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(54) **Apparatus for stowing a jib**

Vorrichtung zum Verstauen eines Auslegers

Appareil pour amarrer une flèche

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(56) References cited:
EP-A1- 0 095 390 GB-A- 2 081 210
JP-A- 10 101 294

EP 1 992 584 B1

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Description**BACKGROUND OF THE INVENTION****1. Field of the Invention**

[0001] The present invention relates to a working machine provided with an extendable and stowable jib such as a crane. Particularly, the present invention relates to an apparatus for stowing a jib in a side surface of a boom extending from a main body of a working machine.

2. Description of Related Art

[0002] Conventionally, an apparatus for stowing a jib disclosed in Japanese Patent Laid-Open No. Hei10-101294 is known as an apparatus for stowing a jib in a side surface of a boom of a wheel crane. The apparatus for stowing the jib supports the jib at three points including a base portion, a middle portion and a top portion. A middle portion supporting means supports the middle portion of the jib so that the middle portion is pivotally movable. A top portion supporting means is provided with a winch for raising the jib and pushing-down means for pushing the top portion of the jib down to the lower side.

[0003] Here, in the case where a position W of a gravity center of the jib does not correspond to a position of the middle portion supporting means, the moment around the middle portion supporting means works on the jib. In this case, it is difficult to insert or take out a pin for fixing the top portion or the base portion of the jib. When the pin is taken out, the jib is inevitably rotated around the middle portion supporting means by the weight of the jib. Even in such a case, according to the apparatus for stowing the jib disclosed in this patent document, it is possible to adjust a position of the top portion of the jib against the moment by the winch and the pushing-down means of the top portion supporting means. Therefore, it is possible to easily and rapidly perform operation of stowing and extending the jib.

[0004] However, in the apparatus for stowing the jib disclosed in this patent document, a structure for fixing the jib on the top portion is complicated so that the cost is increased. In the case where a product has a specification with different weight of a jib main structure, the position of the gravity center of the entire jib is changed. For example, between a standard jib in which an angle of attaching to a boom is changed according to a manual and a hydraulic tilting jib in which the angle is changed with using a hydraulic cylinder, the position of the gravity center of the entire jib is largely changed. Therefore, there may be a need for changing the structure of the pushing-down means in order to properly adjust a pushing-down force of the pushing-down means in accordance with the type of the jib.

SUMMARY OF THE INVENTION

[0005] It is an object of the present invention to provide an apparatus for stowing a jib having a simple structure and excellent efficiency in operation of stowing and extending the jib.

[0006] It is another object of the present invention to provide an apparatus for stowing a jib capable of corresponding to plural kinds of jibs having different gravity centers.

[0007] The present invention relates to an apparatus for stowing a jib of a working machine provided with an extendable and stowable jib such as a crane in a side surface of a boom mounted on the working machine.

[0008] Firstly, the first aspect of the apparatus for stowing the jib according to the present invention will be described. The present invention is provided with a middle portion supporting means for supporting a middle portion of the jib in the longitudinal direction, and the middle portion supporting means is movably attached to the jib along the longitudinal direction of the jib. The present invention is also provided with a first positioning means mounted on the jib and capable of fixing a position of the middle portion supporting means to the jib in the longitudinal direction of the jib.

[0009] According to the first aspect, it is possible to move the middle portion supporting means in the longitudinal direction of the jib and also to fix the middle portion supporting means at a proper position by the first positioning means mounted on the jib. Therefore, it is possible to adjust so as to support a portion of the jib close to the gravity center by the middle portion supporting means. Thereby, it is possible to reduce the moment working on the jib around the position supported by the middle portion supporting means so that operation of inserting and taking out the jib can be efficiently performed.

[0010] Since the moment working on the jib is reduced, the force required for preventing that the jib rotates around the position supported by the middle portion supporting means is decreased. Therefore, the operation of stowing or extending the jib can be performed without using a special device or the like for activating the force for preventing the rotation of the jib. Thereby, the apparatus for stowing the jib can be formed as a simple structure.

[0011] It is also possible to properly change the position supported by the middle portion supporting means in accordance with the position of the gravity center of the jib to be stowed. Therefore, even in the case where there are a plurality of specifications of the jibs having different weight, it is possible to properly correspond to the jibs.

[0012] Next, the second aspect serving as a preferred embodiment of the apparatus for stowing the jib according to the present invention will be described. In this preferred embodiment, the middle portion supporting means supports the jib so that the jib is pivotally movable around an axis extending from the jib to the boom.

[0013] According to the configuration of the second aspect, the jib is able to pivot so that the position of the jib relative to the boom can be adjusted to a proper position at the time of the operation of stowing and extending. Thereby, for example, a supporting pin or the like for fixing the jib to the boom is easily attached and detached.

[0014] Further, the third aspect serving as a preferred embodiment of the apparatus for stowing the jib according to the present invention will be described. In this preferred embodiment, the middle portion supporting means is movably attached to the boom along the longitudinal direction of the boom. A second positioning means mounted on the boom fixes the position of the middle portion supporting means to the boom in the longitudinal direction of the boom.

[0015] According to the configuration of the third aspect, it is possible to adjust the position of the jib supported by the middle portion supporting means relative to the boom by adjusting the position of the middle portion supporting means relative to the boom. Thereby, a supported position which is different from the position of the jib supported by the middle portion supporting means (for example, the supported position on a top portion or a base portion) can be adjusted to the proper position. Particularly, in the case where the position of the jib supported by the middle portion supporting means is changed so as to correspond to the position of the gravity center of the jib to be stowed, the positions of the top portion and the base portion of the jib are changed relative to the boom in accordance with a change in the supported position of the jib. Therefore, there is a fear that the operation of stowing or extending the jib might be hindered. Even in this case, since it is possible to adjust the jib to the proper position by moving the middle portion supporting means relative to the boom, the configuration of the third aspect is very effective.

[0016] Next, the fourth aspect serving as a preferred embodiment of the apparatus for stowing the jib according to the present invention will be described. In this preferred embodiment, the middle portion supporting means is provided with a jib side bracket movably attached to the jib along the longitudinal direction of the jib and a connecting member for connecting the jib side bracket and the boom. The first positioning means mounted on the jib is capable of fixing the position of the jib side bracket in the longitudinal direction of the jib. The jib side bracket is pivotally connected to the connecting member by a supporting pin passing through the jib side bracket and the connecting member from the jib to the boom.

[0017] According to the configuration of the fourth aspect, since the jib side bracket is pivotally connected to the connecting member by the supporting pin, the jib supported by the jib side bracket is capable of rotating around an axis which is substantially orthogonal to the side surface of the boom. Thereby, the jib is able to pivot so as to adjust the position of the jib relative to the boom to the proper position at the time of the operation of stowing and extending.

[0018] The apparatus for stowing the jib which is capable of rotating the jib around the boom can be formed as a simple structure in which the jib and the boom are connected to each other by the supporting pin. Therefore, it is possible to lower the cost for the apparatus for stowing the jib.

[0019] Since the jib side bracket installed in the jib can be downsized to the extent that the jib side bracket is connectable to the connecting member by the supporting pin, it is possible to reduce the size and the weight of the jib. Thereby, it is possible to improve the operability in the operation of stowing and extending the jib.

[0020] Next, the fifth aspect serving as a preferred embodiment of the apparatus for stowing the jib according to the present invention will be described. In this preferred embodiment, the connecting member is movably attached to the boom along the longitudinal direction of the boom. The second positioning means mounted on the boom fixes a position of the connecting member in the longitudinal direction of the boom.

[0021] According to the configuration of the fifth aspect, the connecting member is movably attached to the boom. Therefore, by adjusting the position of the connecting member relative to the boom, it is possible to adjust the position of the jib side bracket to be connected to the connecting member by the supporting pin, that is, the position of the jib supported by the jib side bracket.

[0022] By adjusting the position of the jib side bracket, it is possible to support the jib in the vicinity of the position of the gravity center. By adjusting the position of the connecting member relative to the boom, it is also possible to suppress a position change of the stowed jib relative to the boom.

[0023] Next, the sixth aspect serving as a preferred embodiment of the apparatus for stowing the jib according to the present invention will be described. In this preferred embodiment, the connecting member and the jib side bracket are connected to each other by the supporting pin in a state that the connecting member and the jib side bracket are combined with a predetermined clearance (play) in the longitudinal direction of the jib. This preferred embodiment is also provided with pin hole positioning means for positioning, in the longitudinal direction of the jib, a connecting member side through hole formed in the connecting member through which the supporting pin passes and a bracket side through hole formed in the jib side bracket through which the supporting pin passes.

[0024] According to the configuration of the sixth aspect, the jib side bracket is easily guided to a predetermined stowing position by fitting the jib side bracket into the connecting member at the time of the operation of stowing. Further, the jib side bracket and the connecting member are connected to each other in a state that the jib side bracket and the connecting member are combined with the predetermined clearance (play). Therefore, even in the case where it is difficult to accurately position the jib side bracket, it is possible to easily fit the

jib side bracket into the connecting member. For example, in the case where the jib is moved with using a winch or the like, it is difficult to precisely adjust the position of the jib and there is a fear that it might take a lot of efforts. According to the above configuration, however, when position displacement of the jib is smaller than the width of the predetermined play, it is possible to allow the position displacement of the jib so as to fit the jib side bracket into the connecting member. Even in a state that the jib side bracket is fitted into the connecting member, there is a fear that the position displacement might be generated between the connecting member side through hole and the bracket side through hole in the longitudinal direction of the jib and hence that the supporting pin might be unable to be inserted so as to pass through both the connecting member side through hole and the bracket side through hole at the same time. However, according to the configuration of the sixth aspect, it is possible to adjust the positions of the connecting member side through hole and the bracket side through hole by having the pin hole positioning means. Therefore, the supporting pin is easily inserted so that positioning operation for inserting the supporting pin can be efficiently performed.

[0025] Finally, the seventh aspect serving as a preferred embodiment of the apparatus for stowing the jib according to the present invention will be described. In this preferred embodiment, the pin hole positioning means is provided with a positioning protruding portion formed on either side of the connecting member or the jib side bracket and protruding towards the other side of the connecting member and the jib side bracket. This positioning protruding portion is provided with a taper portion formed with a diameter gradually reducing towards a top portion in the protruding direction. A positioning hole is formed on the other side of the connecting member and the jib side bracket and the positioning protruding portion is insertable into the positioning hole.

[0026] According to the configuration of the seventh aspect, since the positioning protruding portion formed on either side of the connecting member or the jib side bracket is inserted into the positioning hole formed on the other side of the connecting member and the jib side bracket, the positions of the bracket side through hole and the connecting member side through hole are adjusted.

[0027] Further, the taper portion is formed in the top portion of the positioning protruding portion. Therefore, even in the case where the position of a center axis of the positioning protruding portion is displaced from the position of a center axis of the positioning hole in the longitudinal direction of the jib, by inserting a top portion of the taper portion of the positioning protruding portion into the positioning hole, the positioning protruding portion is guided by an edge portion of the positioning hole so that the center axis of the positioning protruding portion comes close to the center axis of the positioning hole. Therefore, the positions of the bracket side through hole and the connecting member side through hole are ad-

justed. Thereby, the positioning operation for inserting the supporting pin can be efficiently performed with a simple structure.

5 BRIEF DESCRIPTION OF THE DRAWINGS

[0028]

Fig. 1 is a side view of a wheel crane provided with an apparatus for stowing a jib according to an embodiment of the present invention;

Fig. 2 is an enlarged view showing a boom and a jib in Fig. 1;

Fig. 3 is a view seen from the direction of the arrow A in Fig. 2;

Fig. 4 is an enlarged view seen from the direction of the arrow X1 and showing the first base portion supporting portion in Fig. 2;

Fig. 5 is an enlarged view of the X2 part showing the second base portion supporting portion in Fig. 3;

Fig. 6 is a sectional view by the line X3-X3 showing the vicinity of a top portion supporting portion in Fig. 3;

Fig. 7 is an enlarged view of the X4 part showing a middle portion supporting portion in Fig. 3;

Fig. 8 is a sectional view by the line X5-X5 in Fig. 7;

Fig. 9 is a view seen from the direction of the arrow X6 in Fig. 7;

Figs. 10A and 10B are enlarged views partially extracting and showing a boom point axis provided in the boom and a connecting rod provided in the jib shown in Fig. 2;

Figs. 11A to 11D are schematic views showing a flow of operation of extending the jib;

Fig. 12 is a view showing a middle portion supporting portion of an apparatus for stowing a jib according to the second embodiment;

Fig. 13 is a sectional view by the line X5-X5 in Fig. 12; and

Fig. 14 is a view seen from the direction of the arrow X6 in Fig. 12.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0029] Hereinafter, the best modes for carrying out the present invention will be described with reference to the drawings.

