



(11) **EP 3 249 106 A1**

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

(43) Date of publication:
29.11.2017 Bulletin 2017/48

(51) Int Cl.:
E02F 3/36 (2006.01) E02F 3/96 (2006.01)

(21) Application number: **16740382.3**

(86) International application number:
PCT/KR2016/000553

(22) Date of filing: **19.01.2016**

(87) International publication number:
WO 2016/117909 (28.07.2016 Gazette 2016/30)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(71) Applicant: **Im, Yong-Tae**
Gapyeong-gun, Gyeonggi-do 12412 (KR)

(72) Inventor: **Im, Yong-Tae**
Gapyeong-gun, Gyeonggi-do 12412 (KR)

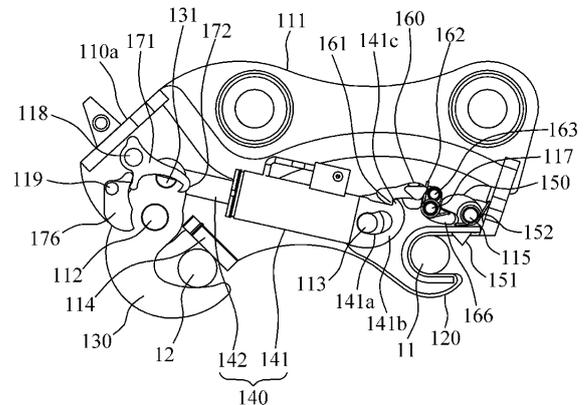
(74) Representative: **Groth & Co. KB**
P.O. Box 6107
102 32 Stockholm (SE)

(30) Priority: **19.01.2015 KR 20150008498**

(54) **QUICK COUPLER HAVING IMPROVED SAFETY**

(57) A hydraulic cylinder of a quick coupler has an elongated hole formed at either a cylinder rod or a cylinder body such that one of the cylinder rod and the cylinder body is fitted onto a cylinder shaft of a coupler body and the other is rotatably coupled to a movable hook, and rotates the movable hook such that the movable hook is coupled to or released from a second coupling pin according to extension or retraction. A rotary key has a rotary key protrusion inserted into or withdrawn from a coupling groove of a fixed hook according to a rotation position thereof, and the rotary key protrusion is maintained in a state in which the protrusion is inserted into the coupling groove of the fixed hook by means of the elastic force of a rotary key spring, so as to prevent the separation of a first coupling pin from the coupling groove of the fixed hook. A stopper has a stopper hook coupled to or separated from a cylinder hook around the elongated hole, is supported by the elastic force of a stopper spring, and rotates the rotary key such that the rotary key protrusion is withdrawn from the coupling groove of the fixed hook when the hydraulic cylinder is retracted.

FIG. 3



EP 3 249 106 A1

Description

[Technical Field]

[0001] The present disclosure relates to a quick coupler employed in heavy equipment, and more particularly, to a quick coupler that allows an attachment to be replaced according to a task purpose of heavy equipment.

[Background Art]

[0002] Heavy equipment such as an excavator used in civil engineering and construction sites performs various tasks with various forms of attachments such as a bucket being replaced in a quick coupler disposed at a front end of an arm of a boom pole.

[0003] Generally, a quick coupler is configured so that an attachment is attached or detached by a hydraulic cylinder, the attachment may be released from the quick coupler and fall to the ground due to damage to the hydraulic cylinder and the like, and an accident in which the attachment falls by mistake may occur while attempting an attachment mounting task. In this way, when the attachment is unintentionally released from the quick coupler and falls, it leads to a serious accident in most cases due to the size and weight of the attachment. To prevent such an accident, a quick coupler having a safety device has been proposed.

[0004] As an example thereof, there is a technology disclosed in Korean Utility Model Registration No. 20-211608. According to this technology, a cylinder housing of a hydraulic cylinder is fixed to one side of a locker, and a cylinder rod of the hydraulic cylinder is fixed to one side of a mobile hook. As the locker is rotated from a releasing position to a coupling position by the hydraulic cylinder, a nose of the locker protrudes to a coupling groove of a fixed hook and narrows an inlet of the coupling groove so that detachment of a coupling pin inserted into the coupling groove can be prevented.

[0005] However, in the above-described technology, because the locker still depends on an operation of the hydraulic cylinder, when the hydraulic cylinder is damaged or is not able to perform its own function, the locker fixed to the hydraulic cylinder cannot prevent the detachment of the coupling pin, and the coupling pin may be released from the fixed hook. Because the attachment falls from the quick coupler due to this, it can be seen that pursuit of safety is incomplete.

