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(54) **APPARATUS FOR REMOVING LARGE-WEIGHT OBJECT LIFTING MEMBERS.**

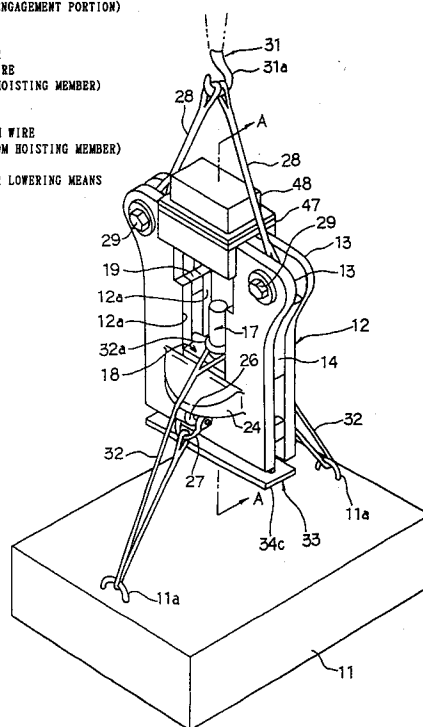
(57) Upper wires (28) are provided between a base (12) and the hook (31a) of a crane (31), and lower wires (32) the base end portions of which are secured to the base are engaged with lifting member locking portions (11a) of a large-weight object (11), rings (32a) at the upper ends of the lower wires (32) being fitted around a mast (17) provided upright on the base. A slider (18) fitted slidably around the mast is pushed up by a first resilient member so that the upper end of the slider is flush with at least that of the mast in a no-load condition a slider lowering means (33) overcoming the resilient force of the first

resilient member to lower the slider. A locking means temporarily fixes the slider lowering means with the slider in a lowered state, and an unlocking means disengages the locking means. The lower lifting members can be removed automatically from the large-weight object lowered to a predetermined place. A large-weight object of any shape can be lifted and lowered to a predetermined place without damaging the tension members, and an operation for hanging tension members on a hook of a crane becomes unnecessary.

EP 0 650 919 A1

FIG. 1

- 11: HEAVY LOAD
- 11a: WIRE ENGAGEMENT PORTION
(HOISTING-MEMBER
ENGAGEMENT PORTION)
- 12: BASE
- 17: MAST
- 18: SLIDER
- 28: TOP WIRE
(TOP HOISTING MEMBER)
- 31: CRANE
- 31a: HOOK
- 32: BOTTOM WIRE
(BOTTOM HOISTING MEMBER)
- 32a: RING
- 33: SLIDER LOWERING MEANS



TECHNICAL FIELD

The present invention relates to a device for dismounting a hoisting member such as a wire, cable, rope, or chain hoisting a heavy load, from the heavy load.

BACKGROUND ART

After a heavy load such as a construction material used for construction works or civil engineering works is raised by a crane by using a hoisting member such as a wire and unloaded at a predetermined place, the wire engaged with the heavy load is normally disengaged by a worker.

However, when the predetermined place is under water such as erection or repair of a breakwater or bank and therefore a work cannot easily approach the place, the wire is left at the place together with a heavy load such as a net case containing stones (for example, refer to Examined Published Japanese Patent Application No. 51-12322).

However, to arrange a lot of heavy loads such as net cages containing stones at a seashore or pier in the case of the above work, leaving of a wire whose unit cost is approx. 10,000 yen for each heavy load increases the construction cost. Therefore, the wire is dismounted by a diver under water. However, because it is not easy to dismount it depending on the meteorological condition or installed condition of the heavy loads, it has been desired to improve the dismounting operation.

To solve the above problems, the applicant of this invention applied for a patent (Unexamined Published Japanese Patent Application No. 3-73986) of a dismounting device for a heavy load hoisting member, in which an upper hoisting member is set between a base and a crane hook, a lower hoisting member whose foundation end is set to the base is engaged with a heavy-load hoisting member engagement portion and whose front-end ring is fitted into a mast erected on the base, and a slider slidably fitted into the mast is pushed up by a resilient body so that the top of the slider fits at least the top of the mast under loadless state and moreover slider lowering means lowers the slider by overcoming the resilient force of the resilient body while the base is raised.

When the slider lowering means is a weight suspended by the slider through a suspension member, the ring at the front end of the lower hoisting member fitted into the mast is completely removed from the mast after a hoisted heavy load is downed at a predetermined place and the weight is mounted on the heavy load, and moreover the base lowers by a predetermined distance. By raising the base by a crane under the above state, the

lower hoisting member is removed from the heavy-load hoisting member engagement portion. Therefore, it is possible to set a heavy load at a place where no worker can work in view of safety and sanitation by using a crane.

When the slider lowering means is provided with a fixed pulley set on the base, a tension member whose one end is set to the slider through the pulley, and a releaser engaged with the hook of a crane and formed so that the other end of the tension member can be freely engaged or disengaged, the ring at the front end of the lower hoisting member is completely removed from the mast before the base contact the heavy load after downing the heavy load at a predetermined place by releasing the other end of the tension member from the releaser at a desired position before the heavy load is downed.

In the case of the above conventional dismounting device, however, the suspension member or tension member may be damaged because they are exposed for a relatively long time.

Moreover, in the case of the dismounting device using the weight, the weight may not stably be mounted on a heavy load when downing the heavy load at a predetermined position if the heavy load is a tetrapod whose top is not flat.

Furthermore, in the case of the dismounting device using the releaser, operations are troublesome because the tension member released from the releaser must be engaged with the releaser again when hoisting another heavy load in order to down an original heavy load at a predetermined place.

It is the first object of the present invention to provide a dismounting device for a heavy load hoisting member, making it possible to automatically dismount a lower hoisting member engaged with a heavy load from the heavy load when downing the heavy load at a predetermined place.

It is the second object of the present invention to provide a dismounting device for a heavy load hoisting member, making it possible to hoist a heavy load with any shape and down it at a predetermined place without damaging a tension member and disuse the engagement of a tension member with the hook of a crane.

DISCLOSURE OF THE INVENTION

The constitution of the present invention to achieve the above objects is described below by referring to FIGs. 1, 2, and 7 which correspond to an embodiment.

The present invention is a device for dismounting a lower hoisting member 32 engaged with a heavy load 11 having a hoisting member engagement portion 11a from the heavy load 11.

The dismantling device comprises a base 12, an upper hoisting member 28 whose foundation end is set to the base 12 and whose front end is formed so that it can be engaged with a hook 31a of a crane 31, a mast 17 erected on the base 12, a lower hoisting member 32 whose foundation end is set to the base 12 and whose front end has a ring 32a to be fitted into the mast 17, and which engages with a hoisting-member engagement portion 11a, a slider 18 vertically movably set to the mast 17, a first resilient body 21 for pushing up the slider 18 under loadless state so that the top of the slider 18 fits at least the top of the mast 17, a slider lowering means 33 for lowering the slider 18 by overcoming the resilient force of the first resilient body 21, locking means 43 for temporarily locking the slider lowering means 33 while the slider 18 lowers, and unlocking means 55 for unlocking the locking means 43.

When the heavy load 11 hoisted by the crane 31 is downed at a predetermined place by using the upper hoisting member 28, base 12, and lower hoisting member 32 and thereafter the locking means 43 is unlocked by the unlocking means 55, the slider lowering means 33 stops. As a result, the ring 32a at the front end of the lower hoisting member 32 fitted into the mast 17 is removed from the mast 17 because the slider 18 is raised up to at least the top of the mast 17 by the resilient force of the first resilient body 21. When the base 12 is raised by the crane 31 under the above state, the lower hoisting member 32 is removed from the hoisting member engagement portion 11a of the heavy load 11 and disengaged from the heavy load 11.

When the locking means 43 is unlocked by the unlocking means 55 before downing the heavy load 11 at a predetermined place, the slider lowering means 33 stops but the slider 18 is kept lowered because the ring 32a of the lower hoisting member 32 on which the load of the heavy load 11 works is fitted into the mast 17. Resultingly, the slider 18 is raised up to the top of the mast 17 by the resilient force of the first resilient body 21 when the heavy load 11 is downed at the predetermined place and thereby the ring 32a of the lower hoisting member 32 fitted into the mast 17 is removed from the mast 17.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective of an important portion, showing the state in which a heavy load is hoisted by a crane through the dismantling device of the first embodiment of the present invention for a heavy load hoisting member;
FIG. 2 is a sectional view taken along the line A-A in FIG. 1, showing the state in which the slider

lowering means of the dismantling device stops and a slider is raised;

FIG. 3 is a sectional view corresponding to FIG. 2, showing the state in which the slider lowering means operates and the slider is lowered;

FIG. 4 is a sectional view taken along the line B-B in FIG. 2;

FIG. 5 is a sectional view taken along the line C-C in FIG. 2;

FIG. 6 is a sectional view taken along the line D-D in FIG. 2;

FIG. 7 is an enlarged view of the portion E in FIG. 2;

FIG. 8 is a block diagram of remote control means for remote-controlling an arm holder;

FIG. 9 is an enlarged view of the portion E in FIG. 2, showing the state in which an adjustable bar engages with a locked member;

FIG. 10 is a sectional view corresponding to FIG. 9, showing the state immediately before an arm rotates in the direction for releasing the engagement of the adjustable bar with the locked member and the locked member lowers;

FIG. 11 is a sectional view corresponding to FIG. 9, showing the state in which the locked member currently lowers;

FIG. 12 is a sectional view corresponding to FIG. 9, showing the state in which the locked member lowers up to the lowest end;

FIG. 13 is a front view of an important portion, showing the state in which a base is mounted on a heavy load to be hoisted and a ring at the front end of a lower hoisting member is fitted into a mast;

FIG. 14 is a front view corresponding to FIG. 13, showing the state in which the heavy load is hoisted by a crane through the dismantling device;

FIG. 15 is a front view corresponding to FIG. 13, showing the state in which the heavy load is downed at a predetermined place;

FIG. 16 is a front view corresponding to FIG. 13, showing the state in which a locking device is unlocked by unlocking means and the slider removes a ring at the front end of a lower hoisting member fitted into a mast from the mast;

FIG. 17 is a front view corresponding to FIG. 13, showing the state in which the dismantling device is hoisted by a crane and the lower hoisting member is removed from the hoisting member engagement portion of a heavy load;

FIG. 18 is a perspective view corresponding to FIG. 7, showing the state in which the adjustable bar of the second embodiment of the present invention engages with the locked member;

FIG. 19 is a perspective view corresponding to FIG. 18, showing the state immediately before

the arm rotates in the direction for releasing the engagement of the adjustable bar with the locked member and the locked member lowers; FIG. 20 is a sectional view corresponding to FIG. 7, showing the state in which the lock pin of the third embodiment of the present invention is inserted into the through-hole of the locked member;

FIG. 21 is a sectional view taken along the line F-F in FIG. 20;

FIG. 22 is a sectional view corresponding to FIG. 21, showing the state in which the lock pin is removed from the through-hole of the locked member;

FIG. 23 is a sectional view taken along the line G-G in FIG. 24, showing the state in which the slider lowering means of the fourth embodiment of the present invention operates and the slider lowers;

FIG. 24 is a sectional view taken along the line H-H in FIG. 23;

FIG. 25 is a perspective view of an important portion, showing a heavy load is hoisted by a crane through the dismounting device for a heavy load hoisting member;

FIG. 26 is a sectional view corresponding to FIG. 23, showing the state in which the heavy load is hoisted by a crane through the dismounting device; and

FIG. 27 is a sectional view corresponding to FIG. 23, showing the state in which the locking device is unlocked by the unlocking means and the slider removes the ring at the front end of the lower hoisting member fitted into the mast from the mast.

BEST MODE FOR CARRYING OUT THE INVENTION

The first embodiment of the present invention is described below in detail by referring to the accompanying drawings.

As shown in FIGs. 1 to 12, this embodiment uses a concrete block as a heavy load 11 in which a reverse-U-shaped wire engagement portion 11a is secured to the top middle between the both ends of the heavy load 11. The dismounting device for a hoisting member has a base 12 with an approximately-T-shaped large-diameter hole 12a formed at its center (FIGs. 1 to 4). The base 12 has a pair of plates 13 and 13 formed by cutting a steel plate approximately into a rectangle, a pair of side plates 14 and 14 arranged at the both margins of the plate 13 to connect these plates 13 and 13 at a predetermined interval, and a bottom block 16 set at the bottom margin center of the plate 13. The plates 13 and 13 are connected each other by welding them through the side plates 14, 14 and

the bottom block 16.

The approximately-T-shaped large-diameter holes 12a and 12a are formed at the center of the plates 13 and 13 respectively so that they face each other and through-holes 13a and 13a are formed at the right and left corners of the top of the plate 13. A through hole 12b is vertically formed at the bottom center of the base 12 toward the large-diameter hole 12a and the bottom of a cylindrical mast 17 is inserted into the through-hole 12b and welded to it. The mast 17 is erected on the base 12 so that it protrudes into the large-diameter hole 12a. The mast 17 has a lower large-diameter portion 17a and an upper small-diameter portion 17b facing the large-diameter hole 12a. A first resilient body 21 is movably fitted into the mast 17 and a flat slider 18 is slidably fitted to the small-diameter portion 17a. A pair of guide portions 18a and 18a slidable to the plates 13 and 13 respectively are protruded from the both ends of the slider 18 and a pair of stoppers 19 and 19 for preventing the slider 18 from separating from the mast 17 are secured to the plates 13 and 13 by a knock pin 23 respectively. This embodiment uses a helical compression spring as the resilient body 21. The slider 18 is energized by the first resilient body 21 so that the guide portion 18a of the slider 18 contacts the stopper 19 when the top of the slider 18 slightly protrudes from the top of the mast 17 (FIG. 2). Flanges 24 and 24 crossing the bottom of the large-diameter holes 12a and 12a and approximately horizontally extending are welded to the surface of the plates 13 and 13 respectively and a pair of shackle holders 26 and 26 are welded vertically to the bottom center of the flange 24 and the plate 13 respectively. A mounting hole 26a into which a shackle 27 can movably inserted is formed on the shackle holder 26 (FIGs. 1 and 4).

Bolts 29 and 29 into which the foundation ends of top wires 28 and 28 are fitted are inserted into the through-holes 13a and 13a formed on the plates 13 and 13 respectively (FIGs. 2 and 3) and a not-illustrated nut is screwed to the bolt 29. The front end of the top wire 28 is engaged with a hook 31a of a crane 31 (FIG. 1). The foundation end of a bottom wire 32 is fitted to the shackle 27 and the shackle 27 is movably inserted into the mounting hole 26a of the shackle holder 26 (FIGs. 1 and 4). A ring 32a which can be fitted to the mast 17 is formed at the front end of the bottom wire 32 (FIGs. 1 and 3).

The base 12 is provided with slider lowering means 33 for lowering the slider 18 by overcoming the resilient force of the resilient body 21 (FIGs. 1, 2, 3, and 5), locking means 43 for temporarily locking the slider lowering means 33 while the slider 18 lowers, and unlocking means 55 for unlocking the locking means 43 (FIGs. 2 to 4 and 7 to

12).

The slider lowering means 33 is provided with a sensor rod 34 which is vertically movably inserted into the base 12 as shown in FIGs. 2, 3, and 5 in detail and which is made of a reverse-U-shaped steel plate and whose bottom protrudes downward from the bottom of the base 12, a movable pulley 41 rotatably set to the sensor rod 34, a fixed pulley 42 rotatably set to the base 12, and a tension member 36 whose one end is secured to the base 12 and other end is secured to the slider 18 and which is set through the movable pulley 41 and the fixed pulley 42. The sensor rod 34 has a pair of leg portions 34a and 34a and a connecting portion 34b for connecting the legs 34a and 34a each other at their top. The bottoms of the legs 34a and 34a protrude downward beyond the bottom of the base 12 due to the sensor rod 34's own weight when the base 12 is hoisted. The movable pulleys 41 and 41 are set to the center of the legs 34a and 34a respectively and a flat member 34c is secured to the bottoms of the legs 34a and 34a by a bolt 34d and a nut 34e respectively (FIG. 4). The fixed pulleys 42 and 42 are set to the plates 13 and 13 at the both sides of the large-diameter portion 17a of the mast 17 protruded from the bottom block 16 respectively. This embodiment uses a wire as the tension member 36 which is set so as to lower the slider 18 by overcoming the resilient force of the first resilient body 21 when the leg 34a of the sensor rod 34 is inserted into the base 12. The base 12 has a mass for inserting the leg 34a of the sensor rod 34 into the base 12 to lower the slider 18 due to the weight of the base 12 by overcoming the resilient force of the first resilient body 21 when lowering the base 12 onto the heavy load 11.

The locking means 43, as shown in FIGs. 4, 7, and 9 to 12 in detail, has a locked member 44 protruded upward from the top of the base 12 integrally erected at the center of the connecting portion 34b of the sensor rod 34 and formed into a flat bar, and a flat adjustable bar 46 which has a slot 46a to be movably inserted into the locked member 44, and which extends in the width direction of the blocked member 44. A box 47 having a lid 48 is secured to the top of the base 12 by a bolt 49 (FIG. 4) and the locked member 44 protrudes into the box 47. A roller 50 is rotatably set to the top of the locked member 44 and the locked member 44 is formed so that the width of the top is smaller than that of the bottom. The slot 46a is formed at the middle of the adjustable bar 46 along the longitudinal direction of the bar 46 and its length is slightly larger than the bottom width of the locked member 44.