50 (First Embodiment)

[0030] Fig. 1 is a side view of a wheel crane provided with an apparatus for stowing a jib according to the first embodiment of the present invention. A wheel crane 1 is provided with a lower traveling body 2 having wheels 2a and 2b. An upper rotating body 4 is mounted on the lower traveling body 2 rotatably around a vertical shaft through a rotation bearing 3. A cabin 5 is provided in the upper

rotating body 4. The cabin 5 is used as a driver's room at the time of traveling and a control room at the time of performing a crane operation. A boom 6 is provided in the upper rotating body 4 and extends towards the front side of the cabin 5. A jib 7 is stowed in a side surface of the boom 6 on the opposite side of the cabin 5.

[0031] The boom 6 is formed into a so-called box type to which a basic boom 6a and a plurality of movable booms 6b are telescopically, extendably and stowably fitted. A base portion of the most outer basic boom 6a is pivoted by a boom foot pin (not shown) on the upper rotating body 4. It is possible to raise and lower the boom 6. The boom foot pin functions as a supporting point.

[0032] The jib 7 is formed into a so-called box type to which a plurality of jib structures are telescopically, extendably and stowably fitted. In Fig. 1, a top portion of the jib 7 faces a base portion of the boom 6 and a base portion of the jib 7 faces a top portion of the boom 6 so that the jib 7 is fixed to the side surface of the boom 6. As shown in Figs. 11A to 11D, the base portion of the jib 7 is combined with the top portion of the boom 6 in the extending direction so that the jib 7 is extended towards the front side of the boom 6 and is raised and lowered in accordance with raising and lowering of the boom 6. It should be noted that in a stowing state shown in Fig. 1, the jib 7 is attached to the side surface of the boom 6 so that an upper wall surface facing the upper side in a state that the jib 7 is attached to the top portion of the boom 6 opposes to the side surface of the boom 6.

[0033] Fig. 2 is an enlarged view showing the boom 6 and the jib 7 in Fig. 1. Fig. 3 is a view seen from the direction of the arrow A in Fig. 2. As shown in Figs. 2 and 3, the base portion of the jib 7 is supported by the first base portion supporting portion 11 and the second base portion supporting portion 12 in the top portion of the boom 6. The top portion of the jib 7 is also supported by a top portion supporting portion 13 in the base portion of the boom 6. The jib 7 is also supported by a middle portion supporting portion 14 in a middle portion of the boom 6 in the longitudinal direction.

[0034] As mentioned above, the jib 7 is supported relative to the boom 6 by the first base portion supporting portion 11, the second base portion supporting portion 12, the top portion supporting portion 13 and the middle portion supporting portion 14. The apparatus for stowing the jib 7 in the boom 6 is provided with the first base portion supporting portion 11, the second base portion supporting portion 12, the top portion supporting portion 13 and the middle portion supporting portion 14.

[0035] Fig. 4 is an enlarged view seen from the direction of the arrow X1 and showing the first base portion supporting portion 11 in Fig. 2. As shown in Fig. 4, the boom 6 is provided with a pair of plate-like brackets 15 which oppose to each other. The brackets 15 are provided so as to protrude from the side surface of the boom 6. Through holes 15a passing through in the direction along the side surface of the boom 6 are provided in the brackets 15 respectively.

[0036] The jib 7 is also provided with a plate-like bracket 16. The bracket 16 is provided so as to protrude from the upper wall surface of the jib 7 which opposes to the side surface of the boom 6 in the stowing state. A through hole 16a passing through in substantially parallel to the longitudinal direction of the jib 7 is formed in the bracket 16. In the stowing state, the bracket 16 is arranged between a pair of the brackets 15. A supporting pin 17 whose diameter is approximately 25mm is inserted into the through holes 15a formed in the brackets 15 and the through hole 16a formed in the bracket 16 so that the jib 7 is supported relative to the boom 6. As mentioned above, the first base portion supporting portion 11 is formed of a pair of the brackets 15 provided in the boom 6, the bracket 16 provided in the jib 7 and the supporting pin 17.

[0037] Fig. 5 is an enlarged view of the X2 part showing the second base portion supporting portion 12 in Fig. 3. As shown in Fig. 5, the boom 6 is provided with a cutout portion 18 protruding from the side surface of the boom 6 and having a cutout 18a which opens towards the lower side. The jib 7 is also provided with a bracket 19 protruding from the upper wall surface of the jib 7 which opposes the side surface of the boom 6 in the stowing state. The bracket 19 is provided with a roller 19a in an end of a protruding portion and a pin-like member 19b which is insertable in the direction along an outer wall surface of the jib 7. In the stowing state, the roller 19a is guided to a curved portion 20 which is formed so as to extend towards the jib 7 in the side surface of the boom 6. The pin-like member 19b of the bracket 19 is engaged with the cutout 18a of the cutout portion 18. As mentioned above, the second base portion supporting portion 12 is formed of the cutout portion 18 and the curved portion 20 both provided in the boom 6 and the bracket 19 provided in the jib 7.

[0038] Fig. 6 is a sectional view by the line X3-X3 showing the vicinity of the top portion supporting portion 13 in Fig. 3. As shown in Fig. 6, the boom 6 is provided with a supporting member 21 protruding from the side surface of the boom 6. The supporting member 21 is provided with a first supporting part 21a protruding substantially perpendicularly to the side surface of the boom 6 and a second supporting part 21b curved from an end of a protruding portion of the first supporting part 21a and obliquely extending towards the upper side of the boom 6. A pair of brackets 22 is provided in a surface of the supporting member 21 facing the top portion of the boom so as to protrude from the surface substantially perpendicularly. A pair of the brackets 22 is provided with a pair of parallel parts 22a which oppose to each other with a predetermined clearance in substantially parallel to the side surface of the boom 6. The brackets 22 are provided with a pair of skirt parts 22b formed so as to be gradually apart from each other towards the lower side and being continuous with the parallel parts 22a. Through holes 22c passing through in the direction substantially perpendicular to the side surface of the boom 6 are formed in a

pair of the parallel parts 22a. A winch 27 which is capable of hanging a hook 27a on an engaging portion 7d provided in the top portion of the jib 7 and winding up the jib 7 at the time of extending and stowing the jib 7 is installed in the vicinity of a top portion of the second supporting part 21b.

[0039] The jib 7 is provided with a plate-like bracket 23 in an outer wall portion of the jib 7 which faces the upper side in the stowing state. A through hole 23a passing through in the direction substantially perpendicular to the side surface of the boom 6 is formed in the bracket 23. In the stowing state, the bracket 23 is arranged between a pair of the parallel parts 22a, and a supporting pin 24 whose diameter is approximately 30mm is inserted into the through holes 22c of a pair of the parallel parts 22a and the through hole 23a formed in the bracket 23 so that the jib 7 is supported relative to the boom 6.

[0040] At this time, since the movement of the bracket 23 is restricted by the parallel parts 22a, it is possible to restrict the movement of the jib 7 in the direction perpendicular to the side surface of the boom 6. It should be noted that a spacer member or the like can be properly provided between the bracket 23 and the parallel parts 22a in order to adjust clearances between the bracket 23 and the parallel parts 22a.

[0041] An end of the supporting pin 24 on the side of the boom 6 is inserted into a through hole of another bracket 25 provided in the supporting member 21 and fixed by a retaining member 26 so as not to be taken out of the through hole.

[0042] As mentioned above, the top portion supporting portion 13 is formed of the supporting member 21, a pair of the brackets 22, the bracket 23 provided in the jib 7 and the supporting pin 24.

[0043] Fig. 7 is an enlarged view of the X4 part showing the middle portion supporting portion 14 in Fig. 3. Fig. 8 is a sectional view by the line X5-X5 in Fig. 7. It should be noted that a part of a side wall is partially cut out and shown by a chain line in Fig. 8 in order to see an internal mechanism of a middle portion supporting connecting member 40. Fig. 9 is a view seen from the direction of the arrow X6 in Fig. 7.

[0044] As shown in Figs. 7 and 8, a boom side bracket 30 is provided at a position which is substantially central in the boom 6 in the longitudinal direction so as to protrude towards the upper position from an upper surface of the boom 6. The boom side bracket 30 is provided with a pair of wall surface portions 31 which oppose to each other with a predetermined clearance in the longitudinal direction of the boom 6. A portion of the boom side bracket 30 in the vicinity of an upper end is formed in a case shape opening in the direction extending from the side of the boom 6 to the side of the jib 7.

[0045] An end of the middle portion supporting connecting member 40 extending so as to connect the side of the boom 6 and the side of the jib 7 is arranged between a pair of the wall surface portions 31 in the case-shape portion formed in the upper end of the boom side bracket

30. In this embodiment, the middle portion supporting connecting member 40 is a connecting member and cooperates with other constituent components so as to play a role of a middle portion supporting means. The middle portion supporting connecting member 40 is formed in a substantially rectangular shape whose inside is hollow. Two connecting pins 32 are provided so as to pass through a pair of the wall surface portions 31 in a state that axes of the connecting pins 32 are substantially parallel to the longitudinal direction of the boom 6. Through holes 46a into which the connecting pins 32 are insertable are formed in a pair of side walls 46 of the middle portion supporting connecting member 40 so that passing positions of the connecting pins 32 in a pair of the wall surface portions 31 correspond to the through holes 46a. The middle portion supporting connecting member 40 is movably connected in the axial direction of the connecting pins 32 in a state that the two connecting pins 32 passing through a pair of the wall surface portions 31 are inserted into the through holes 46a formed in a pair of the side walls 46. It should be noted that the middle portion supporting connecting member 40 of this embodiment is one example of a mode of the connecting member, and hence the present invention is not limited to this mode.

[0046] Here, the movement of the middle portion supporting connecting member 40 in the axial direction of the connecting pins 32 is restricted by bringing outer surfaces of a pair of the side walls 46 of the middle portion supporting connecting member 40 into contact with inner surfaces of a pair of the wall surface portions 31. Therefore, the middle portion supporting connecting member 40 can be moved from a position in which the middle portion supporting connecting member 40 comes in contact with the inner surface of one wall surface portion 31, to a position in which the middle portion supporting connecting member 40 comes in contact with the inner surface of the other wall surface portion 31 at maximum. As mentioned above, the middle portion supporting connecting member 40 is movably attached to the boom 6 along the longitudinal direction of the boom 6.

[0047] A pair of bolts 33 for fixing the position of the middle portion supporting connecting member 40 is screwed into a pair of the wall surface portions 31. In this embodiment, a pair of the bolts 33 corresponds to a second positioning means mounted on the boom. The bolt 33 is screwed into the wall surface portion 31 from the outside of the boom side bracket 30 so that an axis portion 33a protrudes towards the inside of the boom side bracket 30. A lock nut 34 is screwed onto the axis portion 33a between a bolt head and the wall surface portion 31. It is possible to fix the bolt 33 to a proper position by fastening the lock nut 34. Thereby, the middle portion supporting connecting member 40 is sandwiched by a pair of the bolts 33 so that the middle portion supporting connecting member 40 can be fixed to a desired position in the longitudinal direction of the boom 6. In the first embodiment, the position of the middle portion supporting connecting member 40 is fixed so that the jib 7 is arranged

at a proper stowing position relative to the boom 6. That is, the middle portion supporting connecting member 40 is fixed so that the supporting pin 17 for supporting the base portion of the jib 7, the supporting pin 24 for supporting the top portion or the like can be attached to the boom 6. Although a pair of the bolts 33 is used as the second positioning means mounted on the boom in this embodiment, it should be noted that the second positioning means mounted on the boom according to the present invention is not limited to this mode. For example, other fixing means such as a wedge and a hydraulic lock may be used.

[0048] A square cylindrical supporting portion 50 is provided in a side surface 7e in the middle portion of the jib 7 in the longitudinal direction, that is, a surface facing the upper side in the stowing state so as to protrude from the side surface 7e. A base portion 62 of a jib side bracket 60 having a pair of bracket portions 61 is arranged in an inner portion of the square cylinder of the supporting portion 50. In this embodiment, the jib side bracket 60 also cooperates with the other constituent components so as to play a role of the middle portion supporting means. The jib side bracket 60 is arranged so that the bracket portions 61 extend substantially perpendicularly to the side surface of the jib 7. Two connecting pins 52 pass through a pair of wall surface portion 51 arranged in the supporting portion 50 so as to be substantially orthogonal to the longitudinal direction of the jib 7 in a state that axes of the connecting pins 52 are substantially parallel to the longitudinal direction of the jib 7. The jib side bracket 60 is movably connected in the axial direction of the connecting pins 52 in a state that the two connecting pins 52 passing through a pair of the wall surface portions 51 also pass through through-holes formed in the base portion 62 of the jib side bracket 60.

