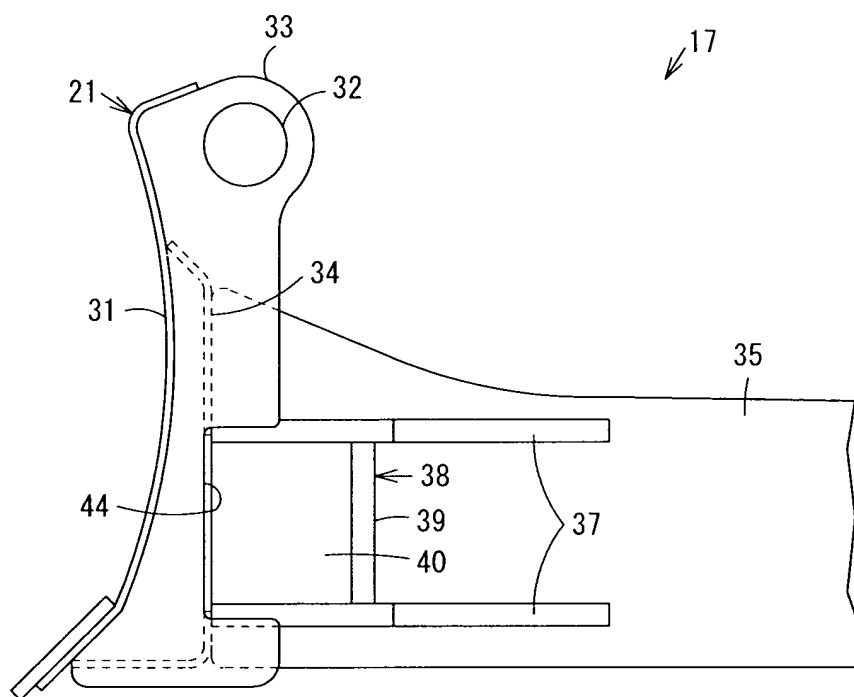


FIG. 5

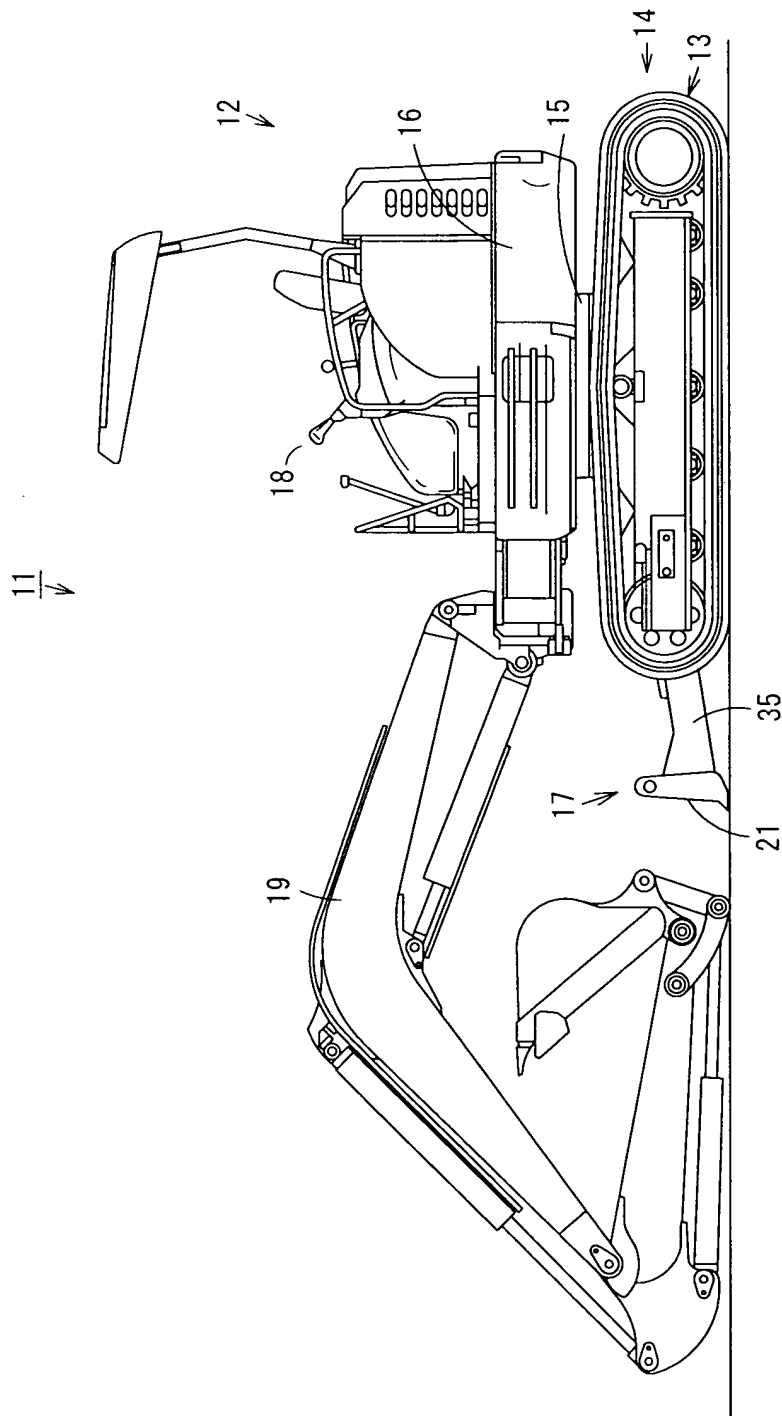


FIG. 6

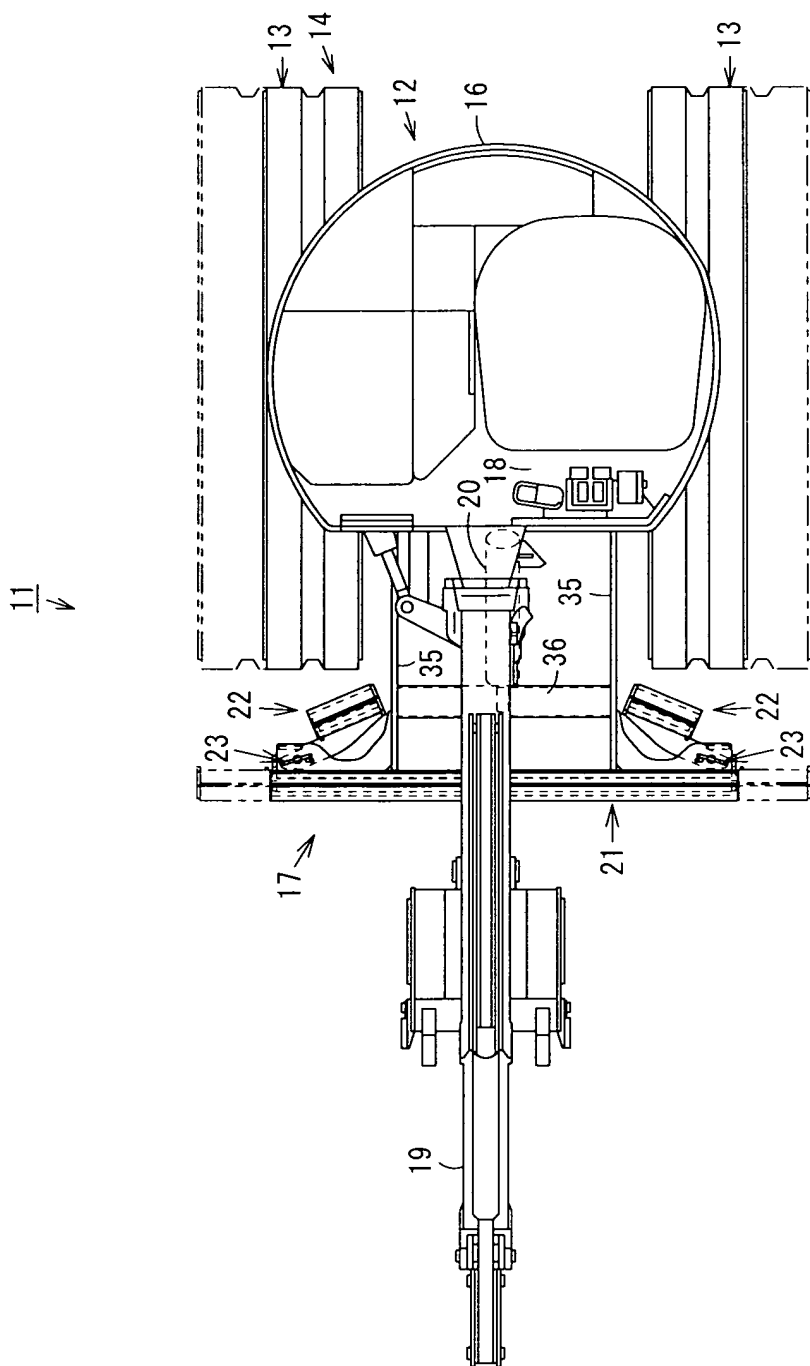


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP03/04958

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl.⁷ E02F3/815

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.⁷ E02F3/815Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2003
Kokai Jitsuyo Shinan Koho 1971-2003 Toroku Jitsuyo Shinan Koho 1994-2003

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.
Y	JP 2000-96602 A (Kubota Corp.), 04 April, 2000 (04.04.00), Full text; Figs. 4 to 5 (Family: none)	1-7
Y	JP 8-296251 A (Kubota Corp.), 12 November, 1996 (12.11.96), Full text; Figs. 4, 6 (Family: none)	1-7

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

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
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"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search
25 July, 2003 (25.07.03)Date of mailing of the international search report
12 August, 2003 (12.08.03)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)