A mounting slot 46b is approximately horizontally formed at the foundation end of the adjustable bar 46 along the longitudinal direction of the bar 46

and the adjustable bar 46 is rotatably set to the box 47 so that it can slide in the longitudinal direction within the vertical plane by passing a pin 52 through the top of an approximately-J-shaped bracket 51 and the mounting slot 46b. When the adjustable bar 46 reaches a predetermined angle, the locked member 44 is constituted so that it is engaged with the slot 46a. In other words, when the adjustable bar 46 rotates about the pin 52 and moves in its longitudinal direction and the cross-directional both margins of the bottom of the locked member 44 are engaged with the both margins of the slot 46a of the adjustable bar 46, the leg 34a of the sensor rod 34 is inserted into the base 12, that is, the slider 18 lowers and thereby the locked member 44 is temporarily fixed. Moreover, an adjusting bolt 53 for adjusting the engagement angle of the adjustable bar 46 is screwed to the front end of the adjustable bar 46 and the bolt 53 is fixed by a lock nut 54.

The unlocking means 55, as shown in FIGs. 7 and 9 to 12, comprises a second resilient body 22 for energizing an arm 57 in the direction for releasing the locked member 44 from the adjustable bar 46 and an arm holder 58 for holding the arm 57 by resisting the resilient force of the second resilient body 22 to secure the locked member 44 to the adjustable bar 46 during operation and releasing the locked member 44 from the adjustable bar 46 by releasing the arm 57 during no operation. The arm 57 is erected at the bottom of the box 47 and rotatably set to a bracket 59 secured to the box 47 through a pin 61. The roller 50 faces the lateral of the arm 57. A catching portion 57a for catching the front end of the adjusting bolt 53 of the adjustable bar 46 is set at one of the laterals of the bottom of the arm 57 and an attracting plate 62 is rotatably set to the top of the arm 57 through a pin 63. This embodiment uses a helical tension spring as the second resilient body 22 which is set between the top of the bracket 51 and that of the arm 57. This spring 22 energizes the arm 57 so that the arm 57 rotates in the direction for pushing up the front end of the adjustable bar 46. The arm holder 58 is set to the top of a reverse-L-shaped bracket 64 secured to the box 47 by a long bolt 66 and a box nut 67 so that it faces the attracting plate 62 and a compression coil spring 68 is fitted to the long bolt 66. The arm holder 58 is constituted so that it can be moved toward the bracket 64 by resisting the resilient force of the compression coil spring 68. Moreover, an electromagnet (not illustrated) is built in the arm holder 58 so that the magnetic force attracts the attracting plate 62 when the electromagnet is magnetized and the attracting plate 62 is separated from the arm holder 58 due to the resilient force of the second resilient body 22 when the electromagnet is demagnetized. The lateral of the

arm 57 facing the roller 50 is formed on a slope 57b which further approaches the locked member 44 at its lower part and the slope 57b rotates the arm 57 in the direction for pressing the attracting plate 62 against the arm holder 58 when the slope 57b contacts the roller 50 to lower the roller 50.

The arm holder 58, as shown in FIG. 8 in detail, is constituted so that it is wirelessly remote-controlled by remote control means 71. The remote control means 71 comprises a transmitter 72 separate from the base 12 and a receiver 73 set in the box 47. The transmitter 72 comprises a switch control panel 72a, a radio transmitting section 72b electrically connected to the control panel 72a, and a transmitting antenna 72c. The receiver 73 comprises a receiving antenna 73c, a radio receiving section 73a, and a driving section 73b for controlling the arm holder 58 electrically connected to the receiving section 73a. By turning on/off a switch (not illustrated) set on the switch control panel 72a, the arm holder is operated or stopped. That is, the radio transmitting section 72b transmits a control signal of the arm holder 58 through the transmitting antenna 72c by operating the switch on the control panel 72a. The radio receiving section 73a receives the transmitted control signal through the receiving antenna 73c and the driving section 73b controls the arm holder 58 in accordance with the received signal.

Operations of the dismounting device thus constituted for a heavy load hoisting member are described below by referring to FIGs. 1 to 3 and 9 to 17.

First, the base 12 is hoisted by the crane 31 through the top wire 28 (FIGs. 1 and 2). In this case, because the locked member 44 lowers up to the bottommost position as shown in FIG. 12, the roller 50 of the locked member 44 rotates the arm 57 in the direction of the solid-line arrow to press the attracting plate 62 against the arm holder 58, a switch (not illustrated) on the switch control panel 72a is turned on and the attracting plate 62 is attracted by the arm holder 58 so as to prevent the arm 57 from rotating in the direction of the broken-line arrow.

As shown in FIG. 3, when the base 12 is downed on the heavy load 11 in order to engage the bottom wire 32 with the heavy load 11 to be hoisted, the leg 34a of the sensor rod 34 protruded downward from the bottom of the base 12 is inserted into the base 12 and the slider 18 lowers by resisting the resilient force of the first resilient body 21. In this case, the locked member 44 rises as shown in FIG. 9. Under the above state, the bottom wire 32 is inserted into the wire engagement portion 11a and thereafter the ring 32a at the front end of the bottom wire 32 is fitted to the mast 17.

When the heavy load 11 is hoisted by the crane 31 through the top wire 28, base 12, and bottom wire 32 as shown in FIG. 14, the locked member 44 engages with the slot 46a of the adjustable bar 46 as shown in FIG. 9. Therefore, the sensor rod 34 does not lower.

When the heavy load 11 is downed at a predetermined place G as shown in FIG. 15, the bottom wire 32 is loosened. When the switch is turned off under the above state, the arm holder 58 does not attract the attracting plate 62. Therefore, the arm 57 rotates in the direction of the solid-line arrow in FIG. 9 due to the resilient force of the second resilient body 22 and the slope 57b of the arm 57 contacts the roller 50 (FIG. 10). Because the arm 57 pushes up the front end of the adjustable bar 46 at the same time, the locked member 44 is released from the adjustable bar 46 and the roller 50 lowers due to its own weight together with the locked member 44 (FIG. 11). In this case, the roller 50 rotates the arm 57 in the direction of the broken-line arrow while rolling on the slope 57b of the arm 57. However, because the narrow portion at the top of the blocked member 44 is located in the slot 46a of the adjustable bar 46, the slot 46a of the adjustable bar 46 lowers up to the position shown in FIG. 12 without engaging with the locked member 44 and the attracting plate 62 is pressed against the arm holder 58. Moreover, because the slider 18 under loadless state is raised due to the resilient force of the first resilient body 21 simultaneously when the locked member 44 lowers, the ring 32a of the bottom wire 32 is removed from the mast and dropped as shown in FIG. 16.

Furthermore, when the base 12 is hoisted by winding up a crane wire (not illustrated) as shown in FIG. 17, the bottom wire 32 is removed from the wire engagement portion 11a of the heavy load 11 and raised together with the base 12. Therefore, it is possible to automatically dismount the bottom wire 32 from the heavy load 11 downed at the predetermined place G.

Furthermore, it is possible to hoist the heavy load 11 again and down it at another place unless the switch is turned off when the heavy load 11 is downed at the predetermined position G.

Furthermore, when the switch is turned off while the heavy load 11 is hoisted as shown in FIG. 14, the arm 57 rotates in the direction of the solid-line arrow in FIG. 9 due to the resilient force of the second resilient body 22 to push up the front end of the adjustable bar 46. Therefore, the locked member 44 is released from the adjustable bar 46 and lowers (FIGs. 10 to 12). In this case, the slider 18 is kept lowered and the tension member 36 is loosened because the ring 32a of the bottom wire 32 on which the load of the heavy load 11 works is fitted to the mast 47. As a result, when the slider

18 is brought under loadless state by downing the heavy load 11 at the predetermined place G, it is raised up to the top of the mast 17 due to the resilient force of the first resilient body 21 and the ring 32a of the bottom wire 32 fitted to the mast 17 is removed from the mast 17.

FIGs. 18 and 19 show the second embodiment of the present invention. In FIGs. 18 and 19, a symbol same as that of first embodiment represents the same part.

The foundation end of an adjustable bar 86 of locking means 83 is set to an approximately-U-shaped bracket 81 secured to the box 47 so that it is rotatable and slidable in the longitudinal direction through a pin 82 and the middle of an arm 87 of unlocking means 85 is rotatably set to an approximately-U-shaped bracket 88 fixed to a box 47, through a pin 89. The front end of the arm 87 faces the bottom of the front end of the adjustable bar 86 and an operating rope 91 is set to the foundation end of the arm 87. A slot 86a to be movably fitted to a locked member 84 is formed at the middle of the adjustable bar 86.

Operations of the thus-constituted dismounting device for a heavy load hoisting member are described below.

When the operating rope 91 is pulled in the direction of the solid-line arrow in FIG. 18 while a heavy load is hoisted or downed at a predetermined place, the front end of the arm 87 pushes up the front end of the adjustable bar 86 as shown in FIG. 19. Therefore, the slot 86a of the adjustable bar 86 is disengaged from the locked member 84 and the locked member 84 lowers. Because operations other than the above mentioned are the same as those of the first embodiment, their description is omitted.

FIGs. 20 to 22 show the third embodiment of the present invention. In FIGs. 20 to 22, a symbol same as that of the first embodiment represents the same part.

Locking means 103 has a through-hole 114a formed on a locked member 114 protruded into the box 47 set to the top of a base (not illustrated) and a lock pin 106 insertable into the through-hole 114a. The locked member 114 is integrated with a sensor rod 104 and protruded upward from the top of the sensor rod 104. The lock pin 106 is slidably held by a pin holder 107 secured to the box 47. The through-hole 114a is formed at a position where it faces the lock pin 106 under the state in which the legs 104a and 104a of the sensor rod 104 protruded from the bottom of the base are inserted into the base, that is, the locked member 114 is almost protruded into the box 47. The lock pin 106 has an insertion portion 106a to be inserted into the through-hole 114a and a flange portion 106b formed at the rear end of the insertion portion

106a. A third resilient body 108 for energizing the lock pin 106 so as to push it toward the locked member 114 is built in the pin holder 107. This embodiment uses a compression coil spring as the third resilient body 108. Symbol 104b represents a connecting portion for connecting the locked member 114 with the legs 104a and 104a.

The unlocking means 105 is a means for removing the lock pin 106 inserted into the through-hole 114a from the through-hole 114a, which has a guide slot 107a formed on the top of the pin holder 107 along the longitudinal direction of the holder 107, an operating pin 109 secured to the lock pin 106 and protruded upward from the guide slot 107a, and an operating bar 111 whose middle portion engages with the operating pin 109. An engagement slot 111a is formed at the middle of the operating bar 111 along its longitudinal direction, which is movably fitted to the operating pin 109. The foundation end of the operating bar 111 is rotatably set to the box 47 through a pin 112 and an operating rope 113 is set to the front end of the operating bar 111.

The following is the description of the thus-constituted dismounting device for a heavy load hoisting member.

When the operating rope 113 is pulled in the direction of the solid-line arrow in FIG. 20 while a heavy load is hoisted or downed at a predetermined place, the operating bar 111 rotates about the pin 112 in the direction of the broken-line arrow and the lock pin 106 is removed from the through-hole 114a (FIG. 22), the locked member 114 lowers. Operations other than the above mentioned are the same as those of the first embodiment. Therefore, their description is omitted.

FIGs. 23 to 27 show the fourth embodiment of the present invention. In FIGs. 23 to 27, a symbol same as that of the first embodiment represents the same part.

In the case of this embodiment, four reverse-U-shaped wire engagement portions 211a are secured to positions close to the four corners at the top of a heavy load 211 one each (FIG. 25). A base 212 comprises a base frame 213 made of H-steel and approximately formed like a rectangle, a box-shaped base body 214 secured to the top center of the base frame 213, a bar mount 215 with a reverse-hat cross section which is secured to the bottom middle of the base body 214 and on which an adjustable bar 246 of locking means 243 to be mentioned later is set, and a pulley mount 216 with an approximately-U-shaped cross section on which the fixed pulley 42 of slider lowering means 233 is set, and secured to the bottom of the bar mount 215. The base body 214 is erected between two reinforcement members 213a and 213a which are secured to the base body 214 in the base frame

213 in parallel with each other. The two reinforcing members 213a and 213a are made of H-steel.

A cylindrical mast 217 is erected at the center of the base body 214. The mast 217 has a large-diameter portion 217a inserted into and welded with the base body 214 and a small-diameter portion 217b protruded toward the top of the base body 214. A first resilient body 221 is movably fitted to the small-diameter portion 217b and then an approximately-truncated-cone-shaped slider 218 is vertically movably fitted to the portion 217b. A boss 218a is protruded on the bottom of the slider 218 and a long groove 217c is vertically formed from a position close to the top of the small-diameter portion 217b to the center of it. A bolt 219 is screwed to the boss 218a and the front end of the bolt 219 is movably inserted into the long groove 217c (FIG. 24). The bolt 219 prevents the slider 218 from rotating against or removing from the mast 217. This embodiment uses a compression coil spring as the first resilient body 221. A vertical hole 217d is formed from the bottom to the top of the large-diameter portion 217a of the mast 217.

The base 212 is provided with slider lowering means 233 for lowering the slider 218 by overcoming the resilient force of the first resilient body 221, locking means 243 for temporarily locking the slider lowering means 233 while the slider 218 is lowered, and unlocking means 255 for unlocking the locking means 243 (FIGs. 23, 24, 26, and 27). The slider lowering means 233 comprises a sensor rod 234 whose top is movably inserted into the vertical hole 217d of the mast 217 and whose bottom passes the bar mount 215 and pulley mount 216 and protrudes downward from the bottom of the pulley mount 216, a movable pulley 41 rotatably set onto the middle of the sensor rod 234, a fixed pulley 42 rotatably set onto the pulley mount 216, and a tension member 236 whose one end is set to the pulley mount 216 and whose other end is set to the slider 218 and which is arranged through the movable pulley 41 and the fixed pulley 42. In this embodiment, the sensor rod 234 uses a flat bar vertically extending and being vertically movably held by slide bearings 223 and 224 set onto the bar mount 215 and pulley mount 216 and a rectangular plate 234a is horizontally welded to the bottom of the rod protruded from the bottom of the pulley mount 216. This embodiment uses two movable pulleys 41 which are set to the both parallel sides of the sensor rod 234 at the middle of the rod (FIG. 24). This embodiment uses two fixed pulleys 42 which are set to the both sides of the sensor rod 234 on the pulley mount 216. This embodiment uses two wires as the tension members 236 which are arranged so as to lower the slider 218 by resisting the resilient force of the first

resilient body 221 when the top of the sensor rod 234 is inserted into the vertical hole 217d. The tension member 236 is movably inserted into a pipe 237 vertically extended and secured in the base body 214 (FIGs. 23, 26, and 27).

Moreover, a rod catching member 238 with which the bottom of the sensor rod 234 can contact protrudes downward from the base 212 and it is vertically movably set to the base 212. In this embodiment, the rod catching member 238 is formed by folding a steel plate and set between two reinforcing members 213a and 213a so as to cover the bottom of the pulley mount 216. Four vertically-extending bosses 238a are secured to four corners of the rod catching member 238 one each and movably fitted to four shafts 213c vertically set to face recessed portions 213b and 213b of the two reinforcing members 213a and 213a. A compression coil spring 239 for pressing the boss 238a downward is movably fitted to the shaft 213c. The base 212 has a mass for inserting the sensor rod 234 into the vertical hole 217d through the rod catching member 238 by overcoming the resilient force of the first resilient body 221 to lower the slider 218 when the base 212 is downed onto the heavy load 211. The top of the shaft 213 is formed at a large diameter by a predetermined length so as to prevent the rod catching portion 238 coming closer to the base 212 than a predetermined distance due to the contact of the top of boss 238a movably inserted in shaft 213C with the step difference portion at the bottom of the large diameter portion 213d of shaft 213C.

The locking means 243 has a slot 246a to be movably fitted to the sensor rod 234 and an adjustable flat bar 246 extending in the width direction of the sensor rod 234 under movably fitted state. The slot 246a is formed at the middle of the adjustable bar 246 along the longitudinal direction of the bar so that the length is slightly longer than the width of the sensor rod 234. A mounting slot 246b is almost horizontally formed at the foundation end of the adjustable bar 246 along the longitudinal direction of the bar 246. The adjustable bar 246 is set to the bar mount 215 by passing a pin 252 through the top of a bracket 251 erected on the bar mount 215 and the mounting slot 246b so that it can be rotated in a vertical plane and slid in the longitudinal direction (FIGs. 23, 26, and 27). The sensor rod 234 is constituted so that it is engaged with the slot 246b when the adjustable bar 246 reaches a predetermined angle. In other words, when the adjustable bar 246 rotates about the pin 252 and moves in its longitudinal direction and the width-directional both ends of the sensor rod 234 are engaged with the both ends of the slot 246a of the adjustable bar 246, the sensor rod 234 is temporarily fixed while the rod 234 is inserted into the vertical hole 217d,

that is, the slider 218 is lowered.