[0049] Here, the movement of the jib side bracket 60 in the axial direction of the connecting pins 52 is restricted by bringing the jib side bracket 60 into contact with an inner surface of one of a pair of the wall surface portions 51. Therefore, the jib side bracket 60 can be moved from a position in which the jib side bracket 60 comes in contact with the inner surface of one wall surface portion 51, to a position in which the jib side bracket 60 comes in contact with an inner surface of the other wall surface portion 51 at maximum.

[0050] A pair of bolts 53 for fixing the position of the jib side bracket 60 is screwed into a pair of the wall surface portions 51. In this embodiment, the bolts 53 correspond to a first positioning means mounted on the jib. The bolt 53 is screwed into the wall surface portion 51 from the outside of the supporting portion 50 so that an axis portion 53a protrudes towards the inside of the supporting portion 50. A lock nut 54 is screwed onto the axis portion 53a between a bolt head and the wall surface portion 51. It is possible to fix the bolt 53 to a proper position by fastening the lock nut 54. Thereby, the jib side bracket 60 is sandwiched by a pair of the bolts 53 so that the jib side bracket 60 can be fixed to a desired position in the

longitudinal direction of the jib 7. In the first embodiment, the position of the jib side bracket 60 is fixed so as to be substantially a gravity center of the jib 7. Although the bolts 53 are used as the first positioning means mounted on the jib in this embodiment, it should be noted that positioning means of other modes may be used.

[0051] As shown in Fig. 8, the middle portion supporting connecting member 40 is formed so as to open towards the lower side in the vicinity of the end on the side of the jib 7. Specifically, an end connecting member 43 having a pair of wall surface portions 41 which oppose to each other with a predetermined clearance in the longitudinal direction of the middle portion supporting connecting member 40 and a connecting wall surface portion 42 for connecting upper ends of a pair of the wall surface portions 41 are secured to the end of the middle portion supporting connecting member 40. The end connecting member 43 opens towards the lower side. A pair of the wall surface portions 41 are formed of parallel parts 41a arranged in substantially parallel to the side surface of the boom 6 and skirt parts 41b which are continuous with the parallel parts 41a and formed so as to be gradually apart from each other towards the lower side. A lower member 47 forming a lower surface of the middle portion supporting connecting member 40 is formed so as to extend from the side of the boom 6 to the vicinity of the wall surface portion 41 on the side of the boom 6.

[0052] In the stowing state, the bracket portions 61 of the jib side bracket 60 are arranged between a pair of the parallel parts 41a on the end of the middle portion supporting connecting member 40. That is, in the case where the jib 7 is moved into the stowing state, the position of the jib 7 is adjusted so that the bracket portions 61 are fitted into an opening in the vicinity of the end of the middle portion supporting connecting member 40. Through holes 41c (connecting member side through holes) and through holes 61a (bracket side through holes) passing through in the direction substantially orthogonal to the side surface of the boom 6 are formed on the substantially same axis in the parallel parts 41a and the bracket portions 61 respectively in the stowing state. The middle portion supporting connecting member 40 and the jib side bracket 60 are pivotally connected to each other by inserting a supporting pin 65 into the through holes. In this embodiment, the through holes 41c are the connecting member side through holes and the through holes 61a are the bracket side through holes.

[0053] A spacer member 67 is arranged between the bracket portion 61 and the parallel part 41a in order to adjust a clearance between the bracket portion 61 and the parallel part 41a. Thereby, since the movement of the bracket portions 61 is restricted by the parallel parts 41a, the movement of the jib 7 is restricted in the direction perpendicular to the side surface of the boom 6.

[0054] The supporting pin 65 has the strength capable of supporting the total weight of the jib 7. In the first embodiment, the diameter of the supporting pin 65 is approximately 40mm in consideration that the weight of the

jib 7 is approximately 650kg.

[0055] In a state that the supporting pin 65 is inserted into the through holes 41c and the through holes 61a, a fixing pin 45 is inserted so as to pass through the supporting pin 65 and a cylindrical portion 44 extending from the end of the middle portion supporting connecting member 40 so that the movement of the supporting pin 65 is restricted in the taking-out direction. It should be noted that the supporting pin 65 is inserted into the cylindrical portion 44 so that a protrusion 65a protruding in the radial direction is fitted into a slit 44a extending in the axial direction of the cylindrical portion 44 and formed in an upper part of the cylindrical portion 44 as shown in Fig. 9. The rotation of the supporting pin 65 around the axis is restricted by the slit 44a.

[0056] As mentioned above, the middle portion supporting portion 14 is provided with the boom side bracket 30 provided in the boom 6, the middle portion supporting connecting member 40 connected to the boom side bracket 30 by the two connecting pins 32, the jib side bracket 60 connected to the middle portion supporting connecting member 40 by the supporting pin 65 and the supporting portion 50 connected to the jib side bracket 60 by the two connecting pins 52 and provided in the jib 7.

[0057] Next, operation of extending the stowed jib 7 with using the apparatus for stowing the jib according to the first embodiment will be described. Figs. 11A to 11D are schematic views showing a flow of the operation of extending the jib 7.

[0058] As shown in Figs. 2 and 3, boom point axes 6c and 6c' are provided in both side surfaces of the top portion of the boom 6. The base portion of the jib 7 is bifurcated. A connecting engagement portion 7a for connecting to the boom point axis 6c' protruding from the side surface of the boom 6 which is opposite to the side surface for stowing the jib 7 is formed in an end of the jib 7 on the upper side in the stowing state. A connecting rod 70 having a connecting engagement portion 7b in a top portion is installed in an end of the jib 7 on the lower side in the stowing state. The connecting engagement portion 7b is connected to the boom point axis 6c protruding from the side surface of the boom 6 for stowing the jib 7.

[0059] Figs. 10A and 10B are enlarged views partially extracting and showing the boom point axis 6c provided in the boom 6 and the connecting rod 70 provided in the jib 7 shown in Fig. 2. Fig. 10A shows a state that the connecting rod 70 is drawn in, and Fig. 10B shows a state that the connecting rod 70 extends. The connecting rod 70 is formed so as to have an axis portion 70a extending in the longitudinal direction of the jib 7 and supported so that the axis portion 70a is insertable into or out of a rod supporting portion 7c extending from a main structure of the jib 7. The connecting engagement portion 7b is provided in a top portion of the axis portion 70a and formed of a base plate portion 70b fixed to the top portion of the axis portion 70a so as to be substantially orthogonal to the axis portion 70a and a pair of supporting plate portions 70c extending from the base plate portion 70b in parallel

to the axis of the connecting rod 70. In a state that the jib 7 is stowed in the side surface of the boom 6, the connecting rod 70 is fixed to the main structure of the jib 7 by a supporting pin 71 in a state that the connecting rod 70 is drawn in the side of the jib 7 as shown in Fig. 10A. When the jib 7 is extended, the supporting pin 71 is firstly removed. The supporting pin 17 attached to a lower part of the base portion of the jib 7 shown in Fig. 4 is also removed.

[0060] As shown in Fig. 10B, the connecting rod 70 is extended towards the side of the boom point axis 6c of the boom 6 and rotated by 90 degrees around an axis of the axis portion 70a, and the connecting engagement portion 7b provided in the top portion of the connecting rod 70 is engaged with the boom point axis 6c. In a state that the connecting engagement portion 7b is engaged with the boom point axis 6c, the supporting pin 17 is inserted so as to pass through both through holes respectively formed in a pair of the supporting plate portions 70c so that the movement of the connecting rod 70 in the drawing-in direction is restricted. It should be noted that the supporting pin 17 is a pin which is attached to the lower part of the base portion of the jib 7 and serves not only for connecting the base portion of the jib 7 but also for fixing the connecting rod 70 in the extending state.

[0061] Next, the supporting pin 24 attached to the top portion of the jib 7 shown in Figs. 3 and 6 is removed. The hook 27a on an end portion of wire rope of the winch 27 is hanged on the engaging portion 7d on the top portion of the jib 7. The winch 27 winds up until the winding-up force of the winch 27 reaches a preset relief load value, and then the supporting pin 65 for supporting the middle portion of the jib 7 in the longitudinal direction is removed. It should be noted that the relief load value is preset as a load value by which the force from the jib 7 caused by its self weight is substantially zero relative to the supporting pin 65.

[0062] Then, as shown in Fig. 11A, the boom 6 is raised by approximately 60 degrees and the winch 27 winds up so that the jib 7 is swung to a suspended posture. As shown in Fig 11B, the hook 27a of the winch 27 is removed and then the jib 7 is twisted by substantially 270 degrees so that the upper wall surface facing towards the upper side in the extending state is turned to the front side. In this state, the jib 7 is swingable in the arbitrary direction. While the top portion of the jib 7 is swung as if the jib 7 is pulled to the front side of the paper, the other connecting engagement portion 7a in the base portion of the jib 7 is adjusted to a position in which the connecting engagement portion 7a can be fitted onto the boom point axis 6c' on the surface opposite to the boom point axis 6c engaged with the connecting engagement portion 7b of the connecting rod 70 mentioned above. Then, the jib 7 is moved to a vertically suspended state again so that the connecting engagement portion 7a is fitted into and fixed to the boom point axis 6c'. Finally, as shown in Fig. 11C, the boom 6 is turned down so that the base portion of the jib 7 is fixed to the top portion of the boom 6 by the

supporting pin 71 removed from the connecting rod 70 and the supporting pin 24 removed from the top portion of the jib 7. The top portion of the boom 6 and the top portion of a basic jib structure in the jib 7 are connected to each other by a jib suspension rod 72 so that movable jib structures housed in the basic jib structure are drawn out. Thereby, as shown in Fig. 11D, it is possible to obtain an operation posture of the jib 7 extending towards the front side of the boom 6. It should be noted that the jib 7 in the extending state can be moved into the stowing state by conversely performing the operation mentioned above.

[0063] As mentioned above, the apparatus for stowing the jib according to the first embodiment is provided with the middle portion supporting portion 14 for supporting the middle portion of the jib 7 in the longitudinal direction. The middle portion supporting portion 14 is provided with the jib side bracket 60 movably attached to the jib 7 along the longitudinal direction of the jib 7. The supporting portion 50 having a pair of the wall surface portions 51 are secured to the jib 7 and the jib side bracket 60 is arranged between a pair of the wall surface portions 51. A pair of the bolts 53 for fixing the position of the jib side bracket 60 relative to the jib 7 in the longitudinal direction of the jib 7 is screwed into a pair of the wall surface portions 51.

[0064] According to this configuration, it is possible to move the jib side bracket 60 in the longitudinal direction of the jib 7 and also sandwich the jib side bracket 60 by a pair of the bolts 53 so as to fix the jib side bracket 60 at a proper position. Therefore, even in the case where other jib having a different position of a gravity center in the longitudinal direction is stowed, it is possible to support the jib at a position close to the position of the gravity center of the jib to be stowed by adjusting the position of the jib side bracket 60. Thereby, it is possible to reduce the moment working on the jib 7 around the position supported by the jib side bracket 60. In this case, the biasing force caused by the rotation of the jib 7 does not easily work on the supporting pin 24 for fixing the top portion of the jib 7 to the boom 6 and the supporting pin 17 for fixing the base portion. Therefore, the supporting pin 24 and the supporting pin 17 are easily attached and detached. Consequently, the operation of extending and stowing the jib 7 can be efficiently performed.

[0065] It should be noted that, in the case the other jib having the different position of the gravity center in the longitudinal direction is stowed, a predetermined amount of weight is installed at a predetermined position in the longitudinal direction of the jib. Therefore, the position of the gravity center can be adjusted so as not to be displaced from the supported position without changing the supported position of the jib. In this case, however, the weight of the jib is increased and the size of the jib is also increased so that handling of the jib is deteriorated. At this point, when the apparatus for stowing the jib according to the first embodiment is provided, there is no need for installing the weight, and hence the weight and the size of the apparatus for stowing the jib can be reduced.

[0066] In the first embodiment, the jib side bracket 60 for supporting the jib 7 and movably attached to the jib 7 along the longitudinal direction of the jib 7 and the middle portion supporting connecting member 40 for connecting the jib side bracket 60 and the boom 6 are pivotally connected to each other. The supporting pin 65 passes through the bracket portions 61 of the jib side bracket 60 and the parallel parts 41a provided in the end of the middle portion supporting connecting member 40 in the substantially perpendicular direction towards the side surface of the boom 6.