[0006] Further, generally, a buzzer may sound in heavy equipment when the hydraulic cylinder is not extended while the coupling pin of the attachment is coupled to the fixed hook. However, because a driver is unable to hear the buzzer often due to a loud noise in an area in which heavy equipment is used or the driver has to simultaneously perform various operations alone in most cases, the driver almost forgets to extend the hydraulic cylinder in some cases.

[0007] In this case, because the coupling pin of the

attachment is just placed on the fixed hook, when the driver lifts or rotates the attachment for next operation in this state, the attachment may immediately fall to the ground and cause an accident.

5 **[0008]** Also, according to the related art, because the safety device mounted in the quick coupler makes an inner space of the quick coupler extremely cramped, when impurities such as soil, pieces of stone, or the like are introduced into the inner space of the quick coupler while the quick coupler is being used in a worksite, the impurities may be unable to exit the inner space of the quick coupler and be accumulated in the inner space of the quick coupler. Because of this, an excessive load may be applied to a driving mechanism of the quick coupler and cause an incorrect operation of the driving mechanism and increase the possibility of an accident.

10 **[0009]** It can be recognized that a safety device that is provided in a way that the inner space of the quick coupler cannot be sufficiently secured as above may rather hinder the safe use of the quick coupler. Accordingly, a regressive phenomenon, in which workers who work at a worksite prefer a manual safety device over an automatic safety device, is exhibited.

15 [Disclosure]

[Technical Problem]

20 **[0010]** An objective of the present disclosure is to provide a quick coupler capable of securing safety and facilitating discharge of impurities by securing relatively large empty inner space while an attachment is mounted.

[Technical Solution]

25 **[0011]** To achieve the above objective, according to the present disclosure, a quick coupler includes a coupler body, a fixed hook, a mobile hook, a hydraulic cylinder, a rotary key, and a stopper. The coupler body may be connected to a front end of an arm of heavy equipment. The fixed hook may be formed in the coupler body and a first coupling pin of an attachment may be fitted thereto. The mobile hook may be rotatably coupled to the coupler body and a second coupling pin of the attachment may be fitted thereto. The hydraulic cylinder may have a slot formed in any one of a cylinder rod and a cylinder body and fitted to a cylinder shaft of the coupler body, have the other one rotatably coupled to the mobile hook, include a cylinder hook formed near the slot, and rotate the mobile hook to be coupled to or released from the second coupling pin according to an extension or contraction operation. The rotary key may be rotatably coupled to the coupler body, may include a rotary key protrusion that is inserted into or withdrawn from a coupling groove of the fixed hook according to a rotary position, and the rotary key protrusion may be maintained in a state of being inserted into the coupling groove of the fixed hook by an elastic force of a rotary key spring and

may prevent detachment of the first coupling pin from the coupling groove of the fixed hook. The stopper may include a stopper hook coupled to or separated from the cylinder hook, may be supported by an elastic force of a stopper spring, and may rotate the rotary key so that the rotary key protrusion is withdrawn from the coupling groove of the fixed hook during a contraction operation of the hydraulic cylinder in a state in which the stopper hook is coupled to the cylinder hook.

[0012] According to the present disclosure, a quick coupler includes a coupler body, a fixed hook, a mobile hook, a hydraulic cylinder, and a locking mechanism. The coupler body may be connected to a front end of an arm of heavy equipment. The fixed hook may be formed in the coupler body and a first coupling pin of an attachment may be fitted thereto. The mobile hook may be rotatably coupled to the coupler body and a second coupling pin of the attachment may be fitted thereto. The hydraulic cylinder may rotate the mobile hook to be coupled to or released from the second coupling pin according to an extension or contraction operation. The locking mechanism may lock the mobile hook to prevent the second coupling pin from being detached from the mobile hook while the mobile hook is coupled to the second coupling pin when the coupler body is located at positions other than that at an angle for mounting or releasing the attachment.

[Advantageous Effects]

[0013] According to the present disclosure, if a hydraulic cylinder does not perform a contraction operation while a coupling pin of an attachment is coupled to a fixed hook, detachment of the coupling pin of the attachment can be prevented by a rotary key. Consequently, an accident due to falling of the attachment can be prevented and safety can be secured.

[0014] According to the present disclosure, in a state in which a quick coupler is located at an angle at which an attachment may fall during work, even when a hydraulic cylinder is damaged or is unable to perform its own function or performs an incorrect operation by mistake of a worker, detachment of a coupling pin of an attachment from a mobile hook can be prevented.

[0015] According to the present disclosure, because a relatively large empty inner space of a quick coupler can be secured, when impurities and the like enter the inner space of the quick coupler, the impurities can immediately exit the inner space of the quick coupler without assigning load or applying pressure to elements such as a hydraulic cylinder located in the inner space. Consequently, problems such as an incorrect operation of an element inside the quick coupler do not occur.

[Description of Drawings]

[0016]

FIG. 1 is a perspective view of a quick coupler according to an embodiment of the present disclosure. FIG. 2 is a plan view of FIG. 1.