The unlocking means 255 has two approximately-L-shaped arms 257 and 257 for rotating the adjustable bar 246 in the direction for releasing the sensor rod 234 from the adjustable bar 246. These arms 257 and 257 are faced each other and pivotally set onto the bar mount 215 so that they rotate in a plane perpendicular to the vertical plane in which the adjustable bar 246 rotates. The arms 257 and 257 have vertical portions 257a and 257a and horizontal portions 257b and 257b respectively. The vertical portions 257a and 257a extend upward along the both laterals of the base body 214 and the horizontal portions 257b and 257b extend so that they get into the bottom front end of the adjustable bar 246 (FIG. 24). Operating ropes 261 and 261 are set to the top of the vertical portions 257a and 257a respectively and a helical tension spring 258 is set between positions close to the top of the vertical portions 257a and 257a. The spring 258 is inserted into a pipe 259 horizontally extended and secured in the base body 214 so as to make the vertical portions 257a and 257a approach each other, that is, so as to separate the horizontal portions 257b and 257b from the adjustable bar 246 and press them against the bar mount 215.

Four reverse-U-shaped shackle holders 226 are secured to positions close to the both ends of the two reinforcing member 213a and 213a on the top of the base 213. The foundation ends of four top wires 228 are set to these holders 226 through shackles 27 respectively and the front end of the top wire 228 is engaged with hook 31a of the crane 31.

To each of the four corners of the bottom of base frame 213, four U-shaped shackle holders 229 are secured respectively and near each of the four corners of the top of base frame 213, four reverse U-shaped guides 227 are secured respectively. Four foundation ends of bottom wire 232 are secured to shackle holder 229 through shackle 27. A ring 232a formed at the front end of the bottom wire 232 is inserted into the wire engagement portion 211a of the heavy load 211 and a wire guide 227 and then fitted to the mast 217 (FIGS. 23, 26, and 27).

Operations of the thus-constituted dismounting device for a heavy load hoisting member are described below.

As shown in FIGs. 23 and 24, when the base 212 is downed on the heavy load 211 to be hoisted in order to engage the bottom wire 232 with the heavy load 211, the rod catching member 238 first contacts the top of the heavy load 211 and the base 212 further lowers and stops when it approaches the rod catching member 238 up to a predetermined distance. In this case, the sensor rod 234 whose bottom contacts the top of the rod

catching member 238 is pushed up relatively to the mast 217 and the top of the sensor rod 234 is inserted into the vertical hole 217d of the mast 217. In other words, because the movable pulley 41 moves upward relatively to the mast 217 together with the sensor rod 234, the other end of the tension member 236 pulls the slider 218 downward. As a result, the slider 218 lowers by resisting the resilient force of the first resilient body 221. After passing the ring 232a at the front end of the bottom wire 232 through the wire engagement portion 211a of the heavy load 211 and the wire guide 227, the ring 232a is fitted to the mast 217 (FIG. 25).

When the heavy load 211 is hoisted by the crane 31 through the top wire 228, base 212, and bottom wire 232 as shown in FIGs. 25 and 26, the base 212 rises while the rod catching member 238 contacts the top of the heavy load 211. When the base 212 rises, the shaft 213c set to the recessed portion 213b of the reinforcing member 213a also rises. When the boss 238a of the rod catching member 238 reaches the bottom of the shaft 213c, the rod catching member 238 separates from the heavy load 211 and rises together with the base 212. In this case, the sensor rod 234 is kept inserted into the vertical hole 217d of the mast 217 because it engages with the slot 246a of the adjustable bar 246. As a result, the rod catching member 238 separates from the bottom of the sensor rod 234.

When the heavy load 211 is downed at a predetermined place, the bottom wire 232 is loosened. In this case, the base 212 is kept hoisted by the crane 31 so that the rod catching member 238 does not contact the heavy load 211. When pulling either of the operating ropes 261 and 261 in the direction of the solid-line arrow in FIG. 24, the sensor rod 234 is released from the adjustable bar 246 because the horizontal portion 257b of the arm 257 pushes up the front-end bottom of the adjustable bar 246. The sensor rod 234 lowers due to its own weight and the resilient force of the first resilient body and contacts the rod catching member 238. At the same time, the slider 218 under loadless state because of downing of the heavy load 211 is raised due to the resilient force of the first resilient body 211 (FIG. 27). Therefore, the ring 232a of the bottom wire 232 is removed from the mast 217 and drops. Moreover, when hoisting the base 212 by winding a crane wire (not illustrated), the bottom wire 232 is removed from the wire guide 227 and the wire engagement portion 211a of the heavy load 211 and raised together with the base 212.

In the above first embodiment, a case is shown in which the dismounting device of the present invention for a hoisting member is applied to civil-

engineering and construction works. However, the device of the present invention is not restricted to the above case but it can also be applied to a case in which it is a problem for a worker to approach a place where a heavy load is set in view of safety and sanitation.

Moreover, in the above first to fourth embodiments, a case is shown in which a wire is used as the top hoisting members 28 and 228, bottom hoisting members 32 and 232, and tension members 36 and 236. However, it is possible to use a cable, rope, or chain instead of the wire.

Furthermore, in the above first embodiment, the base 12 is formed by welding a pair of steel plates 13 and 13 each other through a pair of side plates 14 and 14 and the bottom block 16. However, it is also possible to integrally form a base with cast steel or cast iron.

The above first and fourth embodiments use a concrete block as the heavy load and a reverse-U-shaped hook as the hoisting member engagement portion. However, it is also possible to use a cylindrical body such as a electric light pole or a body having a plurality of protrusions such as a tetrapod as the heavy load. In the case of these heavy loads, the whole periphery of these heavy loads serves as the hoisting member engagement portion and a bottom hoisting member is wound around the periphery.

Moreover, in the case of the first and fourth embodiments, a movable pulley is set to the sensor rod, a fixed pulley is set to the base, a tension member whose one end is set to the base is arranged through the movable and fixed pulleys, and the other end of the tension member is set to the slider. However, the movable pulley is unnecessary by setting the other end to the slider and arranging the tension member through the fixed pulley.

Furthermore, in the case of the first and fourth embodiments, the base 12 or 212 is downed on the heavy load 11 or 211 in order to engage the bottom wire 32 or 232 with the heavy load 11 or 211 to be hoisted as shown in FIG. 3 and 23. However, when the heavy load has a body whose surface is not flat such as a tetrapod or electric light pole, it is possible to fit the front end of the wire 32 or 232 to the mast 17 or 117 by downing the base 12 or 212 on the ground close to the heavy load, lowering and locking the slider 18 or 118, and under this state, hoisting the base 12 or 212 by a crane again to move the heavy load upward and thereby engaging the bottom wire 32 or 232 with the heavy load.

In the case of the first and second embodiments, the locked member is formed like a flat bar. However, it is also possible to use a round bar, a round pipe, or a member with other shape as the

locked member if it can be hooked to a slot bar of the adjustable.

In the case of the third embodiment, the through-hole is formed on the locked member of the sensor rod. It is also possible to form the through-hole on the leg or connecting portion of the sensor rod.

The shape and structure of a mast, slider, and resilient body are not restricted to the shape and structure of the masts 17 and 117, sliders 18 and 118, and resilient bodies 21, 22, and 221 of the first to fourth embodiments as long as they have the same function as the shape and structure of those of the first to fourth embodiments.

As described above, the present invention is constituted so that a base is hoisted by a hook of a crane through a top hoisting member, a bottom hoisting member whose foundation end is set to the base is engaged with the hoisting member engagement portion of a heavy load, a slider is vertically movably set to a mast erected on the base, a ring at the front end of the bottom hoisting member is fitted to the mast while the slider is lowered by slider lowering means by overcoming the resilient force of a first resilient body, locking means temporarily fixes the slider lowering means while the slider lowers, and unlocking means unlocks the locking means. Therefore, by unlocking the locking means by the unlocking means when a heavy load is downed at a predetermined place, the slider is raised due to the resilient force of the first resilient body and the ring of the bottom hoisting member is removed from the mast. As a result, the bottom hoisting member can automatically be removed from the heavy load by raising the base with the crane. Therefore, it is possible not only to greatly save labor but also easily set a heavy load to a place where no worker can work in view of safety and sanitation by using a crane.

Moreover, by using a sensor rod whose slider lowering means is vertically movably inserted into a base and whose bottom protrudes downward from the bottom of the base; a movable pulley rotatably set to the sensor rod; a fixed pulley rotatably set to the base; and a tension member whose one end is set to the base, whose other end is set to the slider, and which is arranged through the movable and fixed pulleys so as to lower the slider when the sensor rod is inserted into the base; the dismounting device of the present invention is not damaged because its tension member is hardly exposed and comparatively short compared with a conventional dismounting device using a weight in which its suspension member and tension member are comparatively long and exposed.

Furthermore, when the heavy load is a body whose top is not flat such as a tetrapod, a conventional dismounting device using a weight cannot

stably mount the weight on the heavy load but the present invention makes it possible to down a heavy load with any shape at a predetermined place.

Furthermore, though the tension member removed from a releaser must be engaged with the releaser again to hoist another heavy load after downing an original heavy load at a predetermined place in the case of a conventional dismounting device using the releaser, the present invention does not require the above operation.

Particularly, it is possible to easily down a heavy load at a remote place by using remote control means.

INDUSTRIAL APPLICABILITY

The dismounting device of the present invention for a heavy load hoisting member makes it possible to easily dismount a hoisting member such as a wire, cable, rope, or chain from a heavy load which is a construction material in construction and civil-engineering works and repeatedly use the hoisting member.

Claims

1. A dismounting device for a heavy load hoisting member for dismounting a bottom hoisting member (32 or 232) engaged with a heavy load (11 or 211) having a hoisting member engagement portion (11a or 211a), comprising:
 - a base (12 or 212);
 - a top hoisting member (28 or 228) whose foundation end is set to the base (12 or 212) and which is constituted so that its front end can be engaged with a hook (31a) of a crane (31);
 - a mast (17 or 217) erected on the base (12 or 212);
 - a bottom hoisting member (32 or 232) whose foundation end is set to the base (12 or 212), on whose front end a ring (32a or 232a) to be fitted to the mast (17 or 217) is formed, and which engages with a hoisting member engagement portion (11a or 211a);
 - a slider (18 or 218) vertically movably set to the mast (17 or 217);
 - a first resilient body (21 or 221) for pushing up the slider (18 or 218) under loadless state so that the top of the slider fits at least the top of the mast (17 or 217);
 - a slider lowering means (33 or 233) for lowering the slider (18 or 218) by overcoming the resilient force of the first resilient body (21 or 221);
 - a locking means (43, 83, 103, or 243) for temporarily locking the slider lowering means

(33 or 233) while the slider (18 or 218) lowers; and

unlocking means (55, 85, 105, or 255) for unlocking the locking means (43, 83, 103, or 243).

2. The dismounting device for a heavy load hoisting member according to claim 1, wherein the mast (17 or 217) is cylindrically formed, the slider (18 or 218) is slidably fitted to the mast (17 or 217), the first resilient body (21 or 221) uses a compression coil spring to be movably fitted to the mast (17 or 217).
3. The dismounting device for a heavy load hoisting member according to claim 1, wherein the slider lowering means (33 or 233) comprises:
 - a sensor rod (34, 104, or 234) which is vertically movably inserted into the base (12 or 212) and whose bottom protrudes downward from the bottom of the base (12 or 212);
 - a fixed pulley (42) rotatably set to the base (12 or 212); and
 - a tension member (36 or 236) whose one end is set to the sensor rod (34, 104, or 234), whose other end is set to the slider (18 or 218), and which is arranged through the fixed pulley (42) so as to lower the slider (18 or 218) when the sensor rod (34, 104, or 234) is inserted into the base (12 or 212).
4. The dismounting device for a heavy load hoisting member according to claim 1, wherein the slider lowering means (33 or 233) comprises:
 - a sensor rod (34, 104, or 234) which is vertically movably inserted into a base (12 or 212) and whose bottom protrudes downward from the bottom of the base (12 or 212);
 - a movable pulley (41) rotatably set to the sensor rod (34, 104, or 234);
 - a fixed pulley (42) rotatably set to the base (12 or 212); and
 - a tension member (36 or 236) whose one end is set to the base (12 or 212), whose other end is set to the slider (18 or 218), and which is arranged through the movable pulley (41) and the fixed pulley (42) so as to lower the slider (18 or 218) when the sensor rod (34, 104, or 234) is inserted into the base (12 or 212).
5. The dismounting device for a heavy load hoisting member according to claim 1, wherein the locking means (43 or 83) comprises:
 - a locked member (44 or 84) which is vertically movably inserted into a base (12), whose bottom is integrated with a sensor rod (34) protruding downward from the bottom of the

base (12), and which protrudes upward from the top of the base (12);

an adjustable bar (46 or 86) having a slot (46a or 86a) to be movably fitted to the locked member (44 or 84) and set to the base (12) rotatably in the vertical plane and slidably in the longitudinal direction under the movably-fitted state; and

an arm (57 or 87) which is constituted so that the locked member (44 or 84) is engaged with the slot (46a or 86a) when the adjustable bar (46 or 86) reaches a predetermined angle to rotate the adjustable bar (46 or 86) so that the unlocking means (55 or 85) releases the locked member (44 or 84) from the adjustable bar (46 or 86).

6. The dismounting device for a heavy load hoisting member according to claim 5, wherein the locking means (55) comprises:

a second resilient body (22) for energizing the arm (57) so as to release the locked member (44) from the adjustable bar (46); and

an arm holder (58) for holding the arm (57) by overcoming the resilient force of the second resilient body (22) to engage the locked member (44) with the adjustable bar (46) under operation and releasing the arm (57) to release the locked member (44) from the adjustable bar (46) under no operation.

7. The dismounting device for a heavy load hoisting member according to claim 6, wherein

the arm holder (58) is constituted so that it is remote-controlled by remote control means (71), and

the remote control means (71) comprises a transmitter (72) which is set separately from a base (12) to transmit a control signal for controlling the arm holder (58) through radio and a receiver (73) which is set to the base (12) to control the arm holder (58) by receiving the control signal from the transmitter (72).

8. The dismounting device for a heavy load hoisting member according to claim 1, wherein the locking means (103) comprises:

a through-hole (114a) formed on a sensor rod (104) which is vertically movably inserted into the base (12) and whose bottom protrudes downward from the bottom of the base (12);

a lock pin (106) set to the base (12) so that it can be inserted into the through-hole (114a);

a third resilient body (108) for energizing the lock pin (106) so as to insert the lock pin (106) into the through-hole (114a); and

an operating lever (111) for unlocking

means (105) to remove the lock pin (106) from the through-hole (114a) by resisting the resilient force of the third resilient body (108).

9. The dismounting device for a heavy load hoisting member according to claim 3 or 4, wherein a rod catching member (238) with which the bottom of a sensor rod (234) can contact protrudes downward beyond a base (212) and is vertically movably set to the base (12).

10. The dismounting device for a heavy load hoisting member according to claim 1, wherein locking means (243) comprises an adjustable bar (246) having a slot (246a) movably fitted to a sensor rod (234) which is vertically movably inserted into a base (212) and whose bottom protrudes downward from the bottom of the base (212) and being set to the base (212) rotatably in the vertical plane and slidably in the longitudinal direction under the movably-fitted state, and

an arm (257) which is constituted so as to engage the sensor rod (234) with the slot (246a) when the adjustable bar (246) reaches a predetermined angle to rotate the adjustable bar (246) so that unlocking means (255) releases the sensor rod (234) from the adjustable bar (246).