[0067] According to this configuration, at the time of the operation of stowing and extending, the jib 7 is rotated around an axis of the supporting pin 65 passing through the jib side bracket 60 so that the top portion or the base portion of the jib 7 can be adjusted to the proper position in a state that the jib 7 is fixed by the jib side bracket 60. For example, even in the case where the position of the gravity center of the jib 7 and the supported position do not completely correspond to each other, the jib 7 is manually turned around the supporting pin 65 so that the supporting pin 24 for supporting the top portion of the jib 7 and the supporting pin 17 for supporting the base portion can be easily attached and detached.

[0068] The apparatus for stowing the jib which is capable of rotating the jib 7 relative to the boom 6 can be formed as a simple structure in which the side of the jib 7 and the side of the boom 6 are connected to each other by the supporting pin 65. Therefore, it is possible to install the apparatus for stowing the jib with low cost.

[0069] The jib side bracket 60 installed in the jib 7 can be downsized to the extent that the jib side bracket 60 is connectable to the middle portion supporting connecting member 40 by the supporting pin 65, and hence it is possible to reduce the size and the weight of the jib 7. Thereby, it is possible to improve the operability in the operation of stowing and extending the jib 7.

[0070] In the first embodiment, the boom side bracket 30 is secured to the boom 6. The boom side bracket 30 is provided with a pair of the wall surface portions 31 which oppose to each other with a predetermined clearance in the longitudinal direction of the boom 6. The middle portion supporting connecting member 40 is arranged between a pair of the wall surface portions 31 and connected to a pair of the wall surface portions 31 by a pair of the supporting pins 32 arranged in parallel with a predetermined clearance in the longitudinal direction of the middle portion supporting connecting member 40. Thereby, the middle portion supporting connecting member 40 is movably connected along the longitudinal direction of the boom 6. A pair of the bolts 33 which is capable of fixing the position of the middle portion supporting connecting member 40 in the longitudinal direction of the boom 6 is screwed into a pair of the wall surface portions 31.

[0071] According to this configuration, by adjusting the position of the middle portion supporting connecting member 40 relative to the boom 6, it is possible to adjust

the position of the jib 7 supported through the middle portion supporting connecting member 40 and the jib side bracket 60 relative to the boom 6.

[0072] It should be noted that, in the case where the supported position of the jib 7 is changed so as to correspond to the position of the gravity center of the jib 7 to be stowed by adjusting the position of the jib side bracket 60, the positions of the top portion and the base portion of the jib 7 are displaced relative to the boom 6 in accordance with the change in the supported position of the jib 7. Even in this case, however, it is possible to adjust the jib 7 to the proper position by moving the middle portion supporting connecting member 40 relative to the boom 6.

[0073] In the first embodiment, after the position of the jib side bracket 60 is adjusted, it is possible to adjust the position of the jib 7 relative to the boom 6 to the proper position so that the through hole 16a of the bracket 16 provided in the base portion of the jib 7 and the through holes 15a of the brackets 15 provided in the boom 6 are on the substantially same axis and the through hole 23a of the bracket 23 provided in the top portion of the jib 7 and the through holes 22c of the brackets 22 provided in the boom 6 are on the substantially same axis.

(Second Embodiment)

[0074] Next, an apparatus for stowing a jib according to the second embodiment of the present invention will be described. Figs. 12 to 14 are views showing the middle portion supporting portion respectively corresponding to Figs. 7 to 9 which are used in the description of the first embodiment.

[0075] The apparatus for stowing the jib according to the second embodiment is different from the first embodiment in terms of the point that the middle portion supporting portion is provided with a positioning means capable of adjusting the position of the jib side bracket 60 relative to the middle portion supporting connecting member 40. The positioning means is provided with a positioning hole 81 and a positioning protruding portion 82. It should be noted that the same members as the first embodiment in Figs. 12 to 14 will be given the same reference numerals and description of the members will be omitted. Fig. 13 shows the middle portion supporting connecting member 40 and the end connecting member 43 in the vicinity of the positioning protruding portion 82 as a cutout section. Fig. 14 shows the middle portion supporting connecting member 40 and the end connecting member 43 as a section perpendicular to the longitudinal direction of the middle portion supporting connecting member 40 including the positioning protruding portion 82.

[0076] As shown in Figs. 12 and 14, in the middle portion supporting connecting member 40, a clearance between a pair of the opposing side walls 46 is set so as to have predetermined clearances Y1 and Y2 between the side walls 46 and the bracket portions 61 of the jib side bracket 60 in the longitudinal direction of the jib 7. That

is, when the jib side bracket 60 is fitted into the middle portion supporting connecting member 40, predetermined play Y1 and Y2 are formed between the bracket portion 61 and the side walls 46.

[0077] As shown in Figs. 12 and 13, a supporting plate 83 is combined with upper ends of a pair of the bracket portions 61 by welding so as to be connected to the bracket portions 61. The supporting plate 83 is arranged so that an upper surface is substantially horizontal when the jib 7 is stowed at a predetermined position. Both ends of the supporting plate 83 are secured to surfaces of the bracket portions 61 which oppose to each other. The positioning protruding portion 82 for protruding substantially perpendicularly to the upper surface is combined with the upper surface of the supporting plate 83 by welding. The positioning protruding portion 82 is provided with a body portion 82a formed in a cylindrical shape and a taper portion 82b formed in a cone trapezoid shape which is continuous with the body portion 82a. The diameter of the taper portion 82b is gradually reduced in the protruding direction.

[0078] As shown in Fig. 13, the positioning hole 81 passing through both an upper wall surface portion 48 of the middle portion supporting connecting member 40 and the connecting wall surface portion 42 of the end connecting member 43 secured to the upper wall surface portion 48 in a layered state is formed in the middle portion supporting connecting member 40 and the end connecting member 43. The positioning hole 81 is formed so that its inner diameter is substantially the same as an outer diameter of the body portion 82a of the positioning protruding portion 82 provided in the jib side bracket 60. The positioning protruding portion 82 is inserted into the positioning hole 81. An opening edge portion of the positioning hole 81 on the side of the jib 7 is chamfered.

[0079] The positioning hole 81 is formed at a predetermined position in the upper wall surface portion 48 of the middle portion supporting connecting member 40 and the connecting wall surface portion 42 of the end connecting member 43 so that the through holes 41c formed in a pair of the wall surface portions 41 of the end connecting member 43 and the through holes 61a formed in the bracket portions 61 of the jib side bracket 60 are aligned at the substantially same position in the longitudinal direction of the jib 7 when the positioning protruding portion 82 of the jib side bracket 60 is inserted into the positioning hole 81. That is, the positioning hole 81 is formed so that the center of the through holes 41c and the center of the through holes 61a are located on the same straight line seen from the vertical direction by inserting the positioning protruding portion 82 of the jib side bracket 60 into the positioning hole 81 up to the body portion 82a. It should be noted that the center of the through holes 41c and the center of the through holes 61a are aligned on the axial line substantially orthogonal to the side surface of the boom 6 in the present embodiment.

[0080] The positions of through holes 41c and 61a in

the vertical direction are adjusted to the proper positions, for example, by bringing upper end surfaces of the bracket portions 61 into contact with the connecting wall surface portion 42 of the end connecting member 43.

[0081] According to this configuration, the jib side bracket 60 and the middle portion supporting connecting member 40 are fitted to each other with the predetermined play Y1 and Y2 in the longitudinal direction of the jib 7. Therefore, at the time of the operation of stowing the jib, high precision for position is not required when the jib 7 is wound up by the winch 27. That is, even when the jib 7 is displaced from a predetermined stowing position but the position displacement is smaller than the width of the predetermined play Y1 and Y2 at the time of winding up the jib 7 with using the winch 27, the jib 7 is fitted between a pair of the side walls 46 of the middle portion supporting connecting member 40. Therefore, it is possible to efficiently perform the operation of winding up the jib 7 at the time of stowing.

[0082] Here, since there are the predetermine play in the fitting in a state that the jib side bracket 60 is fitted into the end of the middle portion supporting connecting member 40, there is a possibility for generating the position displacement between the through holes 41c formed in the end connecting member 43 and the through holes 61a formed in the jib side bracket 60 in the longitudinal direction of the jib 7. Thereby, there is a fear that the supporting pin 65 might be unable to be inserted so as to pass through the through holes 41c and the through holes 61a at the same time.

[0083] However, in the apparatus for stowing the jib according to the second embodiment, the position of the jib 7 is adjusted and drawn to the upper side to the extent that a top portion of the positioning protruding portion 82 provided in the jib side bracket 60 is inserted into the positioning hole 81 formed in the end connecting member 43. Therefore, a side peripheral surface of the taper portion 82b of the positioning protruding portion 82 is guided to an edge portion of the positioning hole 81. Thereby, the positioning protruding portion 82 is inserted into the positioning hole 81 up to the body portion 82a. That is, even in the case where the position displacement is generated between the center axis of the positioning protruding portion 82 and the center axis of the positioning hole 81, the positioning protruding portion 82 is guided by the edge portion of the positioning hole 81 by inserting the top portion of the positioning protruding portion 82 into the positioning hole 81 so that the center axis of the positioning protruding portion 82 comes close to the center axis of the positioning hole 81.

[0084] In the case where the body portion 82a of the positioning protruding portion 82 is inserted into the positioning hole 81, the through holes 41c formed in the end connecting member 43 and the through holes 61a formed in the jib side bracket 60 are aligned on the substantially same straight line seen from the vertical direction. By bringing the upper end surfaces of the bracket portions 61 into contact with the end connecting member

43, it is possible to align the positions of the through holes 41c and the through holes 61a in the vertical direction. As a result, the through holes 41c and the through holes 61a are adjusted to be aligned on the same straight line.

[0085] As mentioned above, the apparatus for stowing the jib according to the second embodiment is provided with the positioning hole 81 and the positioning protruding portion 82 as pin hole positioning means for positioning the through holes 41c and the through holes 61a in the longitudinal direction of the jib 7. Since the taper portion 82b is formed in the top portion of the positioning protruding portion 82, it is possible to adjust the position of the jib 7 so that the supporting pin 65 can be inserted into the through holes 41c and the through holes 61a with almost no precise adjustment of the position of the jib 7. Thereby, it is possible to efficiently perform the positioning operation for inserting the supporting pin 65. Due to the simple structure in which the taper portion 82b is formed in the positioning protruding portion 82, the manufacturing cost of the apparatus for stowing the jib is not excessively increased. It should be noted that since the opening edge portion on the lower side of the positioning hole 81 is chamfered as in the present embodiment, the positioning protruding portion 82 is further easily guided into the positioning hole 81.

[0086] It should be noted that, as an example of the pin hole positioning means, the positioning hole 81 is provided in the middle portion supporting connecting member 40 and the positioning protruding portion 82 is provided in the jib side bracket 60 in the second embodiment. However, even when a positioning protruding portion (not shown) is provided in the middle portion supporting connecting member 40 and a positioning hole (not shown) is provided in the jib side bracket 60, it is possible to obtain the substantially same operation effect as the second embodiment.

[0087] Although a through hole is used as the positioning hole 81 in the second embodiment, a hole which is only opened on the side of fitting to the positioning protruding portion 82 may be used.

[0088] Although the embodiment of the present invention is described above, the present invention is not limited to the embodiment described above and various modifications can be performed within the scope of the claims.

[0089] In the present embodiment, the apparatus for stowing the jib is provided with the first base portion supporting portion 11, the second base portion supporting portion 12, the top portion supporting portion 13 and the middle portion supporting portion 14. However, the present invention is not limited to the configuration provided with all the supporting portions 11 to 14 but the present invention may be a configuration provided with at least the middle portion supporting portion 14. For example, the jib 7 may be supported by the middle portion supporting portion 14 and the first base portion supporting portion 11 and the second base portion supporting portion 12 for supporting the base portion of the jib 7, or

the jib 7 may be supported by the middle portion supporting portion 14 and the top portion supporting portion 13 for supporting the top portion of the jib 7. A mode of the jib is not limited to the box type as in the present embodiment but may be a lattice type.

[0090] An apparatus for stowing a jib according to the present invention stows a jib (7) which is connectable to a top portion of a boom (6) in a side surface of the boom (6) of a wheel crane (1). A middle portion of the jib (7) in the longitudinal direction is supported. The supported position of the jib (7) is movable along the longitudinal direction of the jib (7). The movement of the jib (7) in the longitudinal direction can be fixed. The apparatus for stowing the jib according to the present invention has a simple structure and excellent workability for stowing and extending the jib. The apparatus for stowing the jib is capable of corresponding to plural kinds of jibs having different gravity centers.

Claims

1. An apparatus for stowing a jib (7) connectable to a top portion of a boom (6) in a side surface of the boom (6) mounted on a working machine (1), **characterized in that** said apparatus for stowing the jib comprising:

a middle portion supporting means (14) for supporting a middle portion of said jib (7) in the longitudinal direction, said middle portion supporting means being movably attached to said jib (7) along the longitudinal direction of said jib (7); and

a first positioning means (53) mounted on said jib (7) and capable of fixing a position of said middle portion supporting means (14) to said jib (7) in the longitudinal direction of said jib (7).

2. The apparatus for stowing the jib according to claim 1, wherein said middle portion supporting means (14) supports said jib (7) so that said jib is pivotally movable around an axis extending from said jib (7) to said boom (6).
3. The apparatus for stowing the jib according to claim 1 or 2, wherein said middle portion supporting means (14) is movably attached to said boom (6) along the longitudinal direction of said boom (6), and a second positioning means (33) mounted on said boom (6) is capable of fixing the position of said middle portion supporting means (14) to said boom (6).
4. The apparatus for stowing the jib according to at least one of claims 1 to 3, wherein said middle portion supporting means (14) further comprises:

a jib side bracket (60) for supporting said jib (7), the jib side bracket (60) being movably attached to said jib (7) along the longitudinal direction of said jib (7); and

a connecting member (40) for connecting said jib side bracket (60) and said boom (6); said first positioning means (53) is capable of fixing the position of said jib side bracket (60) in the longitudinal direction of said jib (7), and said jib side bracket (60) is pivotally connected to said connecting member (40) by a supporting pin (65) passing through said jib side bracket (60) and said connecting member (40) from said jib (7) to said boom (6).

5. The apparatus for stowing the jib according to claim 4, wherein said connecting member (40) is movably attached to said boom (6) along the longitudinal direction of said boom (6), and said second positioning means (33) is capable of fixing a position of said connecting member (40) in the longitudinal direction of said boom (6).

6. The apparatus for stowing the jib according to claim 4 or 5, wherein in said middle portion supporting means (14), said connecting member (40) and said jib side bracket (60) are connected to each other by said supporting pin (65) in a state that said connecting member (40) and said jib side bracket (60) are combined with a predetermined clearance (Y1, Y2) in the longitudinal direction of said jib (7), and said middle portion supporting means (14) is provided with pin hole positioning means (81, 82) for positioning, in the longitudinal direction of said jib (7), connecting member side through holes (41c) formed in said connecting member (40) through which said supporting pin (65) passes and bracket side through holes (61a) formed in said jib side bracket (60) through which said supporting pin (65) passes.

7. The apparatus for stowing the jib according to claim 6, wherein said pin hole positioning means (81, 82) further comprises:

a positioning protruding portion (82) formed on either side of said connecting member (40) or said jib side bracket (60), the positioning protruding portion (82) protruding towards the other side of said connecting member (40) and said jib side bracket (60), the positioning protruding portion being provided with a taper portion (82b) in a top portion, the taper portion being formed with a diameter gradually reducing towards the top portion in the protruding direction; and a positioning hole (81) into which said position-

ing protruding portion (82) is insertable, the positioning hole being formed on the other side of said connecting member (40) and said jib side bracket (60).

Patentansprüche

1. Vorrichtung zum Verstauen eines Auslegers (7), der mit einem oberen Abschnitt eines Schwenkarms (6) auf einer Seitenfläche des an einer Arbeitsmaschine (1) montierten Schwenkarms (6) verbindbar ist, **dadurch gekennzeichnet, dass** die Vorrichtung zum Verstauen des Auslegers aufweist:

eine Mittelabschnittthalteeinrichtung (14) zum Halten eines mittleren Abschnitts des Auslegers (7) in Längsrichtung, wobei die Mittelabschnittthalteeinrichtung an dem Ausleger (7) entlang der Längsrichtung des Auslegers (7) bewegbar angebracht ist; und
eine erste Positionierungseinrichtung (53), die an dem Ausleger (7) montiert ist und in der Lage ist, eine Position der Mittelabschnittthalteeinrichtung (14) zu dem Ausleger (7) in der Längsrichtung des Auslegers (7) zu fixieren.

2. Vorrichtung zum Verstauen des Auslegers nach Anspruch 1, wobei die Mittelabschnittthalteeinrichtung (14) den Ausleger (7) hält, so dass der Ausleger um eine sich von dem Ausleger (7) zu dem Schwenkarm (6) erstreckende Achse drehbar bewegbar ist.

3. Vorrichtung zum Verstauen des Auslegers nach Anspruch 1 oder 2, wobei die Mittelabschnittthalteeinrichtung (14) an dem Schwenkarm (6) entlang der Längsrichtung des Schwenkarms (6) bewegbar angebracht ist, und eine zweite Positionierungseinrichtung (33), die an dem Schwenkarm (6) montiert ist, in der Lage ist, die Position der Mittelabschnittthalteeinrichtung (14) an dem Schwenkarm (6) zu fixieren.

4. Vorrichtung zum Verstauen des Auslegers nach mindestens einem der Ansprüche 1 bis 3, wobei die Mittelabschnittthalteeinrichtung (14) ferner aufweist:

ein auslegerseitiger Beschlag (60) zum Halten des Auslegers (7), wobei der auslegerseitige Beschlag (60) an dem Ausleger (7) entlang der Längsrichtung des Auslegers (7) bewegbar angebracht ist; und

ein Verbindungselement (40) zum Verbinden des auslegerseitigen Beschlags (60) mit dem Schwenkarm (6); wobei die erste Positionierungseinrichtung (53) in der

Lage ist, die Position des auslegerseitigen Beschlags (60) in der Längsrichtung des Auslegers (7) zu fixieren, und

der auslegerseitige Beschlag (60) mit dem Verbindungselement (40) über einen Haltestift (65) drehbar verbunden ist, der durch den auslegerseitigen Beschlag (60) und das Verbindungselement (40) von dem Ausleger (7) hin zu dem Schwenkarm (6) verläuft.

5. Vorrichtung zum Verstauen des Auslegers nach Anspruch 4, wobei das Verbindungselement (40) an dem Schwenkarm (6) entlang der Längsrichtung des Schwenkarms (6) bewegbar angebracht ist, und die zweite Positionierungseinrichtung (33) in der Lage ist, eine Position des Verbindungselements (40) in der Längsrichtung des Schwenkarms (6) zu fixieren.

6. Vorrichtung zum Verstauen des Auslegers nach Anspruch 4 oder 5, wobei bei der Mittelabschnittthalteeinrichtung (14) das Verbindungselement (40) und der auslegerseitige Beschlag (60) über den Haltestift (65) in einem Zustand miteinander verbunden sind, in dem das Verbindungselement (40) und der auslegerseitige Beschlag (60) mit einem vorbestimmten Abstand (Y1, Y2) in der Längsrichtung des Auslegers (7) miteinander kombiniert sind, und die Mittelabschnittthalteeinrichtung (14) mit einer Stiftlochpositionierungseinrichtung (81, 82) versehen ist, um in der Längsrichtung des Auslegers (7) verbindungselementseitige Durchgangslöcher (41c), die in dem Verbindungselement (40) ausgebildet sind, durch die der Haltestift (65) verläuft, und befestigungsteilseitige Durchgangslöcher (61a), die in dem auslegerseitigen Beschlag (60) ausgebildet sind, durch den der Haltestift (65) verläuft, zu positionieren.

7. Vorrichtung zum Verstauen des Auslegers nach Anspruch 6, wobei die Stiftlochpositionierungseinrichtung (81, 82) ferner aufweist:

einen vorstehenden Positionierungsabschnitt (82), der auf Seiten eines von dem Verbindungselement (40) oder dem auslegerseitigen Beschlag (60) ausgebildet ist, wobei der vorstehende Positionierungsabschnitt (82) in Richtung der anderen Seite des Verbindungselements (40) und des auslegerseitigen Beschlags (60) vorsteht und wobei der vorstehende Positionierungsabschnitt mit einem Schrägabschnitt (82b) in einem oberen Abschnitt versehen ist, wobei der Schrägabschnitt mit einem sich allmählich in Richtung des oberen Abschnitts in

der Vorstehrichtung verringernden Durchmesser ausgebildet ist; und ein Positionierungsloch (81), in das der vorstehende Positionierungsabschnitt (82) einführbar ist, wobei das Positionierungsloch auf Seiten des anderen von dem Verbindungselement (40) und dem auslegerseitigen Beschlags (60) ausgebildet ist.

Revendications

1. Appareil destiné à amarrer une flèche (7) pouvant être raccordée à une partie supérieure d'un bras (6) dans une surface latérale du bras (6) monté sur une machine de travaux (1), **caractérisé en ce que** ledit appareil d'arrimage de la flèche comprend :

un moyen (14) soutenant une partie médiane destiné à supporter une partie médiane de ladite flèche (7) dans la direction longitudinale, ledit moyen soutenant la partie médiane étant fixé de manière amovible à ladite flèche (7) le long de la direction longitudinale de ladite flèche (7) ; et un premier moyen de positionnement (53) monté sur ladite flèche (7) et capable de fixer une position dudit moyen (14) soutenant la partie médiane à ladite flèche (7) dans la direction longitudinale de ladite flèche (7).

2. Appareil destiné à amarrer la flèche selon la revendication 1, dans lequel ledit moyen (14) soutenant la partie médiane supporte ladite flèche (7) de sorte que ladite flèche se déplace en pivotement autour d'un axe s'étendant de ladite flèche vers ledit bras (6).

3. Appareil destiné à amarrer la flèche selon la revendication 1 ou 2, dans lequel ledit moyen (14) soutenant la partie médiane est fixé de manière amovible audit bras (6) le long de la direction longitudinale dudit bras (6), et un deuxième moyen de positionnement (33) monté sur ledit bras (6) est capable de fixer la position dudit moyen (14) soutenant la partie médiane audit bras (6).

4. Appareil destiné à amarrer la flèche selon au moins l'une des revendications 1 à 3, dans lequel ledit moyen (14) soutenant la partie médiane comprend en outre :

un support (60) côté flèche pour supporter ladite flèche (7), ledit support (60) côté flèche étant fixé de manière amovible à ladite flèche (7) le long de la direction longitudinale de ladite flèche (7) ; et un élément de raccord (40) destiné à raccorder

ledit support (60) côté flèche audit bras (6) ; ledit premier moyen de positionnement (53) est capable de fixer la position dudit support (60) côté flèche dans la direction longitudinale de ladite flèche (7), et ledit support (60) côté flèche est raccordé en pivotement audit élément de raccord (40) par une goupille de fixation (65) passant par ledit support (60) côté flèche et ledit élément de raccord (40) de ladite flèche (7) audit bras (6).

5. Appareil destiné à amarrer la flèche selon la revendication 4, dans lequel

ledit élément de raccord (40) est fixé de manière amovible audit bras (6) le long de la direction longitudinale dudit bras (6), et

ledit deuxième moyen de positionnement (33) est capable de fixer une position dudit élément de raccord (40) dans la direction longitudinale dudit bras (6).

6. Appareil destiné à amarrer la flèche selon la revendication 4 ou 5, dans lequel

dans ledit moyen (14) soutenant la partie médiane, ledit élément de raccord (40) et ledit support (60) côté flèche sont raccordés l'un à l'autre par ladite goupille de fixation (65) dans un état où ledit élément de raccord (40) et ledit support (60) côté flèche sont combinés avec un dégagement prédéterminé (Y1, Y2) dans la direction longitudinale de ladite flèche (7), et

ledit moyen (14) soutenant la partie médiane est doté d'un moyen (81, 82) de positionnement d'un trou de goupille pour positionner, dans la direction longitudinale de ladite flèche (7), des trous traversants (41c) côté élément de raccord formés dans ledit élément de raccord (40) à travers lequel ladite goupille de fixation (65) passe et des trous traversants (61a) côté support formés dans ledit support (60) côté flèche à travers lequel ladite goupille de fixation (65) passe.

7. Appareil destiné à amarrer la flèche selon la revendication 6, dans lequel

ledit moyen (81, 82) de positionnement du trou de goupille comprend en outre :

une partie de positionnement en protubérance (82) formée sur l'un ou l'autre dudit élément de raccord (40) ou dudit support (60) côté flèche, la partie de positionnement en protubérance (82) faisant saillie vers l'autre côté dudit élément de raccord (40) et dudit support (60) côté flèche, la partie de positionnement en protubérance étant dotée d'une partie effilée (82b) dans une partie supérieure, la partie effilée étant formée d'un diamètre diminuant progressivement vers la partie supérieure dans la direction en protubérance ; et

un trou de positionnement (81) dans lequel la dite partie de positionnement en protubérance (82) peut être insérée, le trou de positionnement étant formé sur l'autre côté dudit élément de raccord (40) et dudit support (60) côté flèche.