FIG. 1

- 11: HEAVY LOAD
- 11a: WIRE ENGAGEMENT PORTION
(HOISTING-MEMBER
ENGAGEMENT PORTION)
- 12: BASE
- 17: MAST
- 18: SLIDER
- 28: TOP WIRE
(TOP HOISTING MEMBER)
- 31: CRANE
- 31a: HOOK
- 32: BOTTOM WIRE
(BOTTOM HOISTING MEMBER)
- 32a: RING
- 33: SLIDER LOWERING MEANS

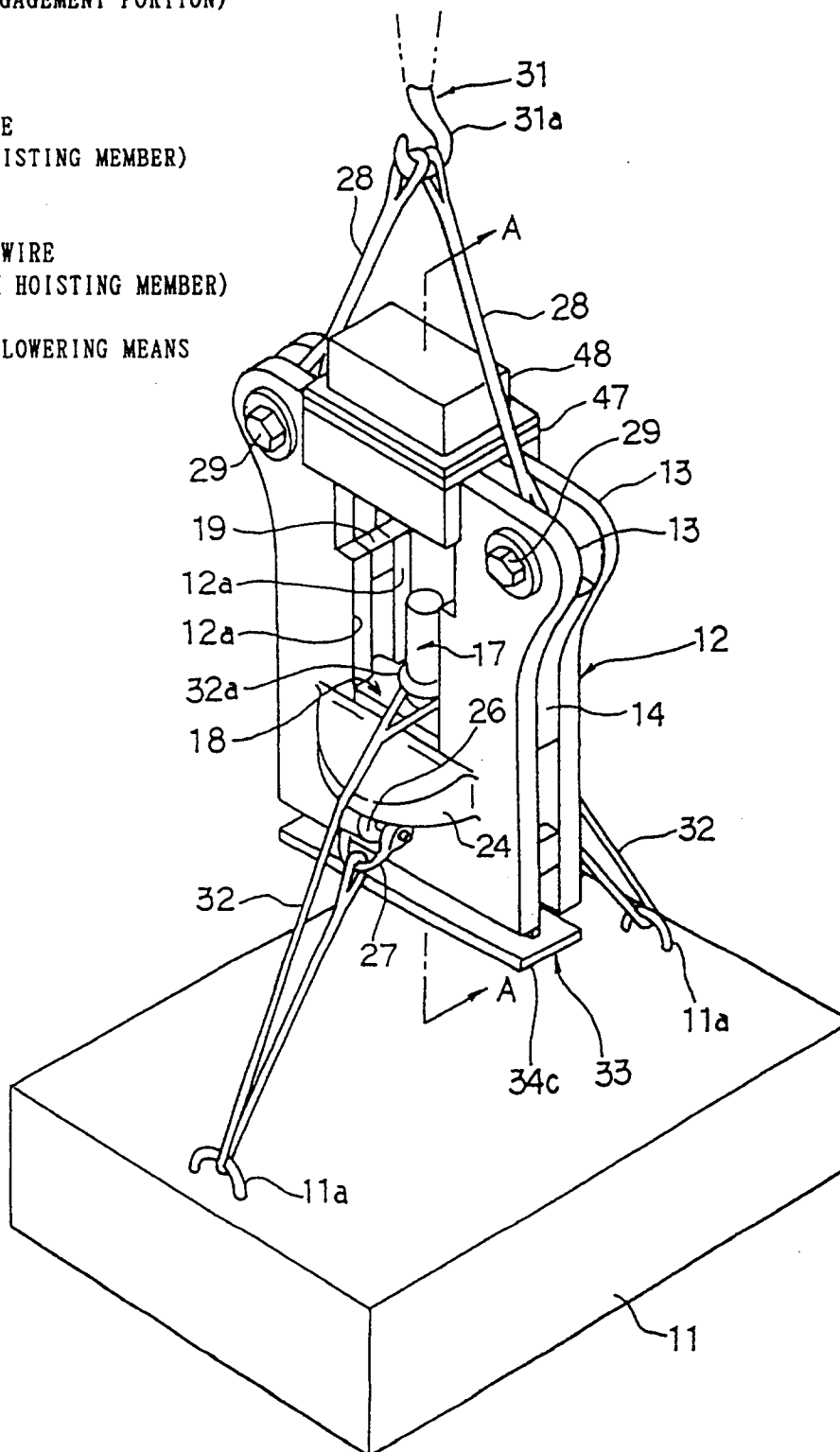


FIG. 2

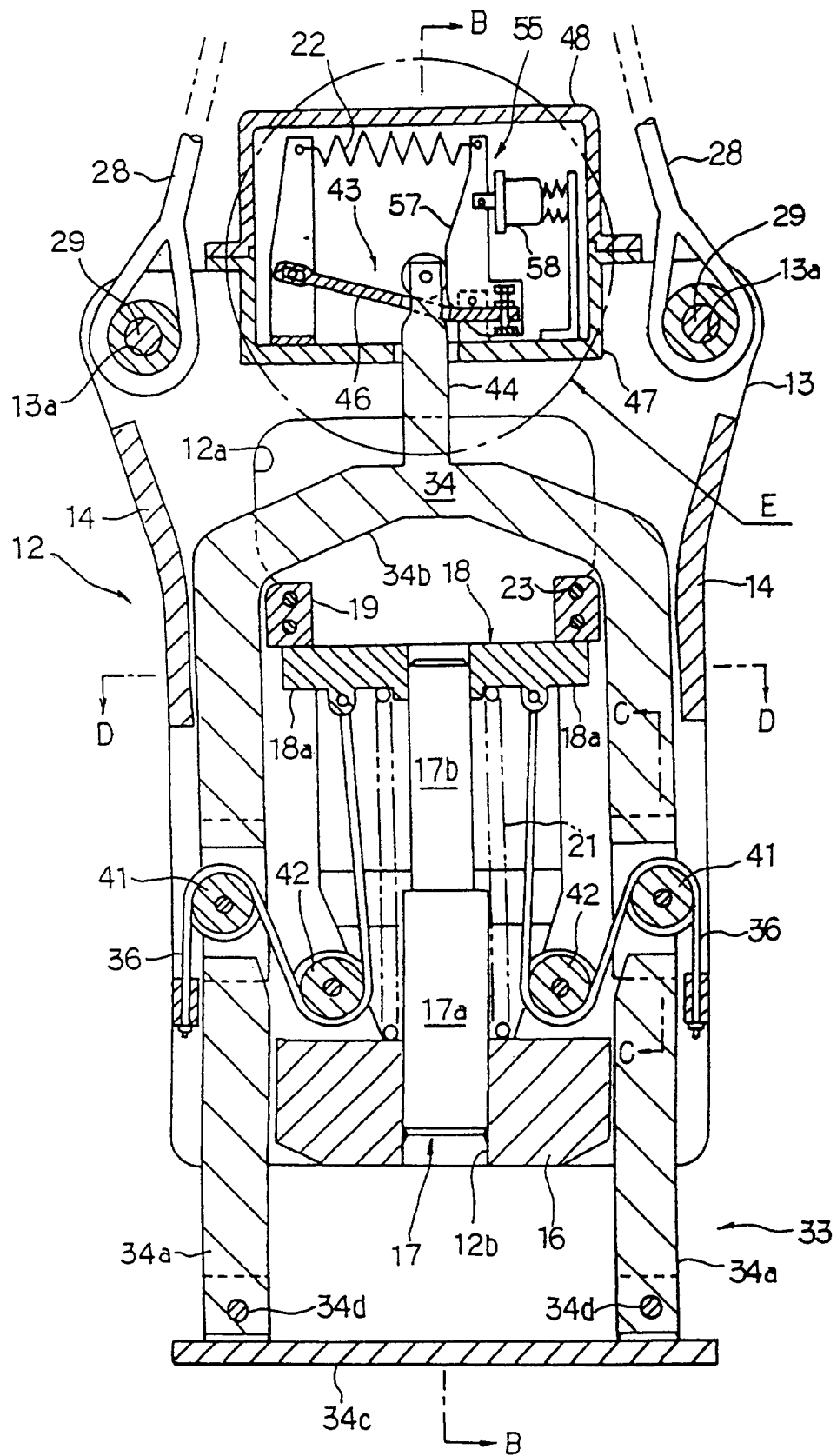


FIG. 3

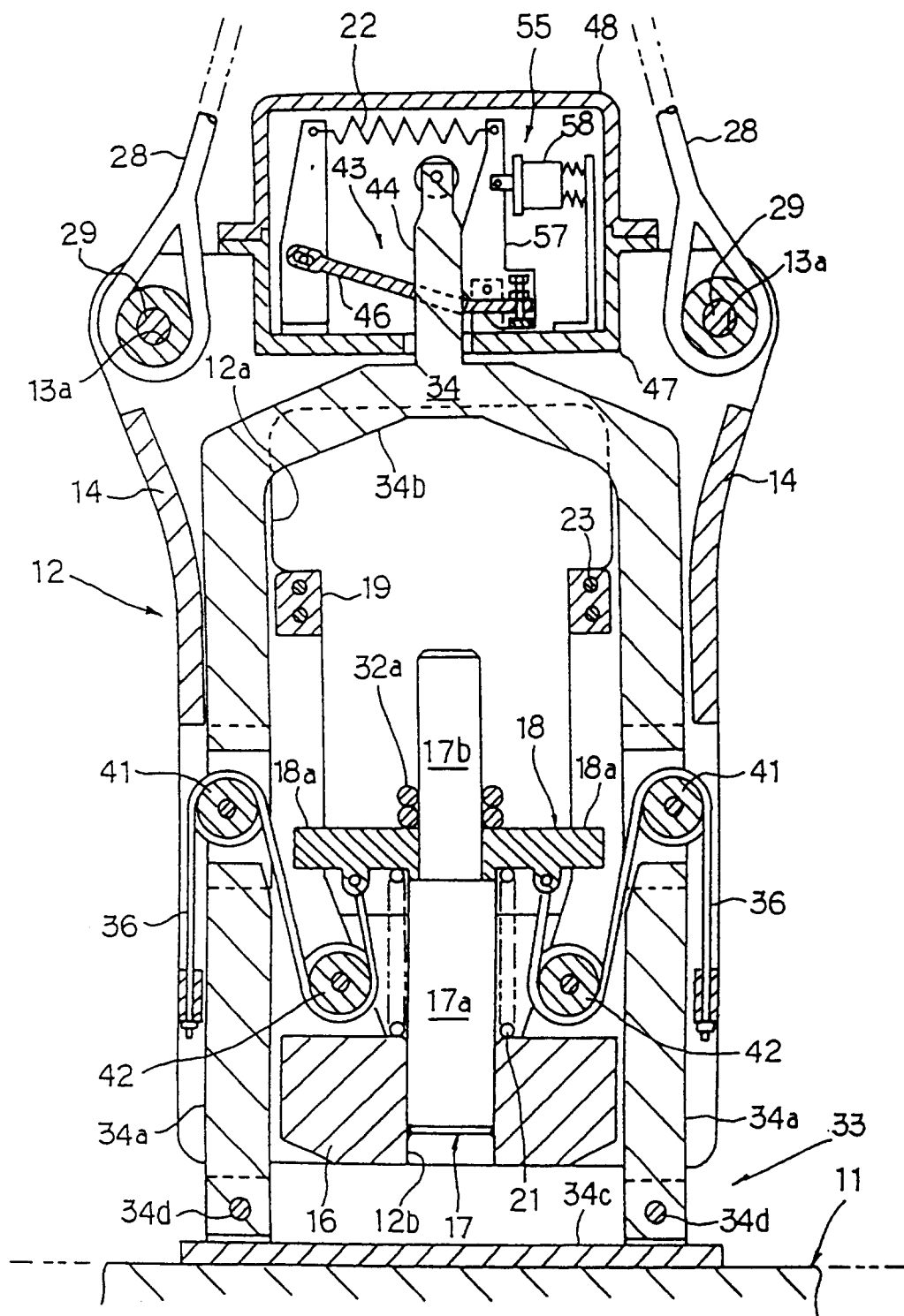


FIG. 4

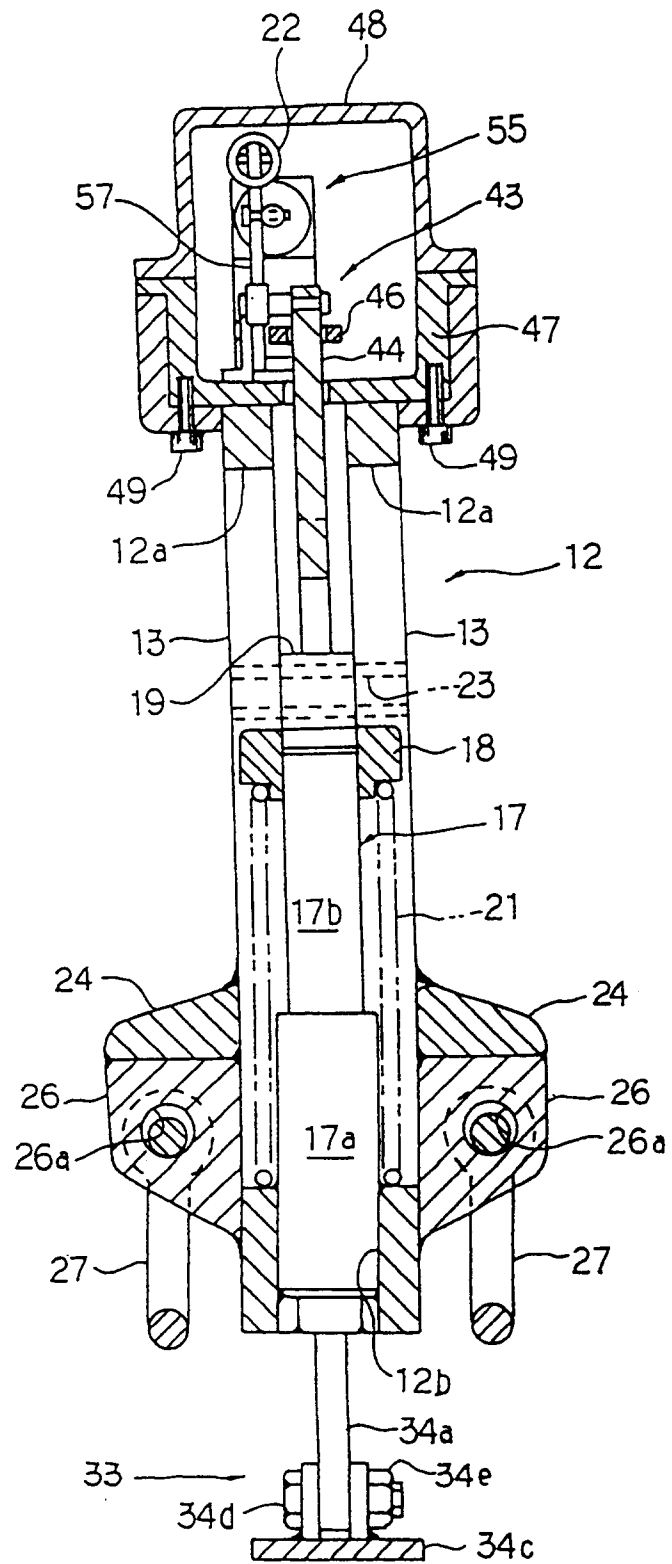


FIG. 5

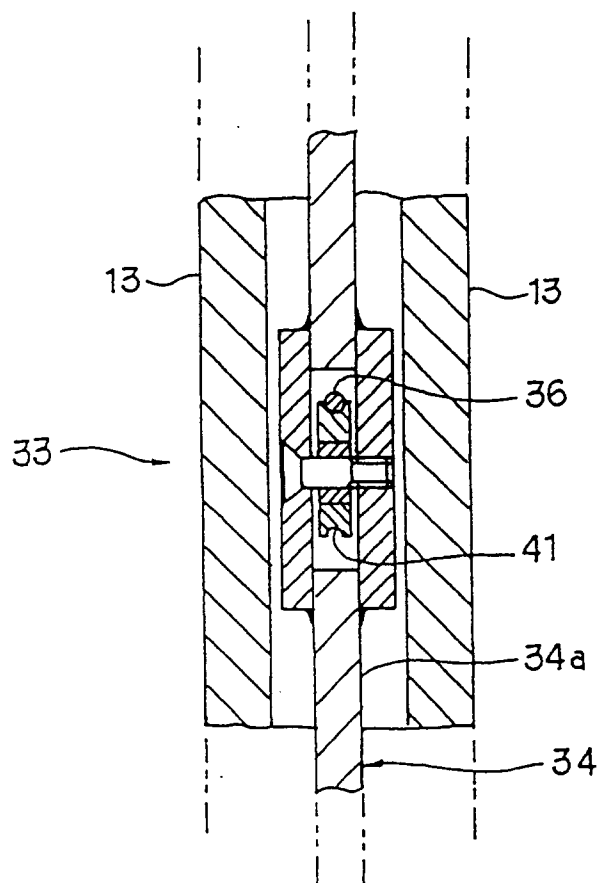


FIG. 6

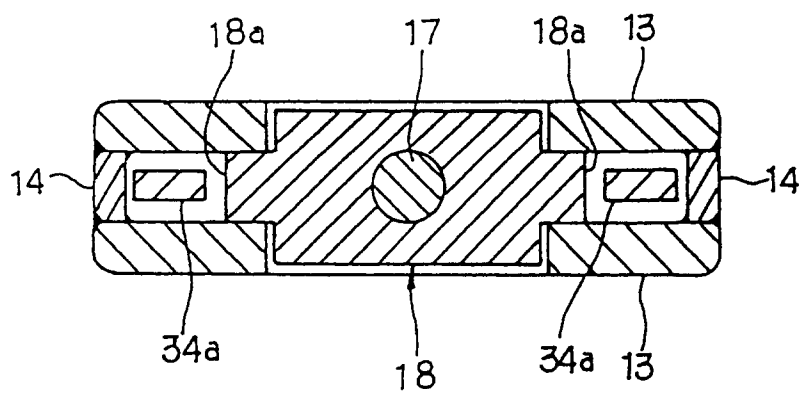


FIG. 7

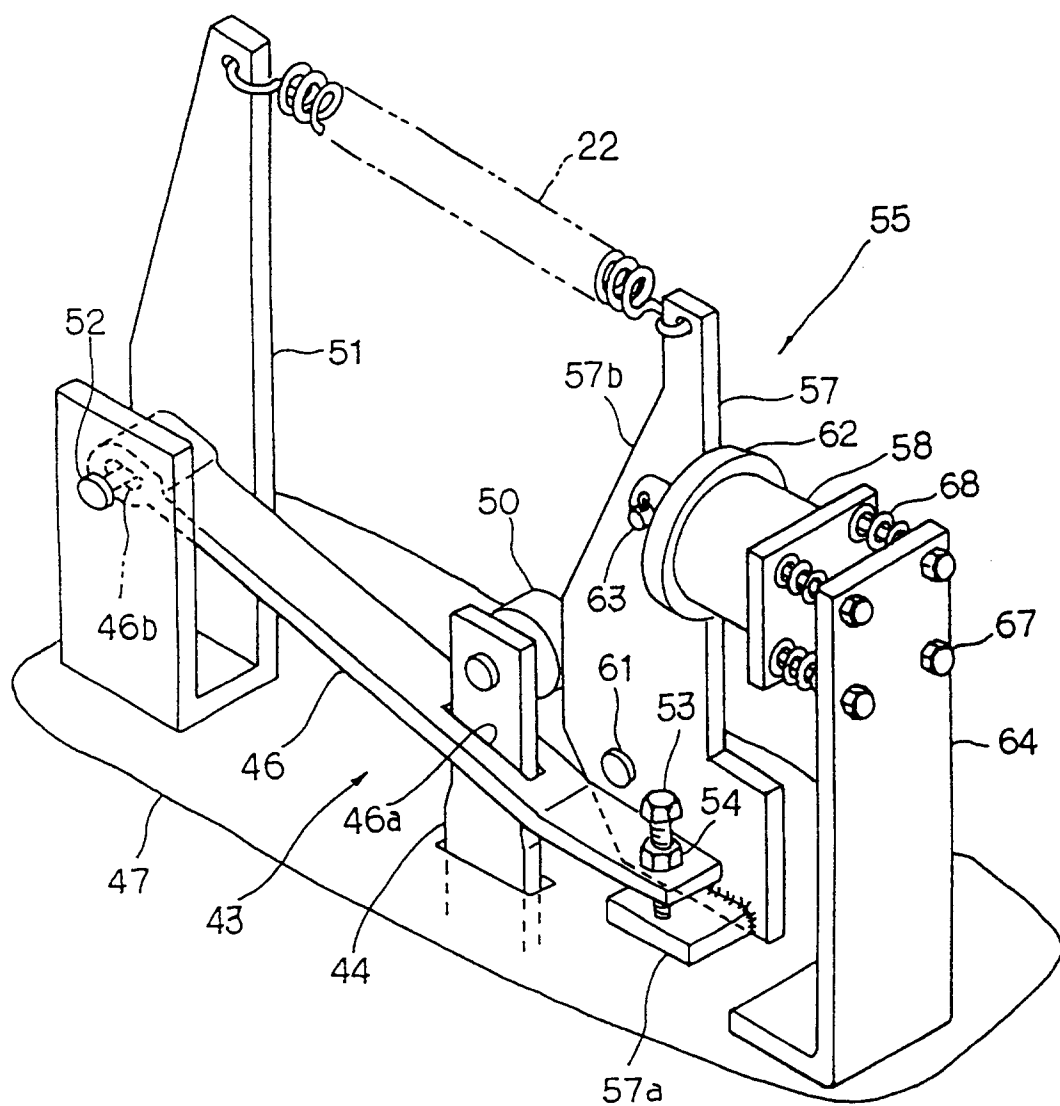


FIG. 8

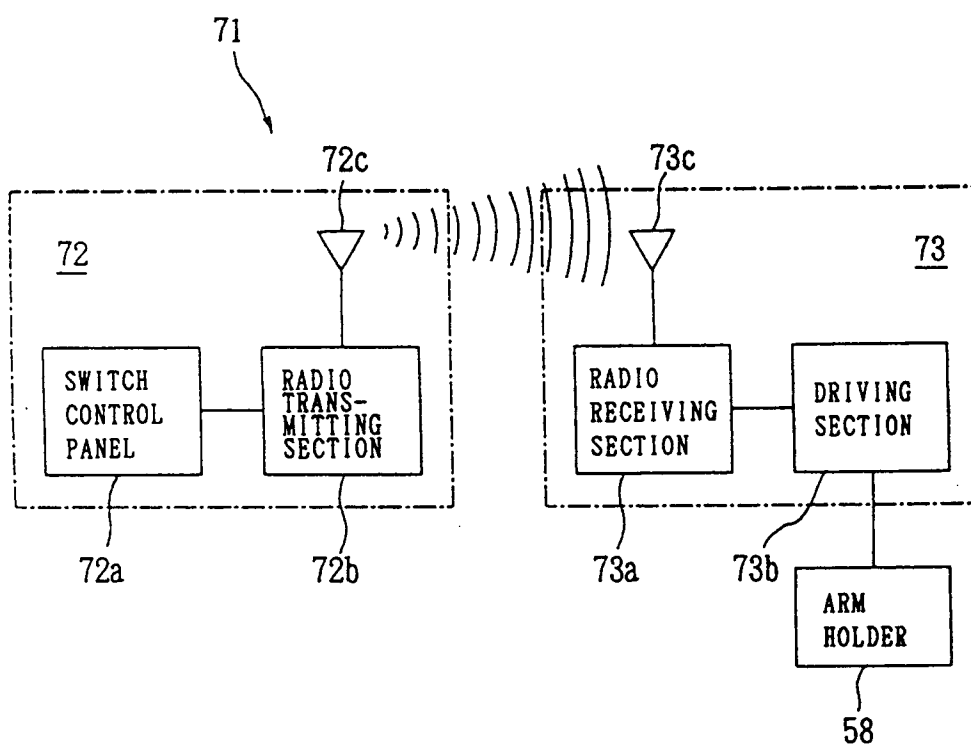


FIG. 9

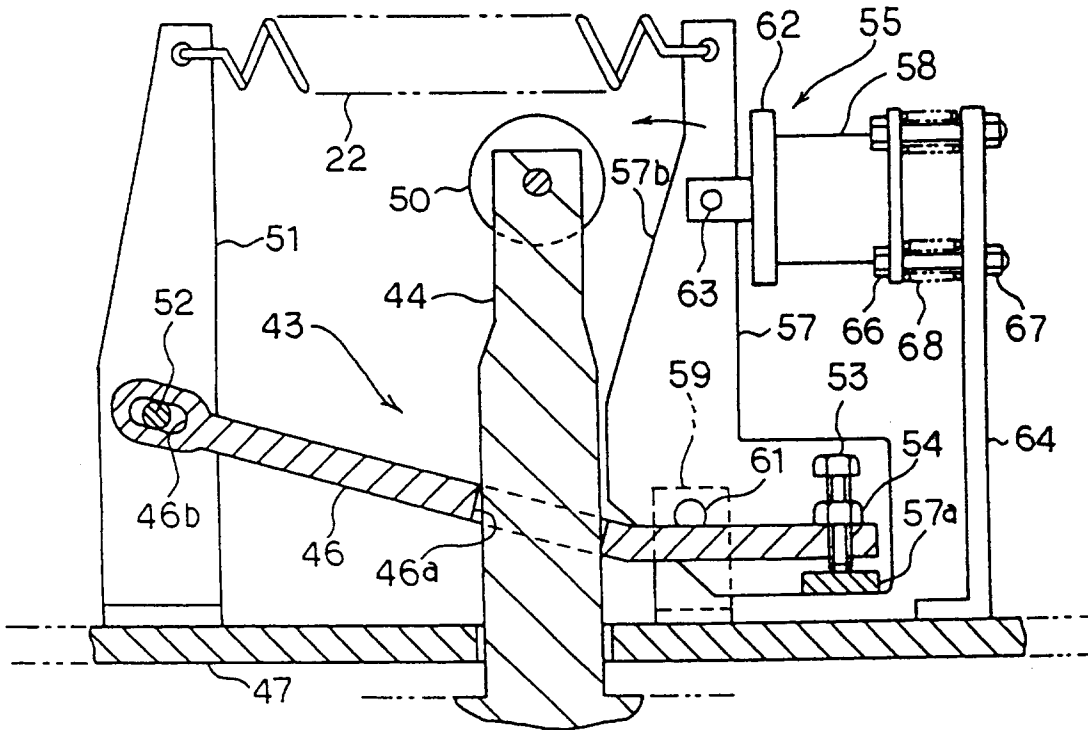


FIG. 10

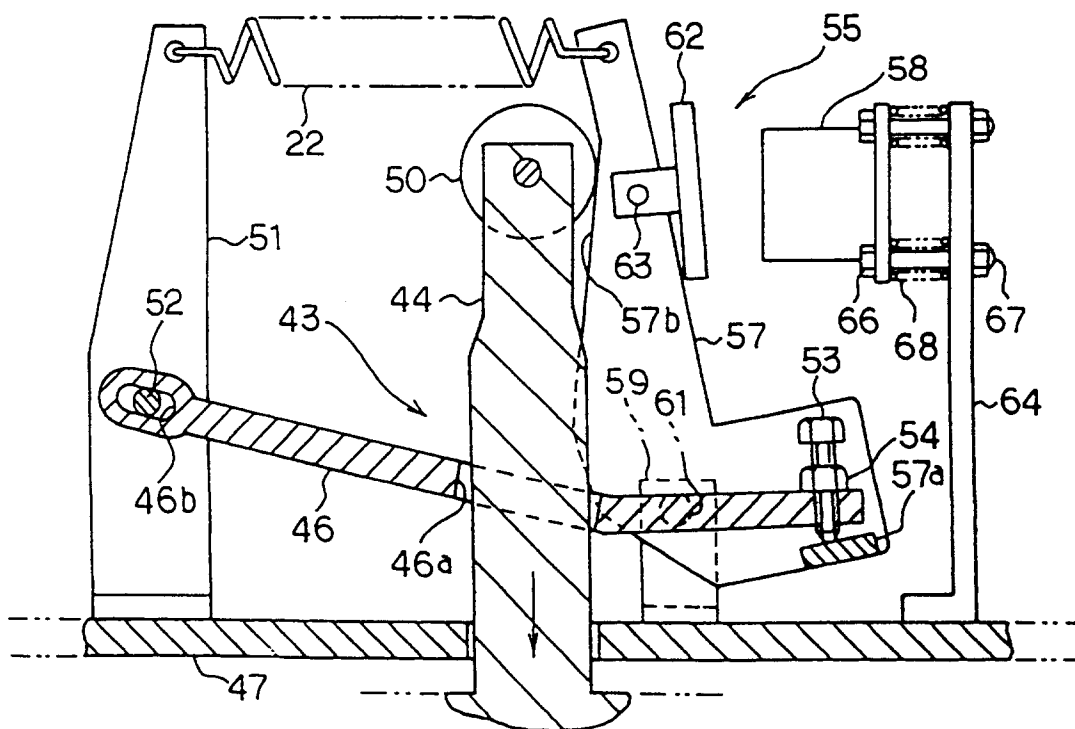


FIG. 11