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FIG. 2

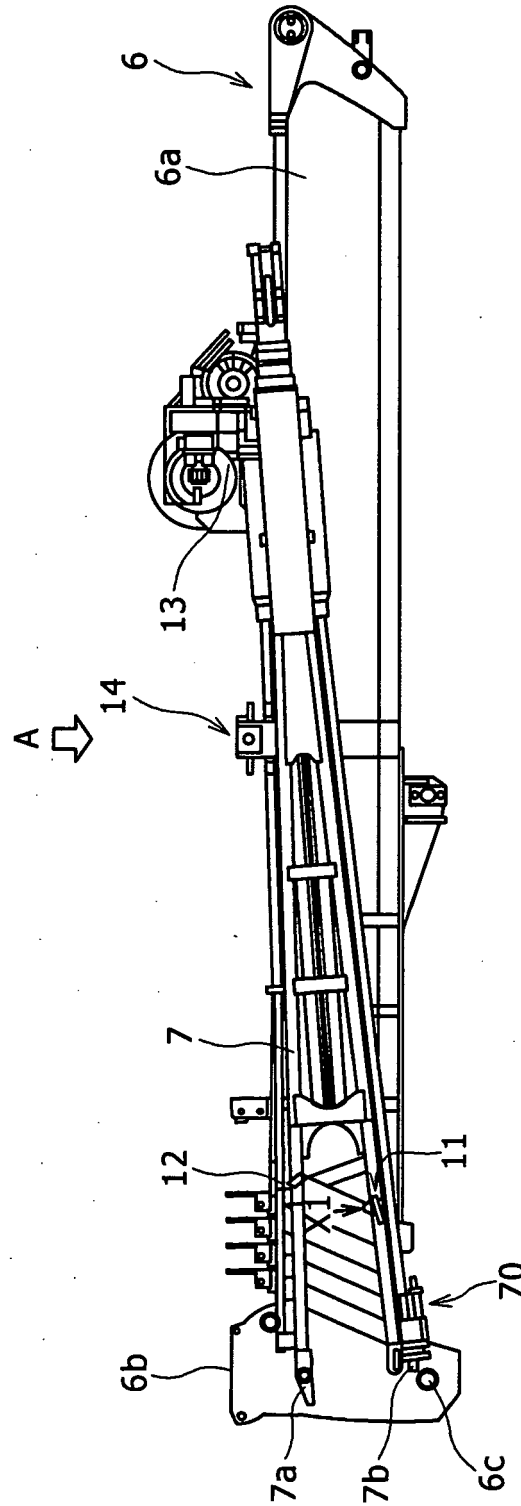


FIG. 3

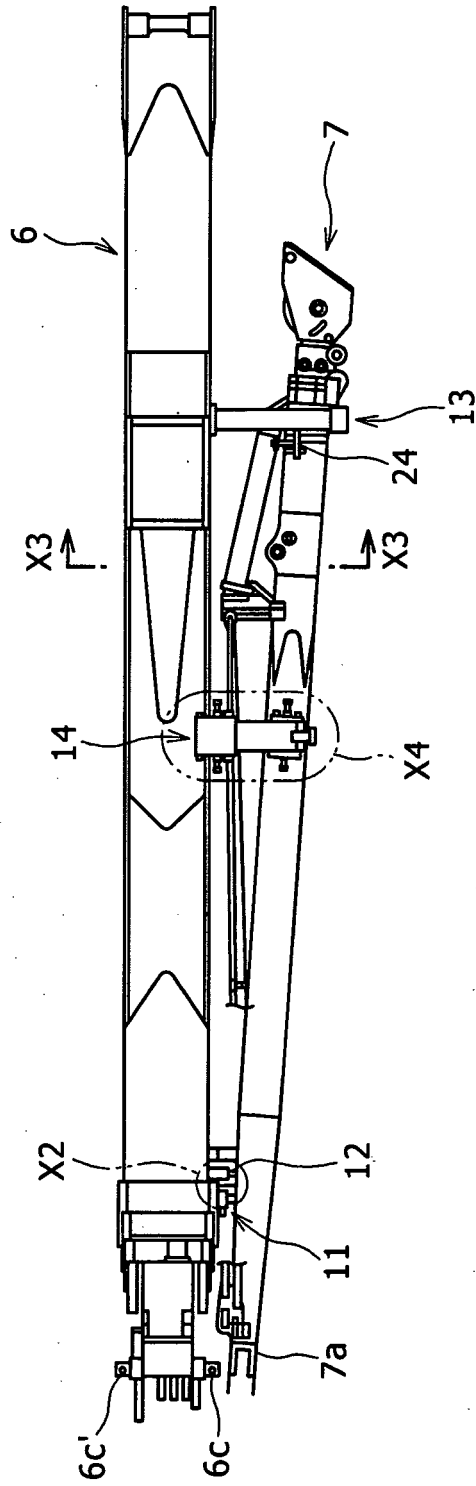


FIG. 4

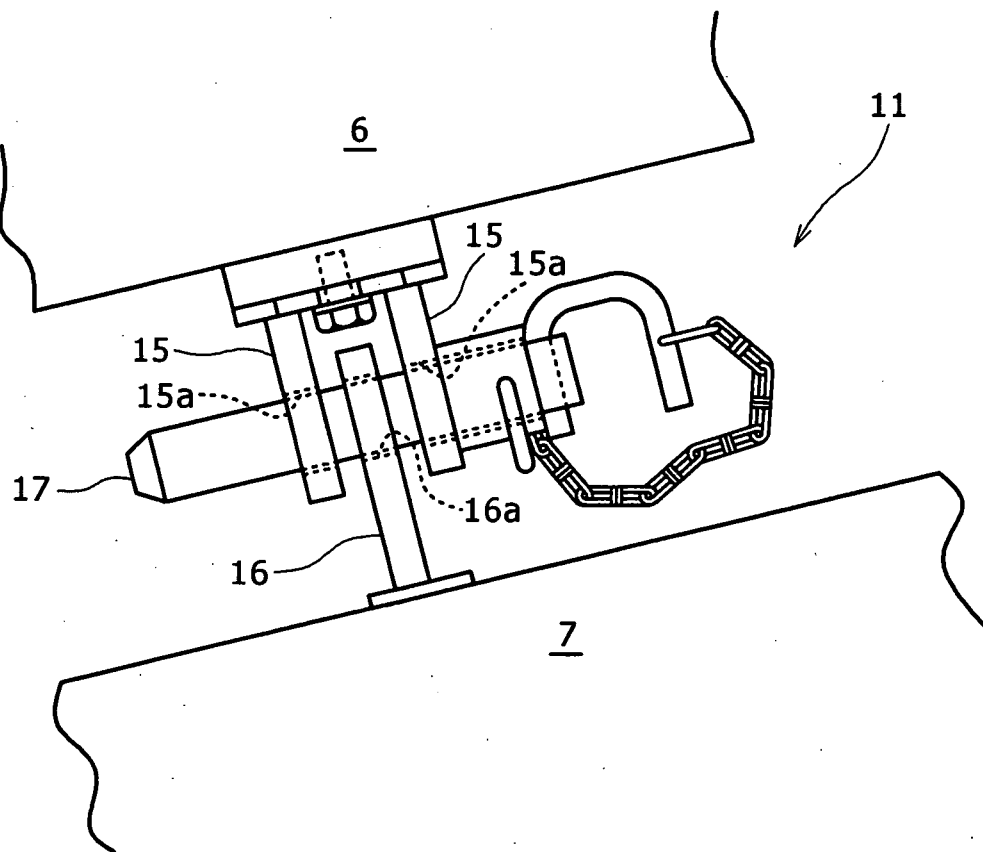


FIG. 5

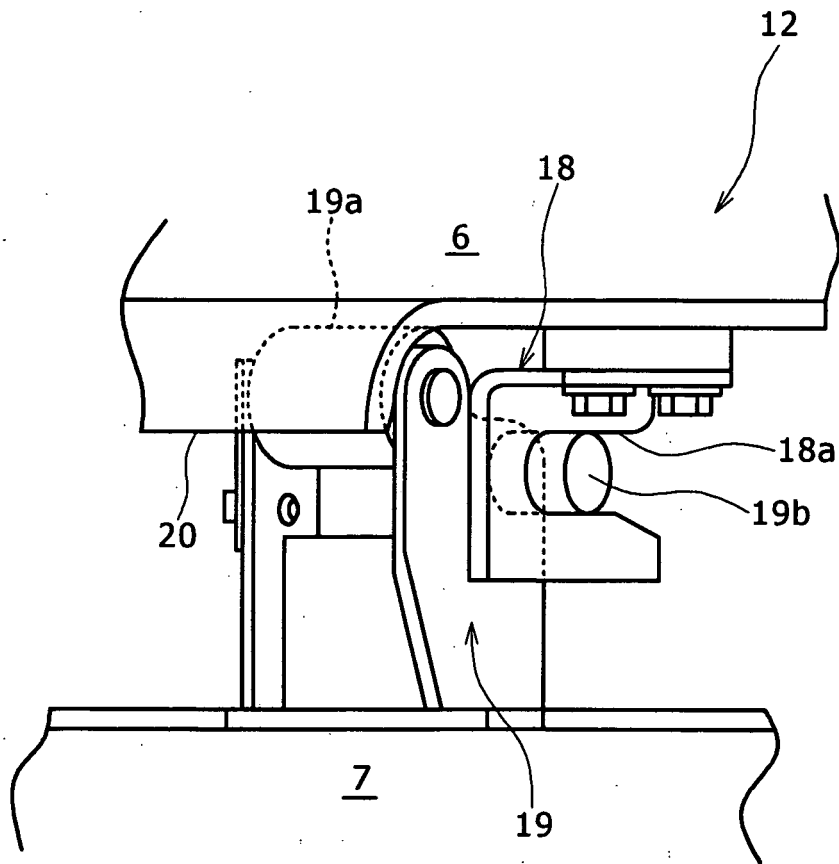


FIG. 6

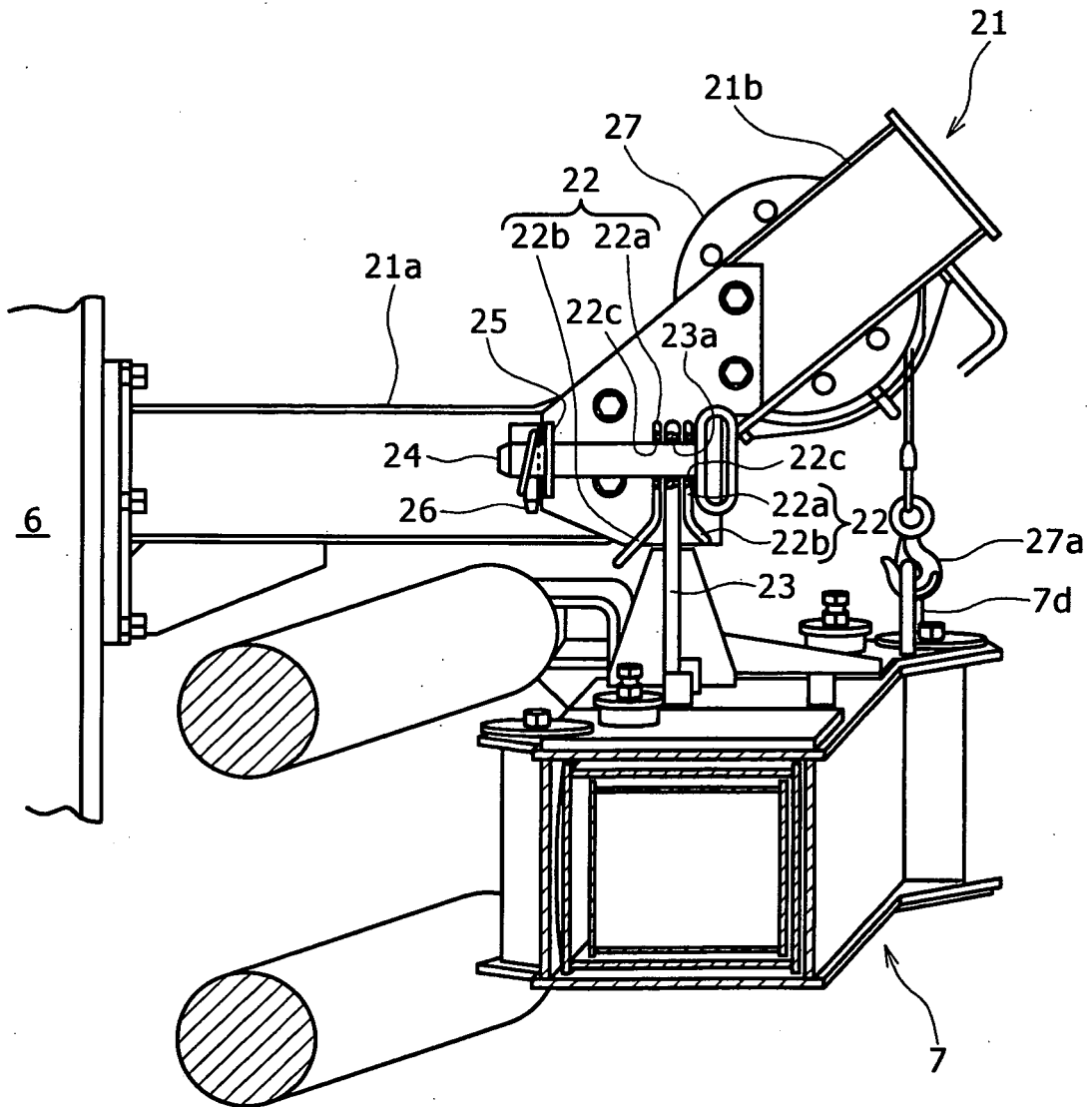


FIG. 7