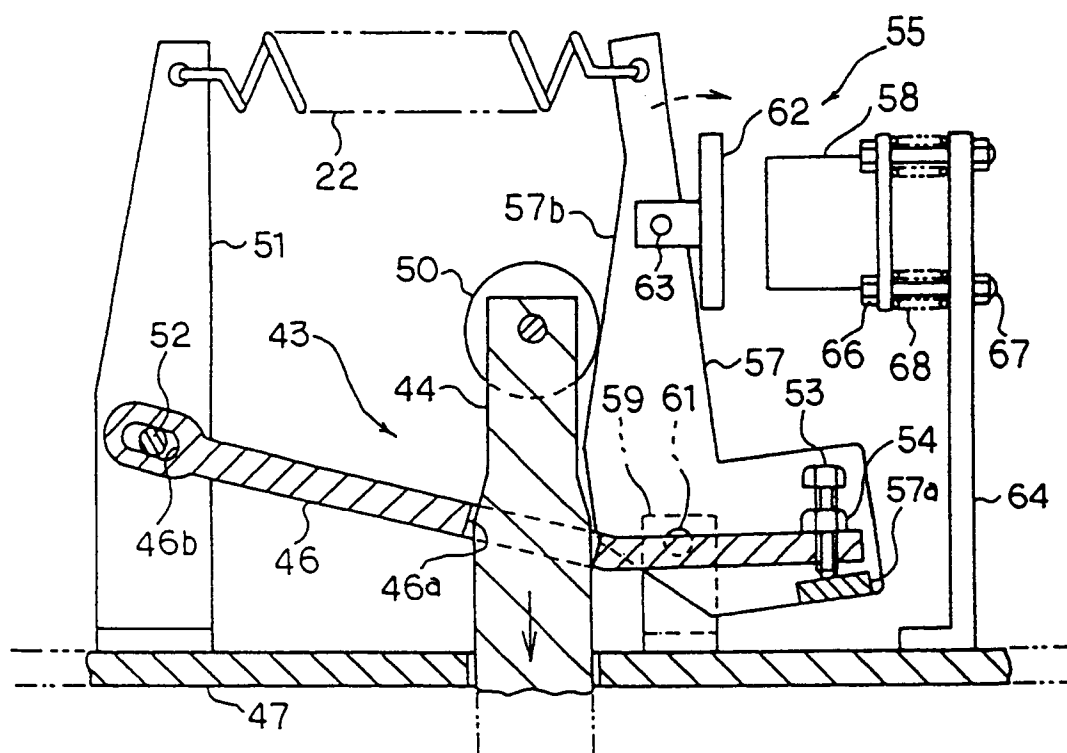


FIG. 12

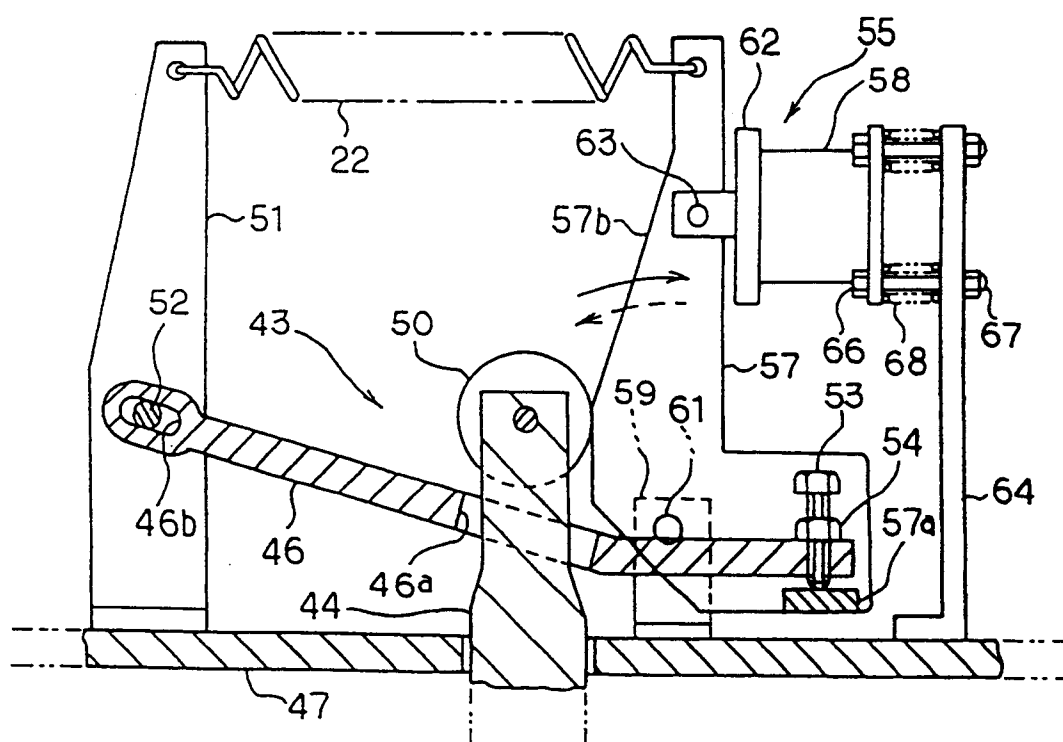


FIG. 13

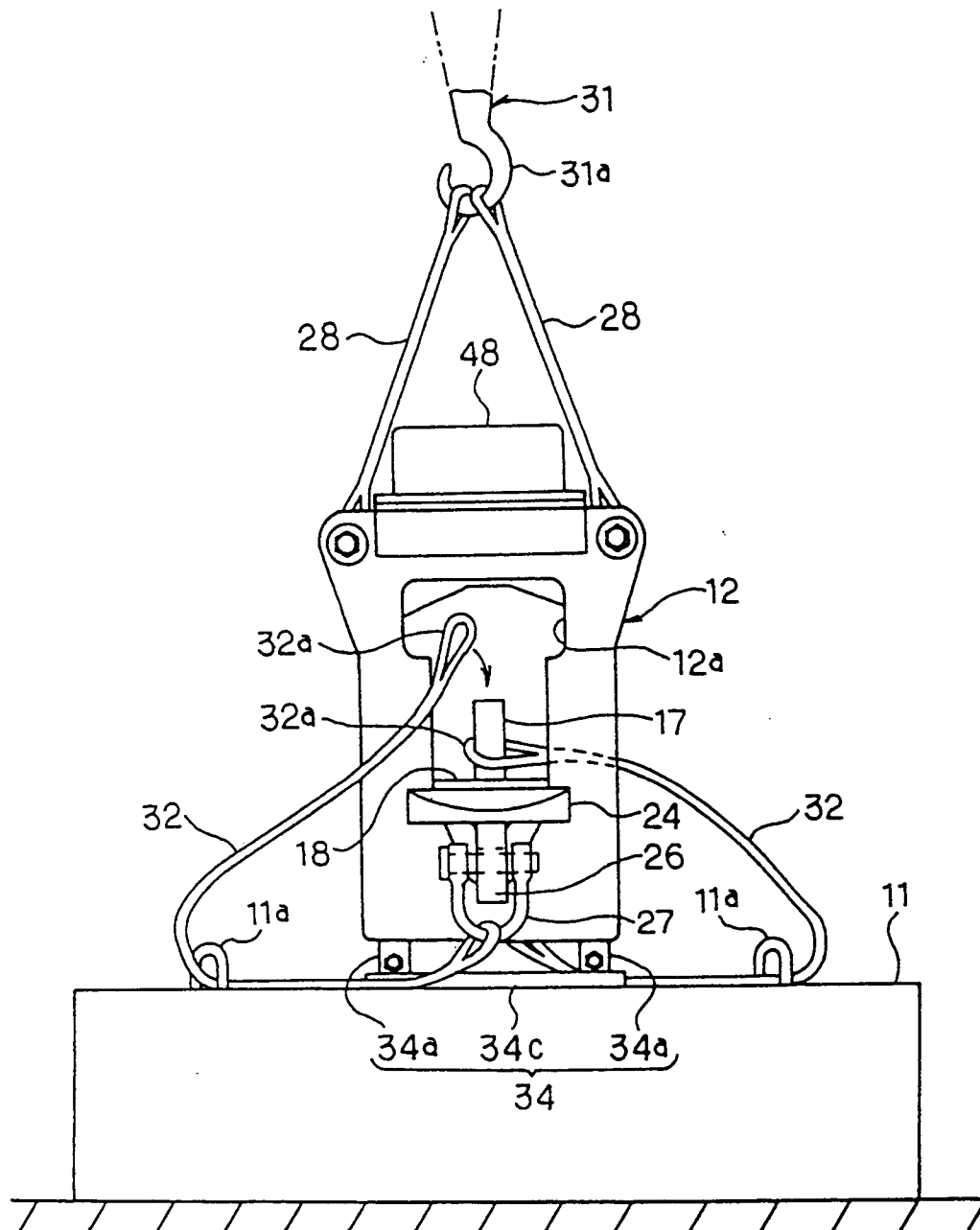


FIG. 14

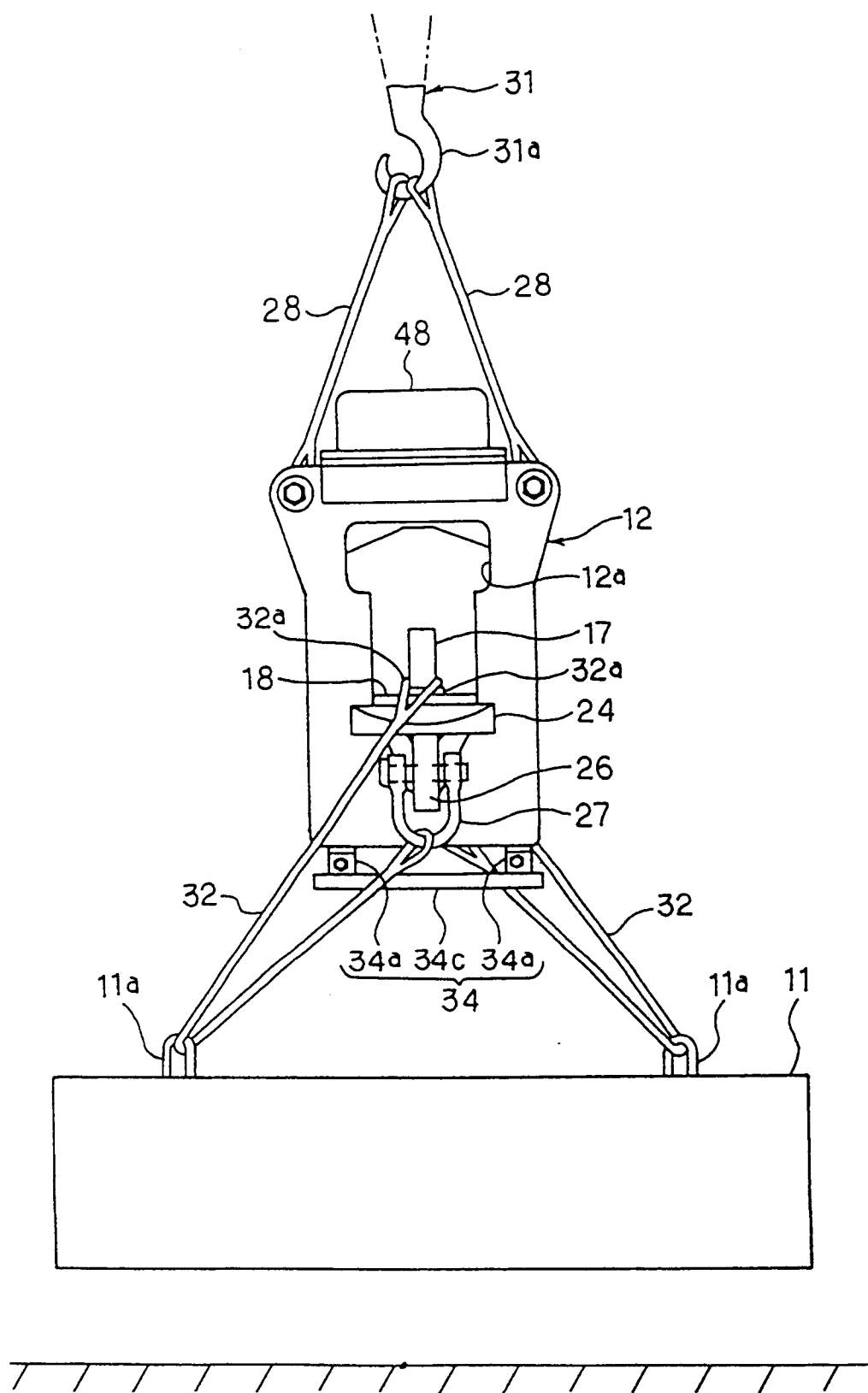


FIG. 15

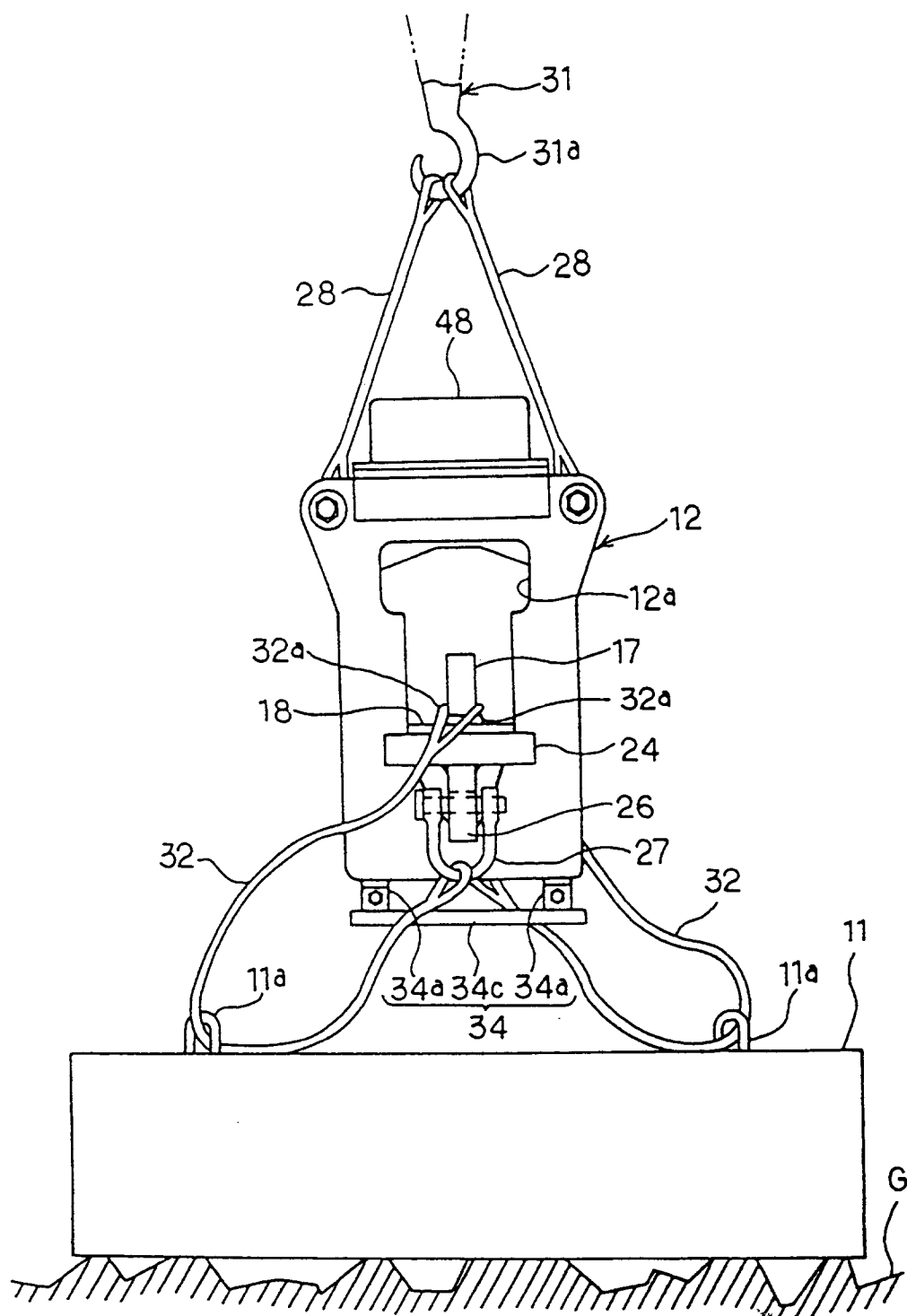


FIG. 16

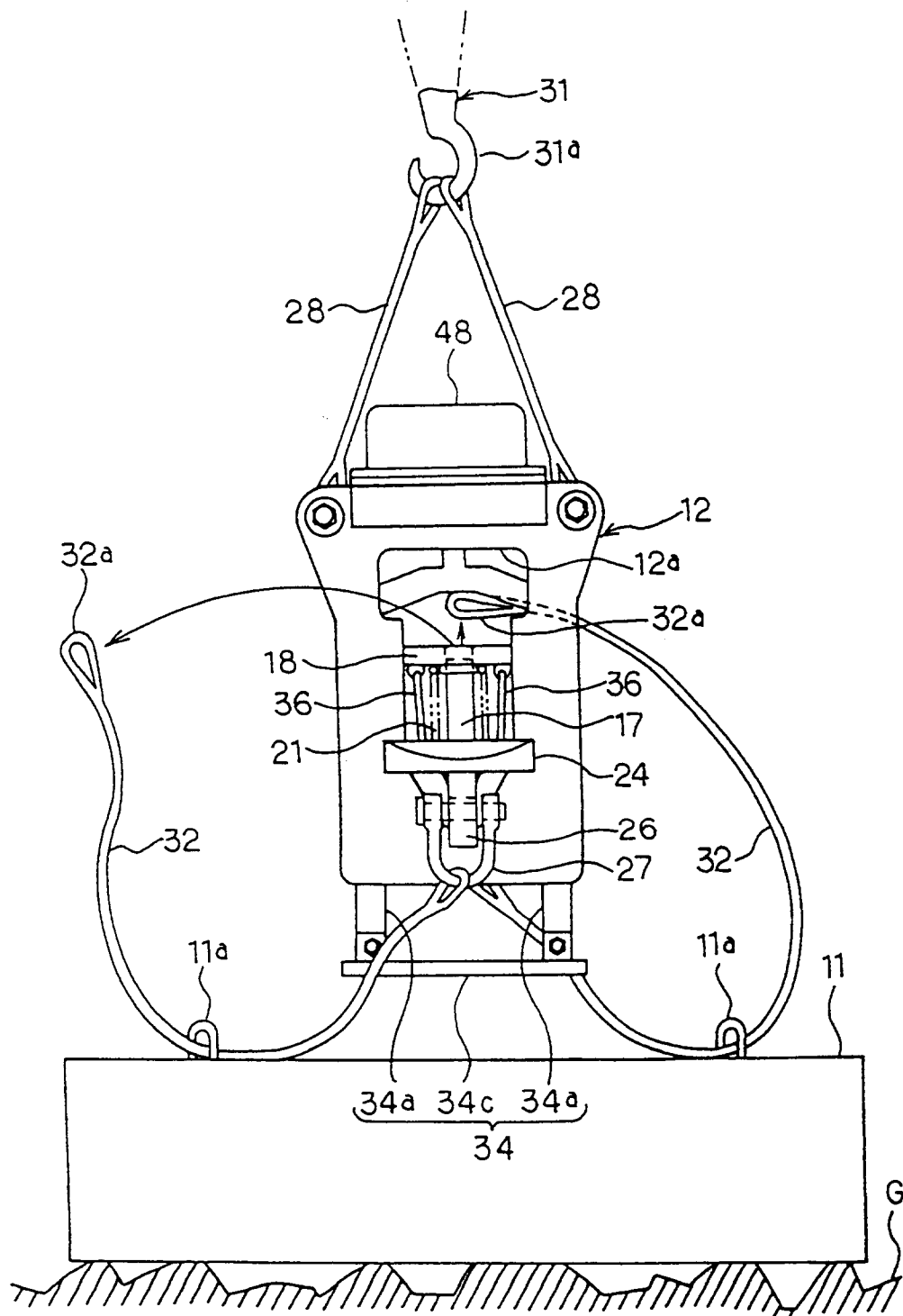


FIG. 17

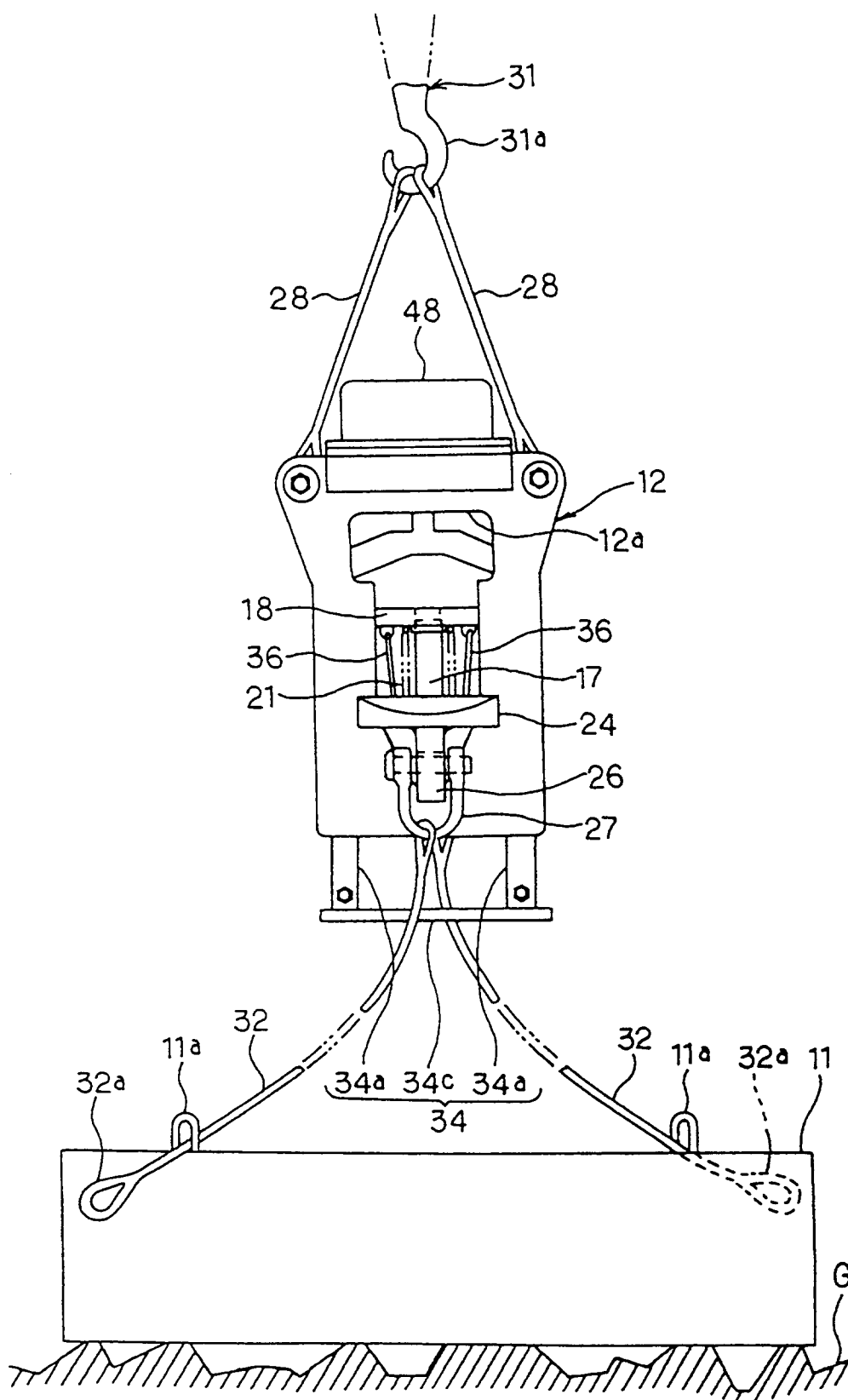
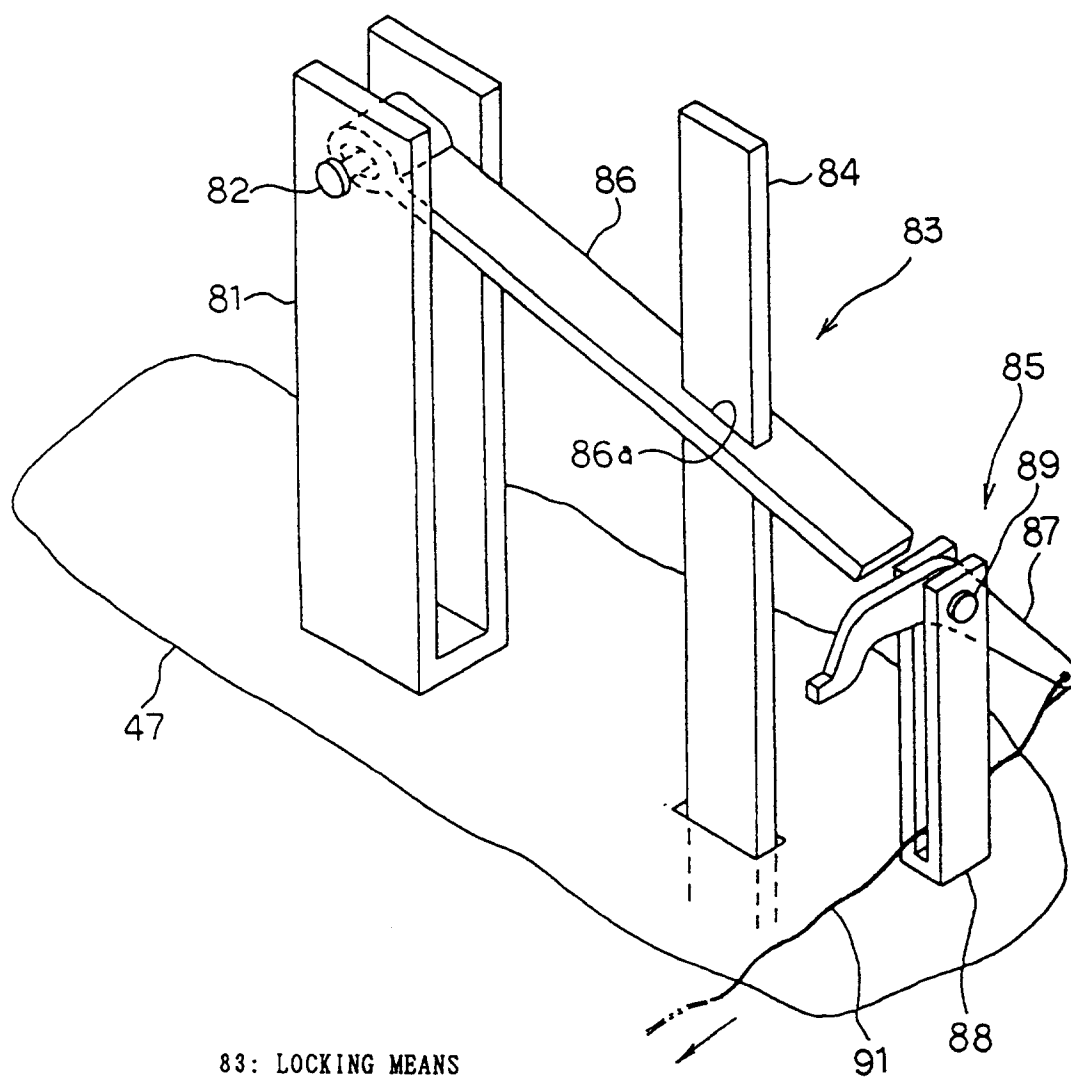