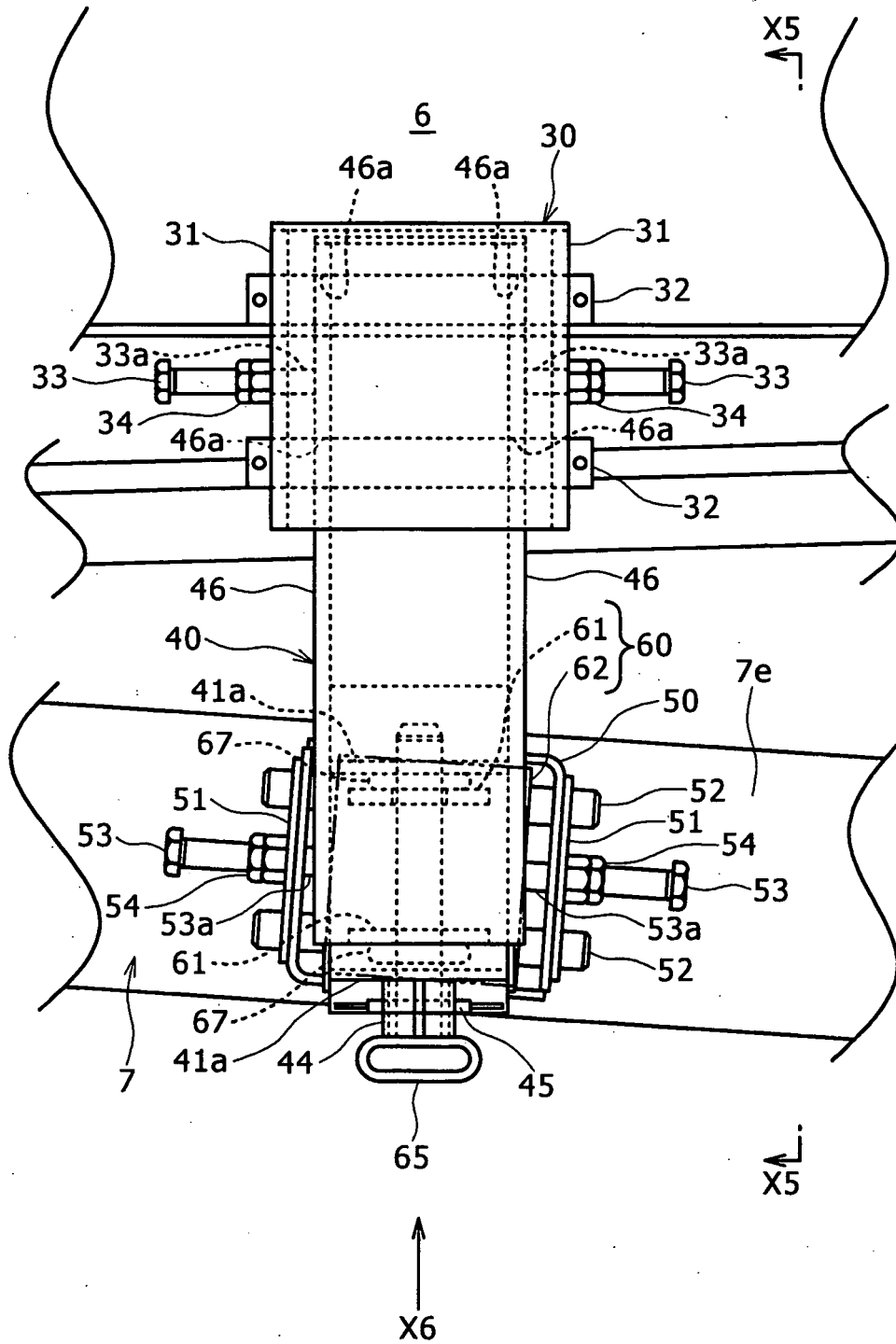


FIG. 8

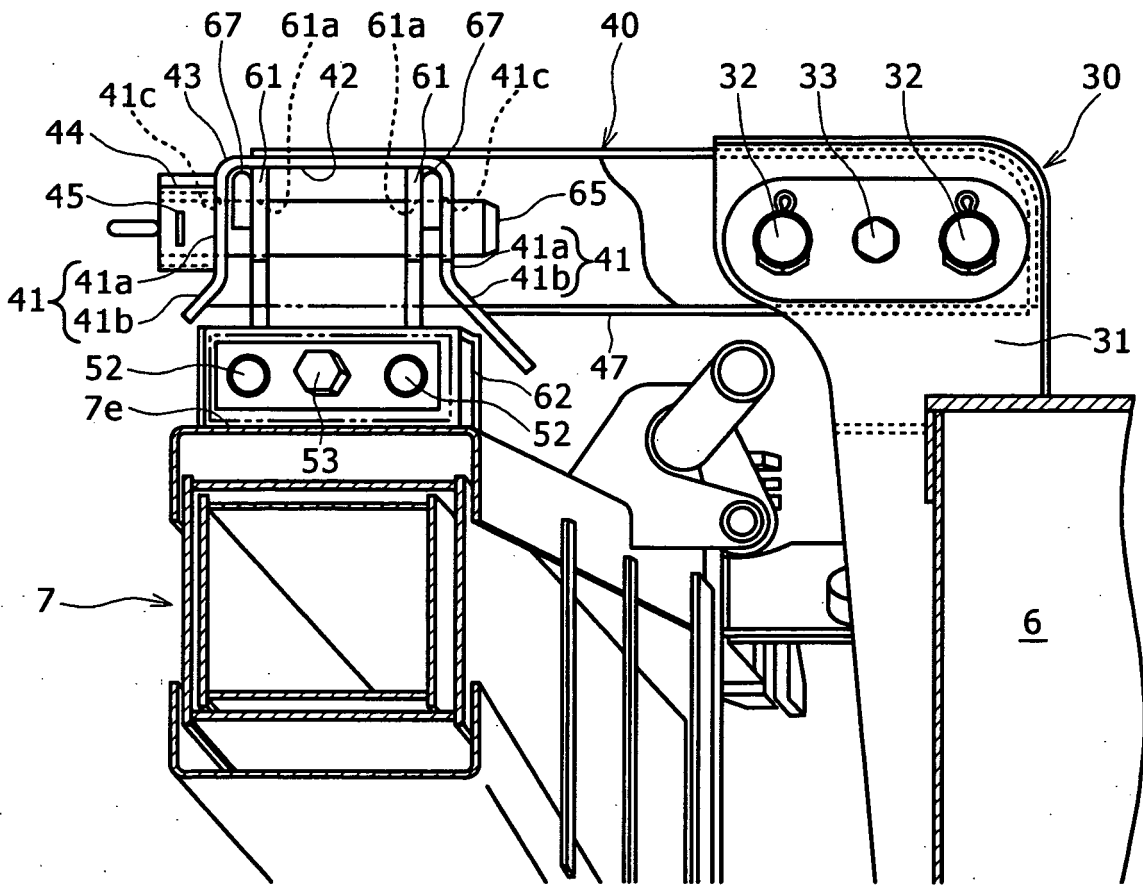


FIG. 9

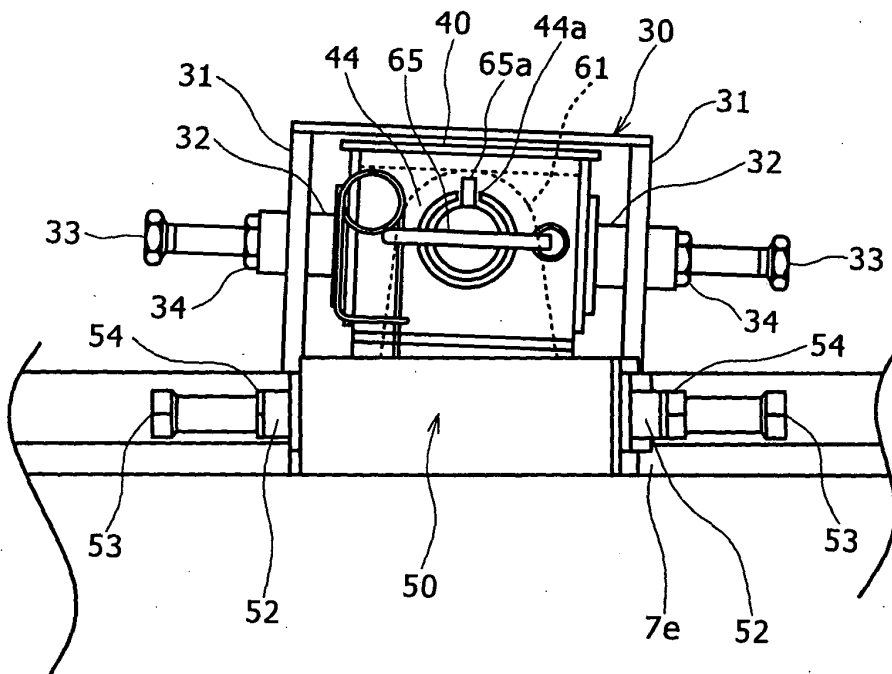


FIG. 10A

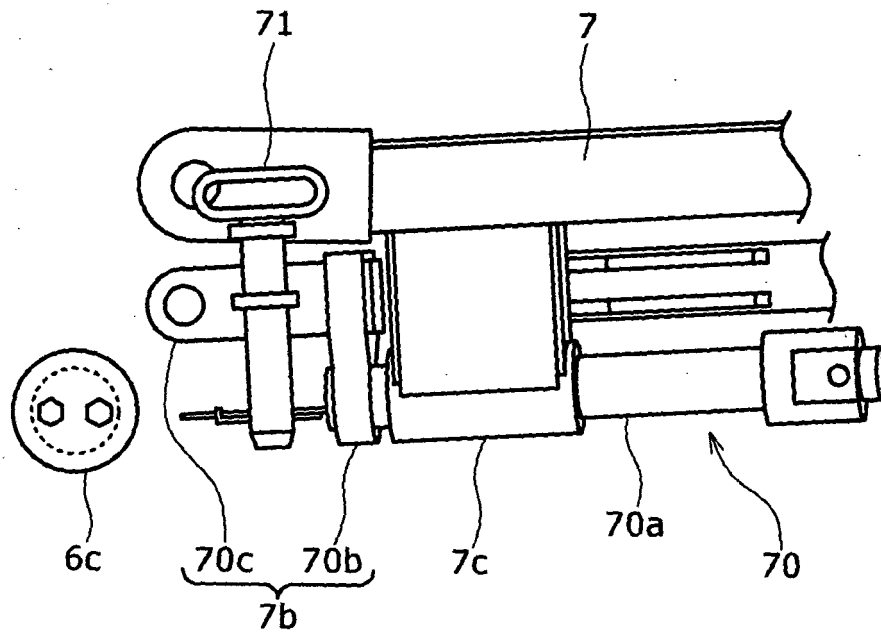


FIG. 10B

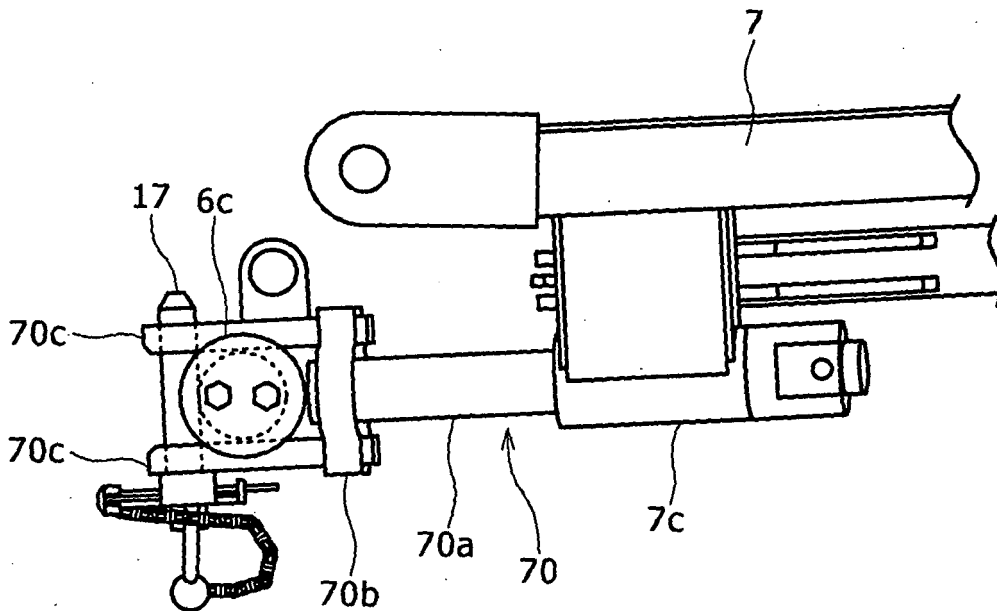


FIG. 11A

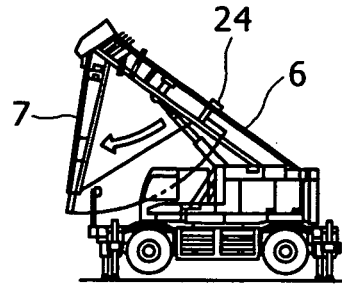


FIG. 11B

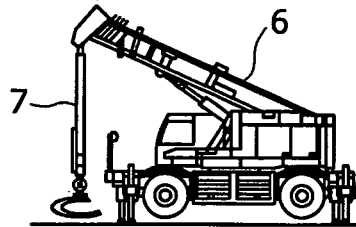