FIG. 18



- 83: LOCKING MEANS
- 84: LOCKED MEMBER
- 85: UNLOCKING MEANS
- 86: ADJUSTABLE BAR
- 86a: SLOT
- 87: ARM

FIG. 19

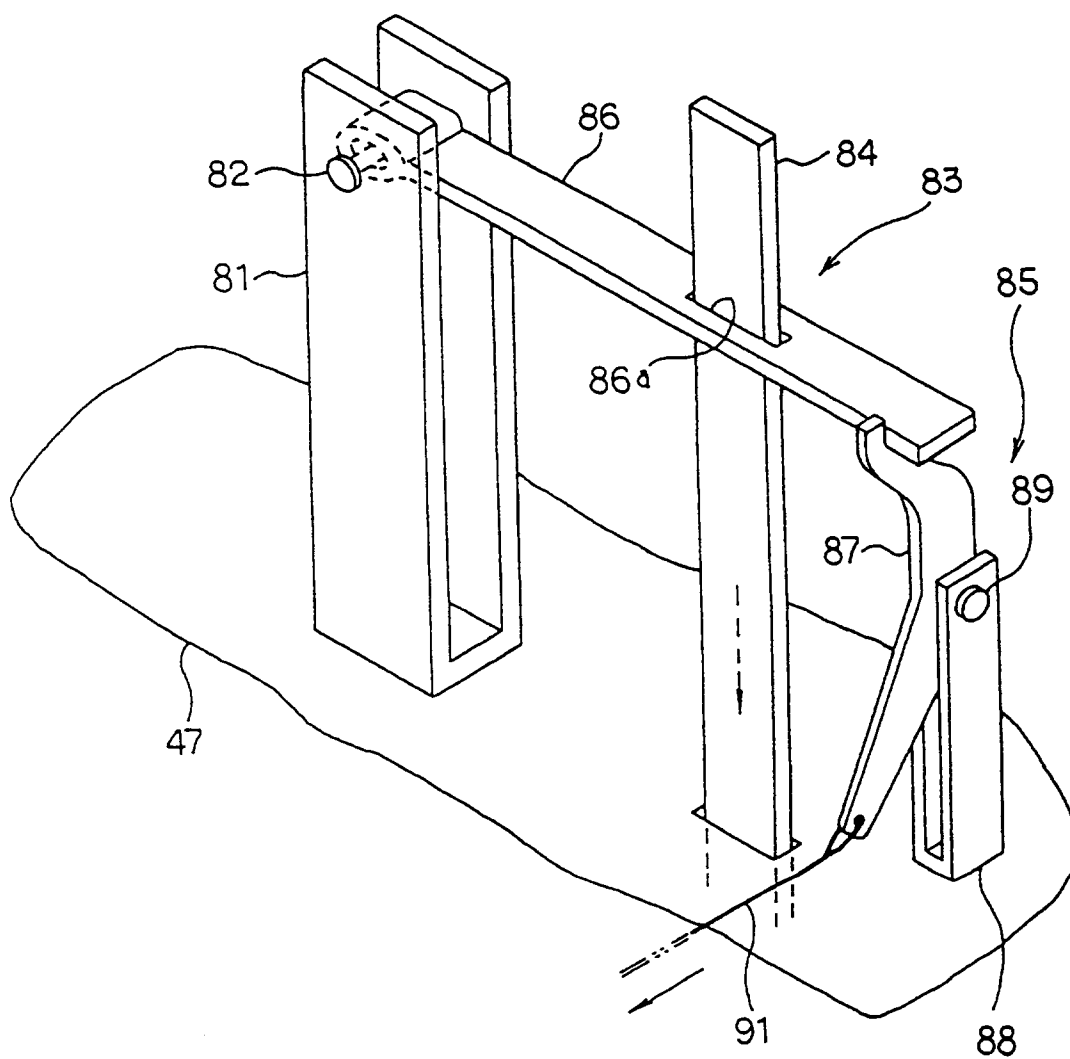


FIG. 20

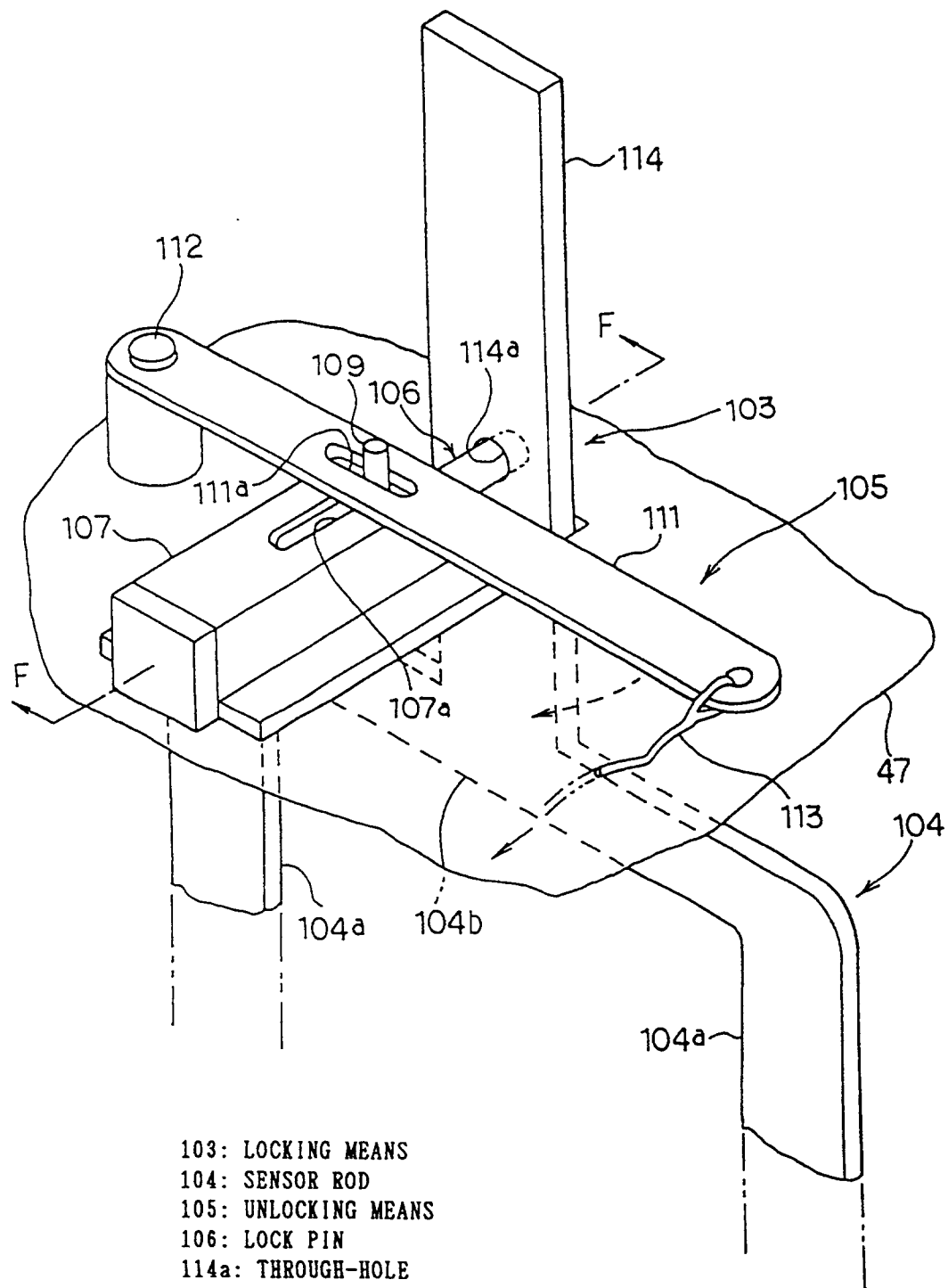


FIG. 21

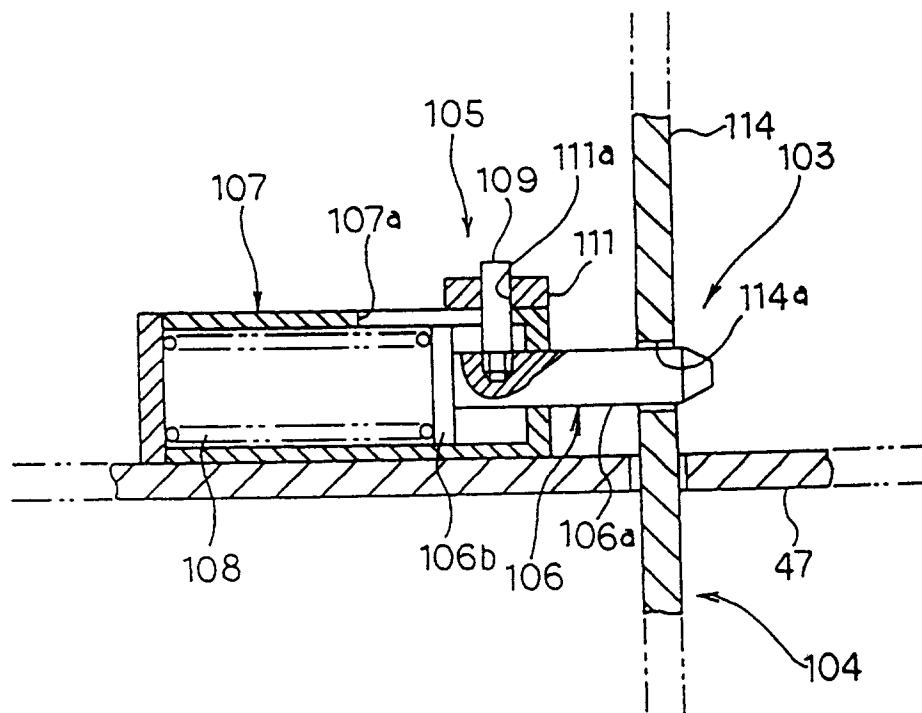


FIG. 22

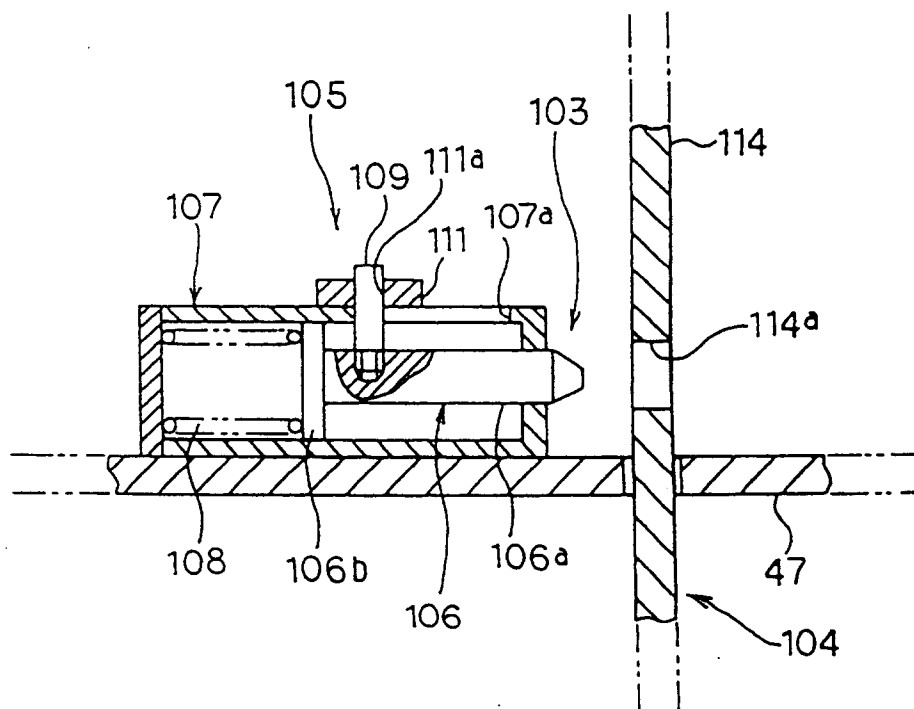


FIG. 23

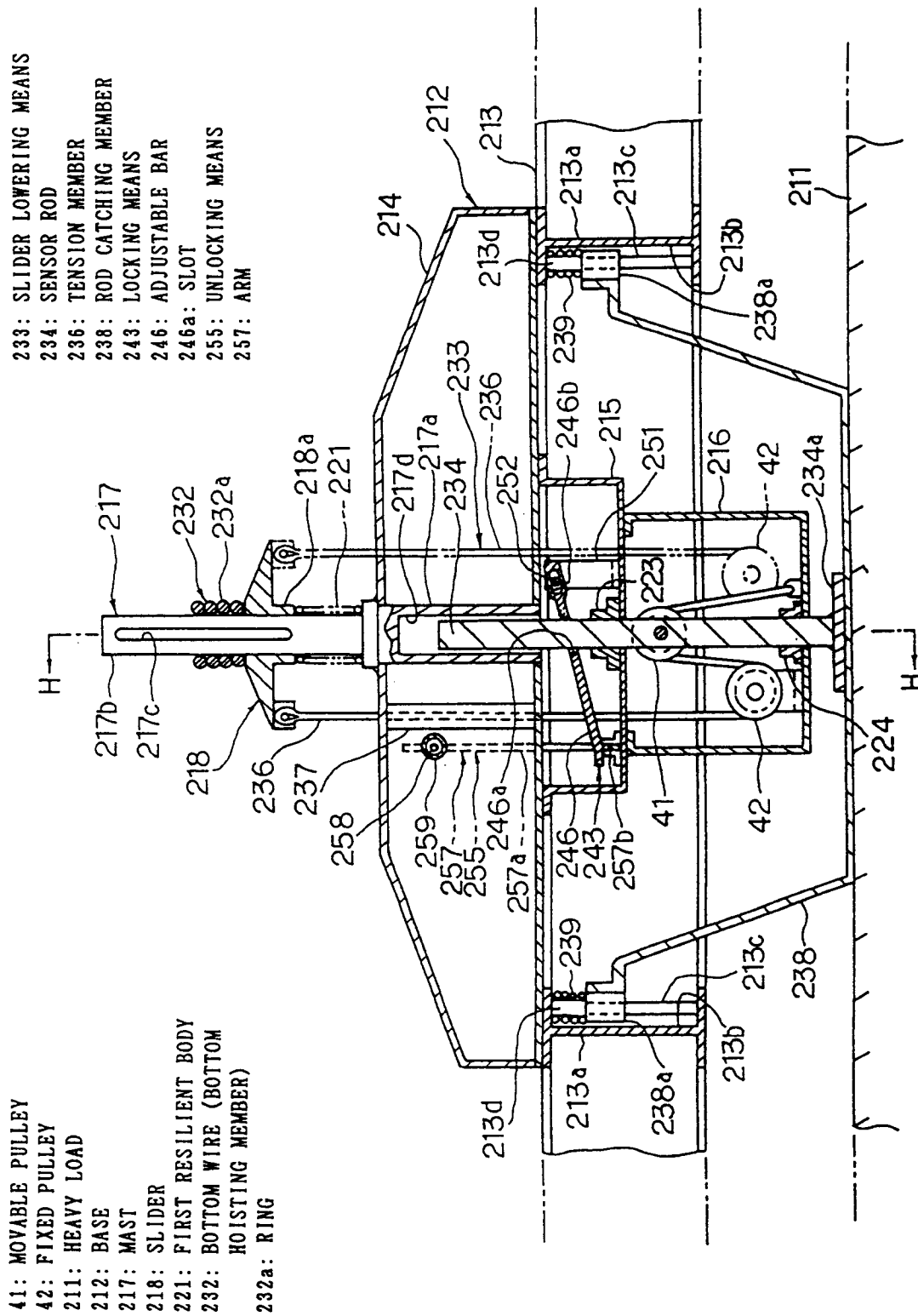


FIG. 24

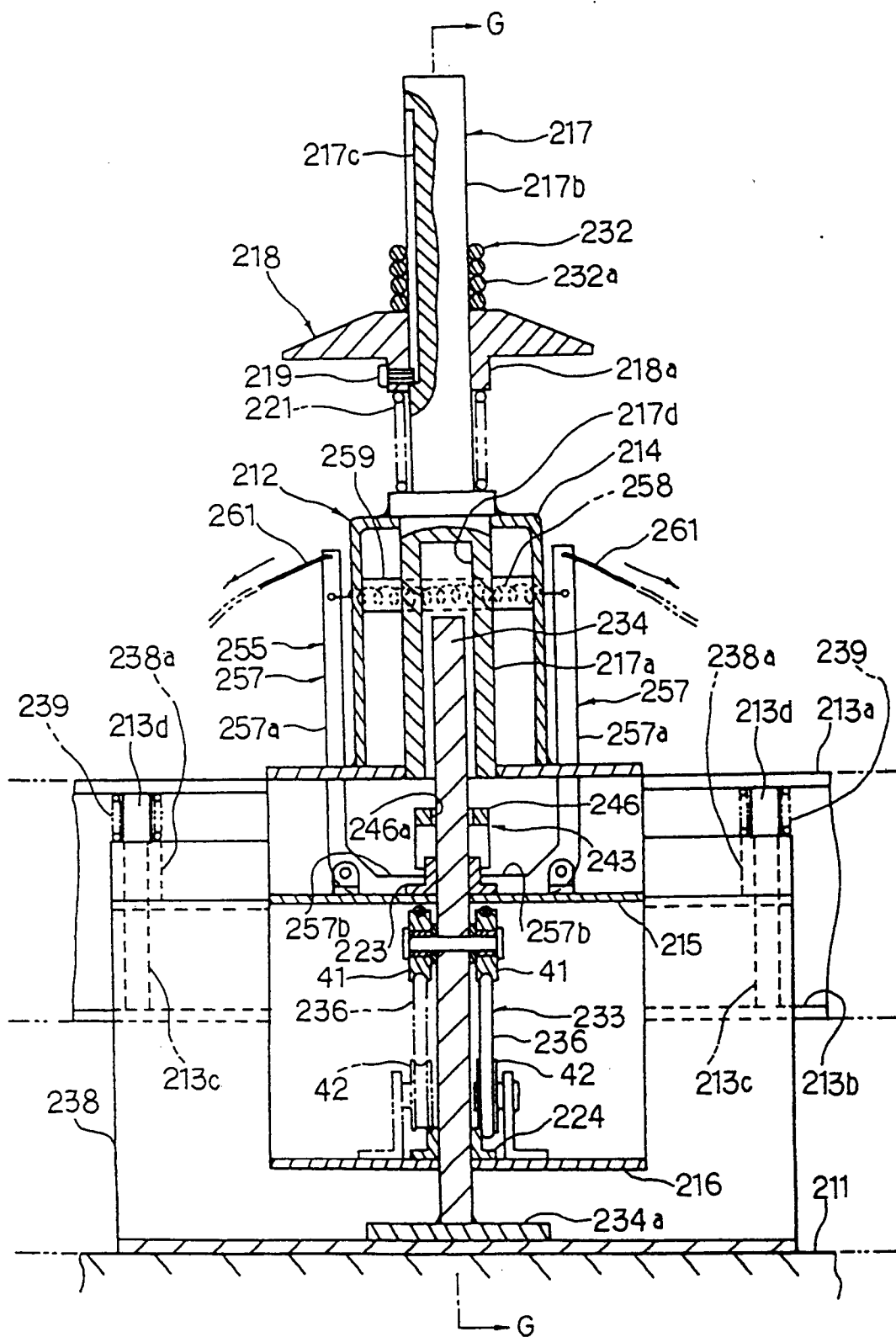


FIG. 25

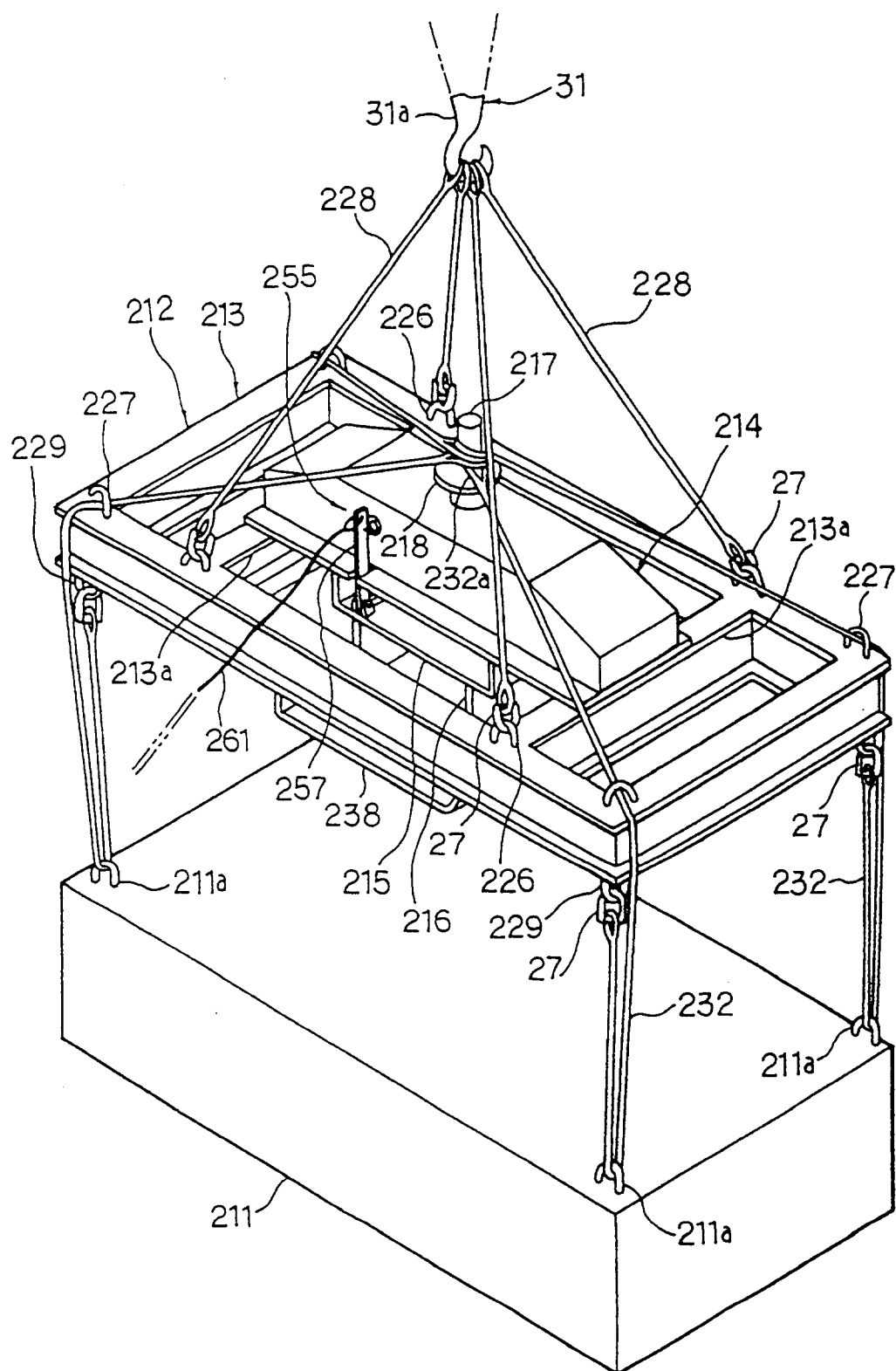


FIG. 26

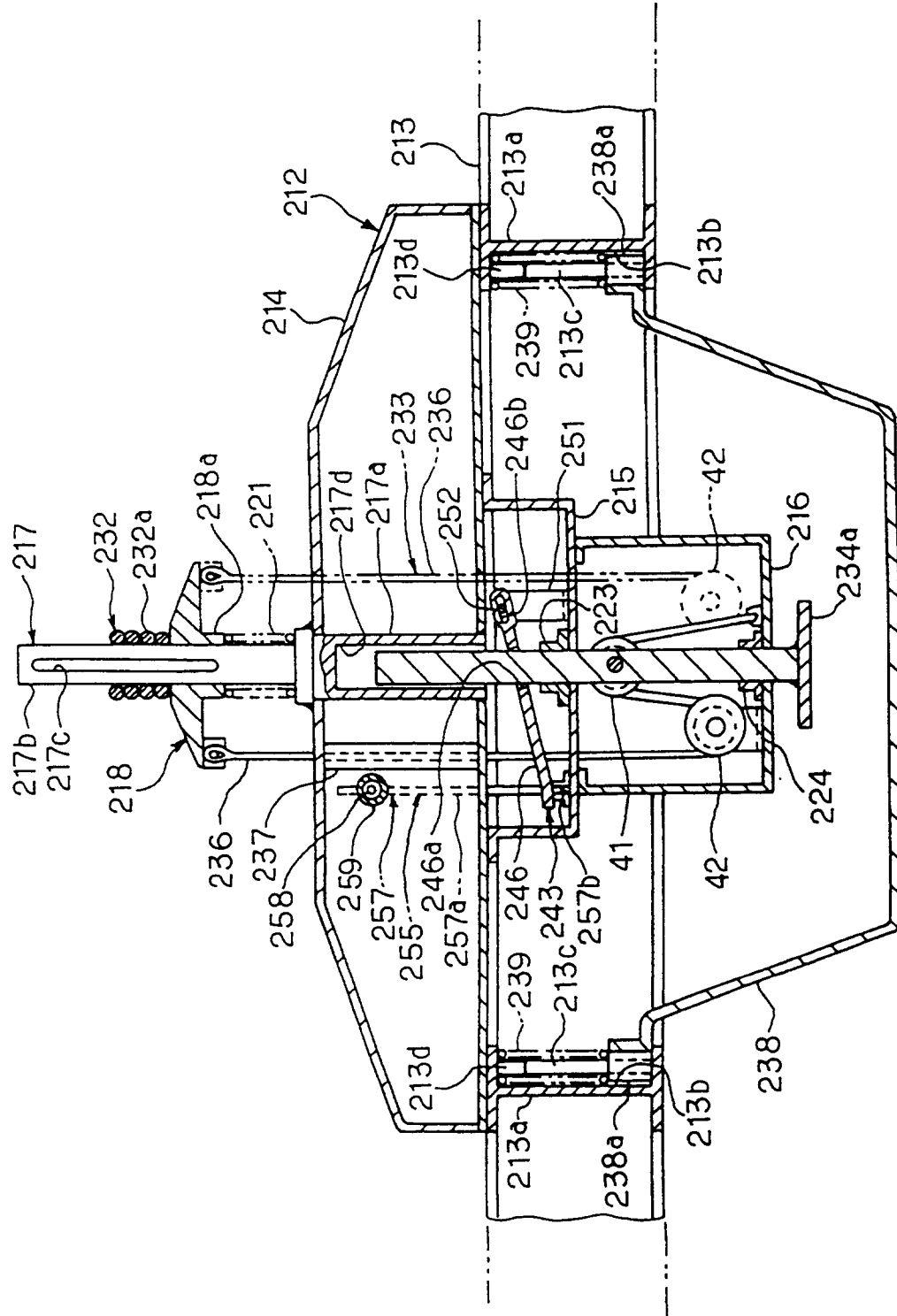
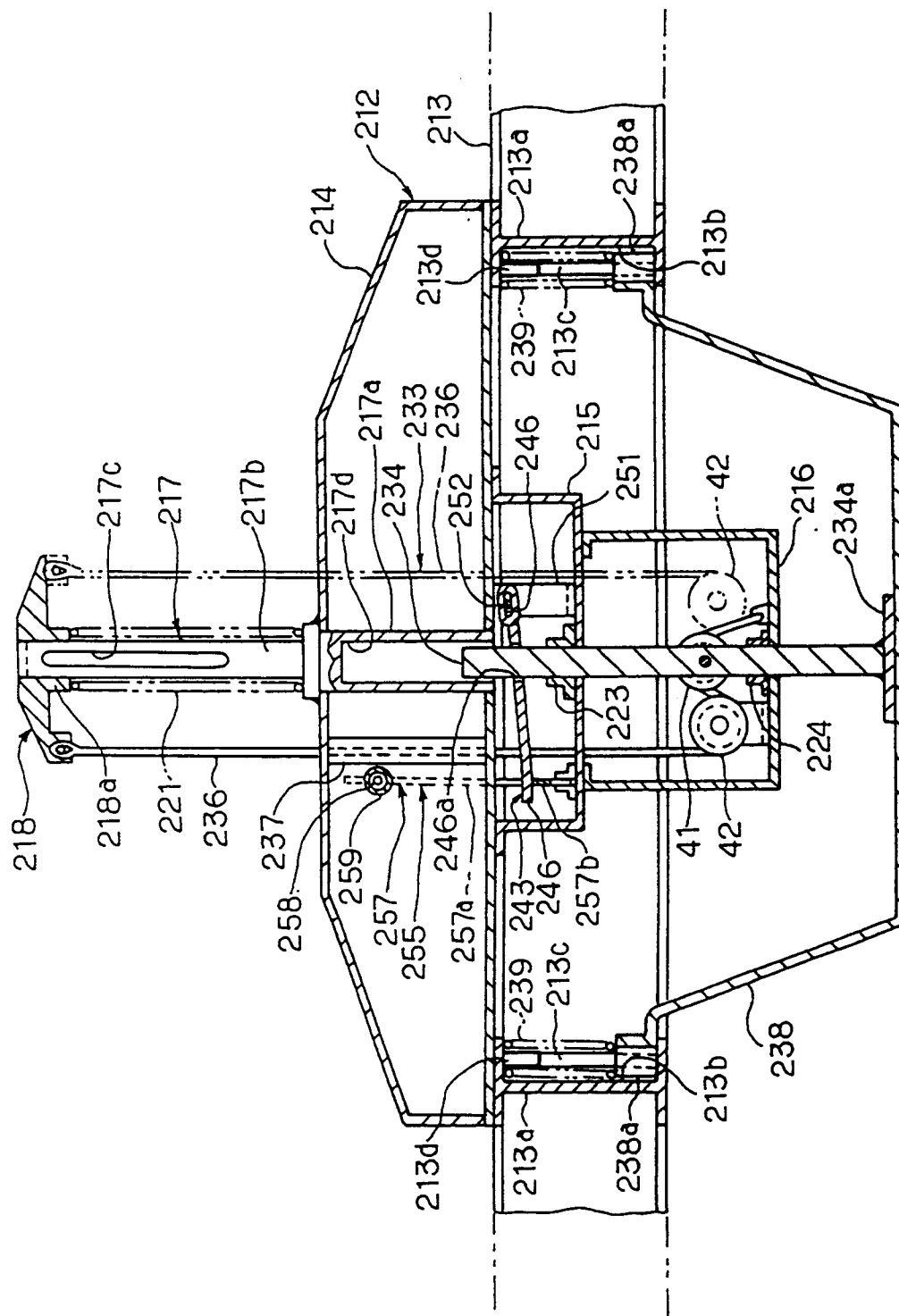


FIG. 27



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP94/00689

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl⁵ B66C1/12, B66C1/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl⁵ B66C1/10, B66C1/12, B66C1/34

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

Jitsuyo Shinan Koho 1926 - 1994

Kokai Jitsuyo Shinan Koho 1971 - 1994

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, A, 5-17095 (Totetsu K.K.), January 26, 1993 (26. 01. 93), (Family: none)	1-10
A	JP, U, 55-132084 (Bridgestone Corp.), September 18, 1980 (18. 09. 80), (Family: none)	1-10
A	JP, U, 56-68780 (National Jutaku Kenzai K.K.), June 8, 1981 (08. 06. 81), (Family: none)	7

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

July 4, 1994 (04. 07. 94)

Date of mailing of the international search report

August 2, 1994 (02. 08. 94)

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