FIG. 11C

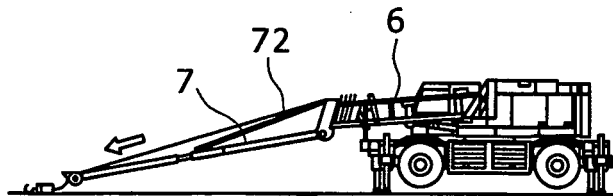


FIG. 11D

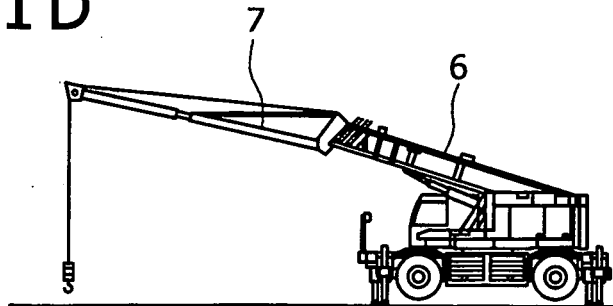


FIG. 12

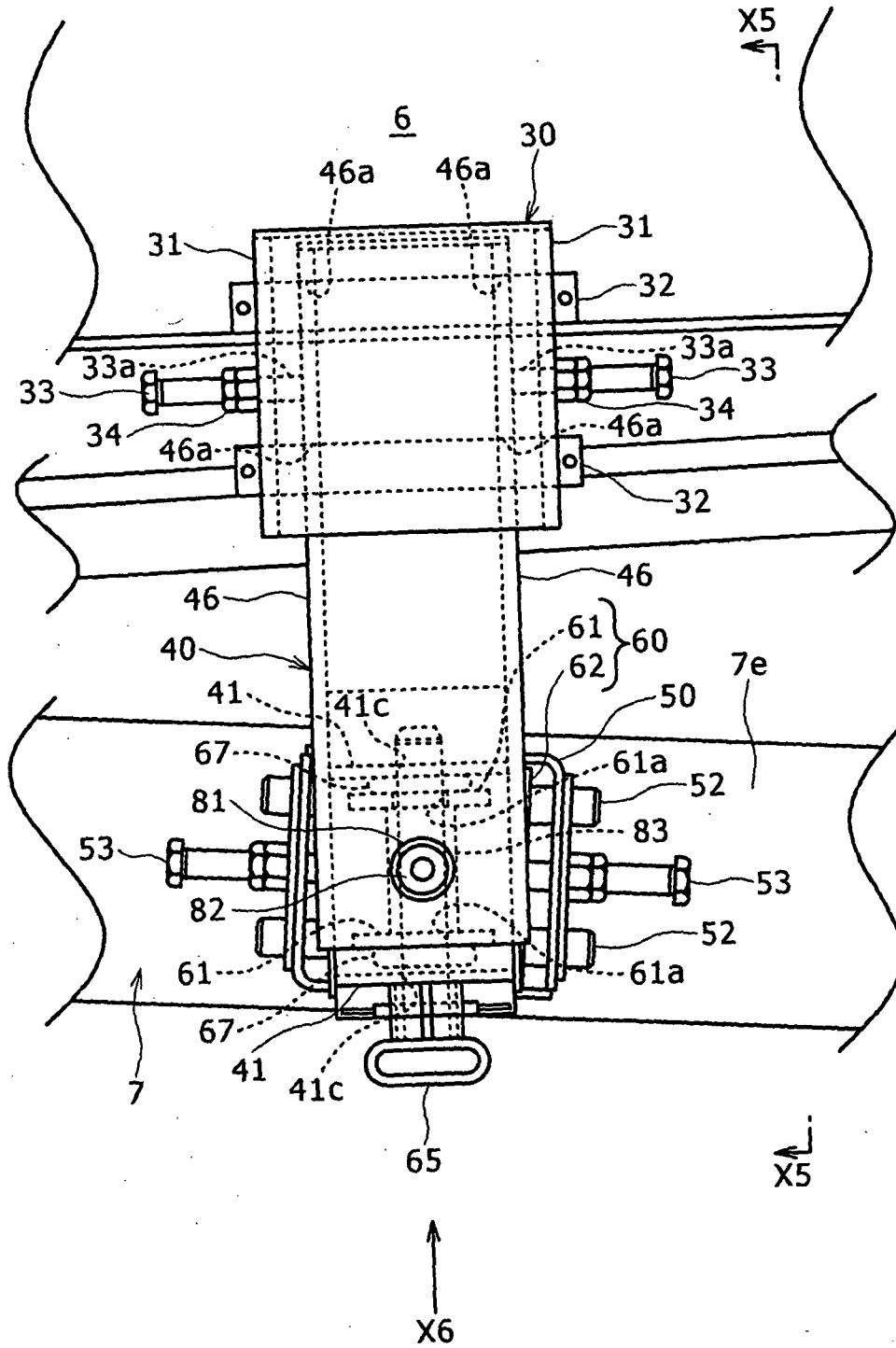


FIG. 13

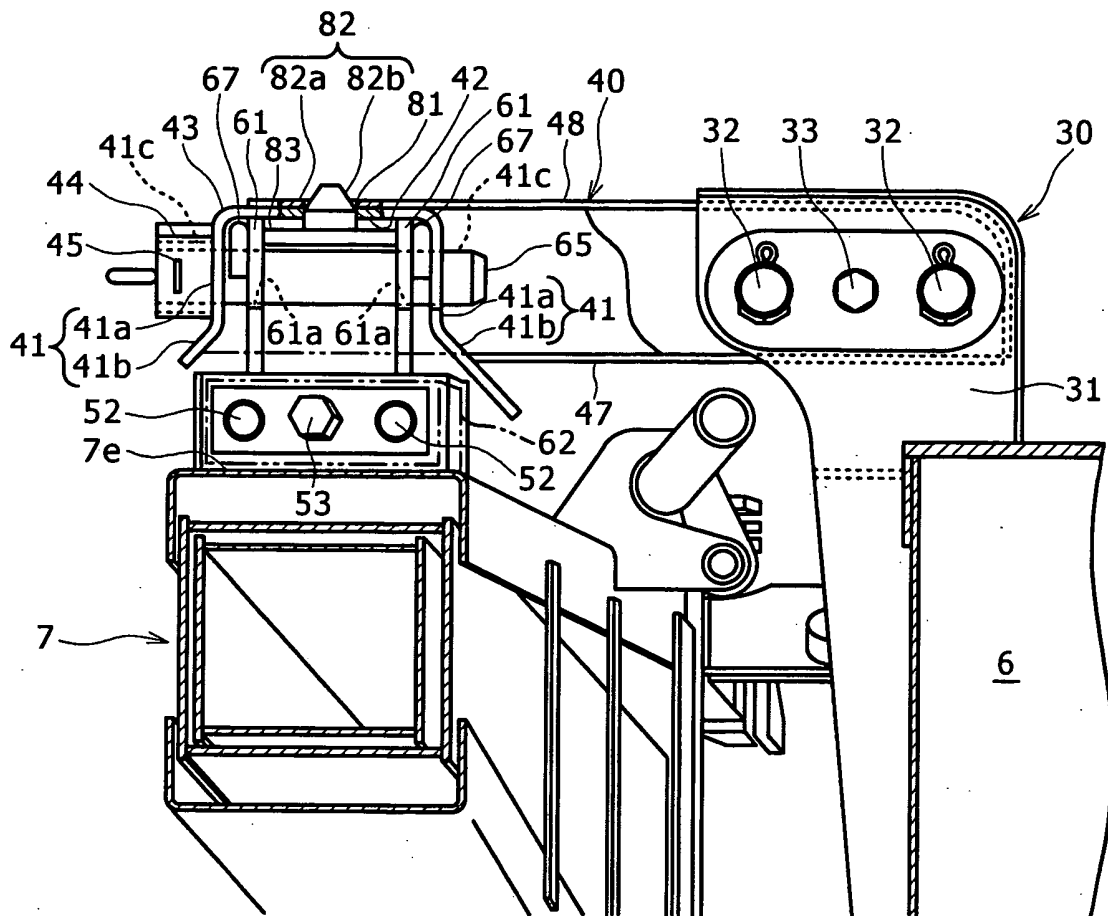
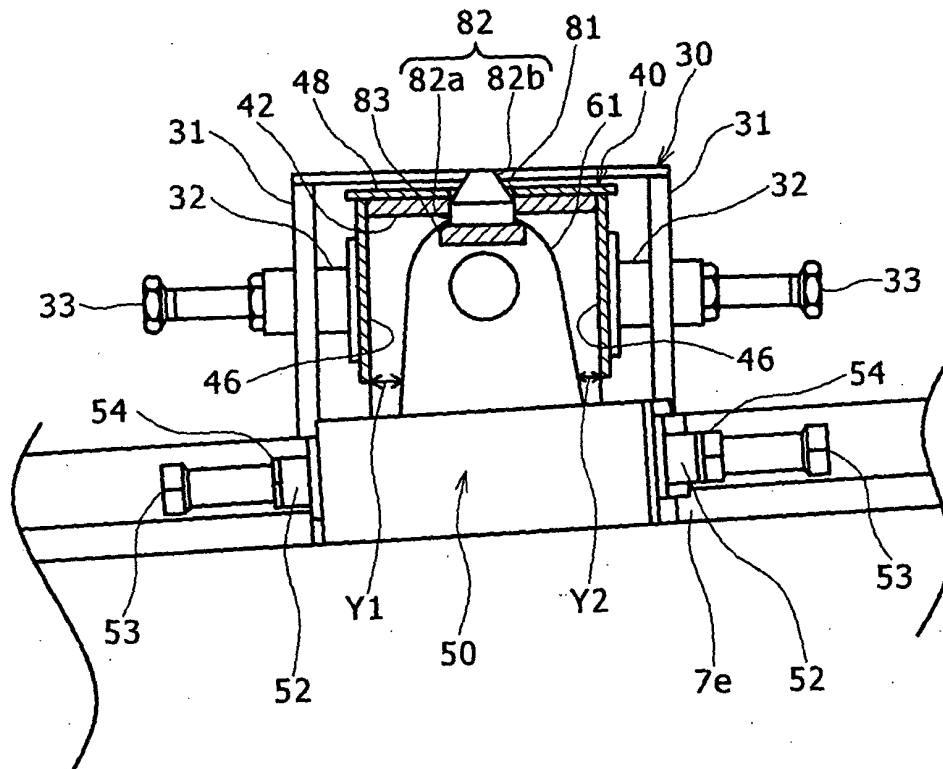


FIG. 14



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP HEI10101294 B [0002]