FIG. 3 is a front view illustrating an inside of the quick coupler illustrated in FIG. 1.

FIG. 4 is a perspective view illustrating a fixed hook portion in FIG. 3.

FIG. 5 is a perspective view illustrating a mobile hook portion in FIG. 3.

FIGS. 6 and 7 are views for describing actions of a gab and a weight.

FIG. 8 is a perspective view illustrating another example of a weight in FIG. 5.

FIG. 9 is a view illustrating an example of mounting an attachment on the quick coupler in FIG. 3.

FIGS. 10 to 13 are views for describing a process in which first and second coupling pins of an attachment are coupled and then detached to and from the quick coupler illustrated in FIG. 9.

FIG. 14 is a perspective view illustrating a state in which another example of a rotary key is applied.

FIG. 15 is a perspective view of the rotary key illustrated in FIG. 14.

FIG. 16 is a perspective view illustrating an example in which an intermediate body is omitted.

FIG. 17 is a perspective view of a rotary key illustrated in FIG. 16.

FIG. 18 is a configuration diagram of a quick coupler according to another embodiment of the present disclosure.

FIG. 19 is a perspective view of FIG. 18.

FIG. 20 is a view illustrating a state in which an extension operation is performed by a hydraulic cylinder in FIG. 18.

FIG. 21 is a view illustrating an action example of a stopper weight in FIG. 20.

FIG. 22 is a view for describing an action example of a second weight in FIG. 20.

FIG. 23 is a view illustrating a state in which a coupler body is located at an angle for mounting or releasing an attachment in FIG. 18.

FIG. 24 is a cross-sectional view illustrating an inside of a hydraulic cylinder.

FIG. 25 is a view illustrating a piston head in FIG. 24.

FIG. 26 is a view illustrating a region A in FIG. 24.

FIG. 27 is a view illustrating a contraction operation of the hydraulic cylinder in FIG. 26.

[Modes of the Invention]

[0017] The present disclosure will be described in detail below with reference to the accompanying drawings. Here, like reference numerals will be used for like configurations, and repeated descriptions and detailed descriptions of known functions and configurations that may unnecessarily blur the gist of the present disclosure will be omitted. Embodiments of the present disclosure are provided to more thoroughly describe the present disclosure.

sure to one of average skill in the art. Consequently, shapes, sizes, and the like of elements in the drawings may be exaggerated for clearer description.

[0018] FIG. 1 is a perspective view of a quick coupler according to an embodiment of the present disclosure. FIG. 2 is a plan view of FIG. 1. FIG. 3 is a front view illustrating an inside of the quick coupler illustrated in FIG. 1. FIG. 4 is a perspective view illustrating a fixed hook portion in FIG. 3. FIG. 5 is a perspective view illustrating a mobile hook portion in FIG. 3.

[0019] Referring to FIGS. 1 to 5, a quick coupler is located at a front end of an arm of a boom pole disposed in heavy equipment to attach or detach an attachment and includes a coupler body 110, a fixed hook 120, a mobile hook 130, a hydraulic cylinder 140, a rotary key 150, and a stopper 160.

[0020] The coupler body 110 is connected to the front end of the arm of the heavy equipment. The coupler body 110 is formed in a structure in which a pair of frames 111 are arranged at an interval to have an inner space. The fixed hook 120 is formed in the coupler body 110, and a first coupling pin 11 of an attachment 10 (see FIG. 10) is fitted thereto. The fixed hook 120 has a coupling groove to which the first coupling pin 11 is fitted.

[0021] The mobile hook 130 is rotatably coupled to the coupler body 110. The mobile hook 130 may rotate about a mobile hook shaft 112 of the coupler body 110. A second coupling pin 12 of the attachment 10 is fitted to the mobile hook 130. The mobile hook 130 has a coupling groove to which the second coupling pin 12 is fitted. The mobile hook 130 may be fitted to the second coupling pin 12 by rotating in a direction approaching the fixed hook 120 when the hydraulic cylinder 140 performs an extension operation. For example, when the mobile hook 130 is arranged at the left side of the fixed hook 120, the mobile hook 130 may be fitted to the second coupling pin 12 by rotating counterclockwise.

[0022] The hydraulic cylinder 140 includes a cylinder body 141 and a cylinder rod 142. A slot 141 a is formed in the cylinder body 141 and fitted to a cylinder shaft 113 of the coupler body 110. The cylinder shaft 113 protrudes from the frame 111 and is fitted to the slot 141 a. The slot 141 a may be formed in a cylinder shaft portion 141b of the cylinder body 141. The slot 141a may be formed in an elliptical shape or the like.

[0023] The slot 141 a of the hydraulic cylinder 140 may move leftward and rightward while being placed on the cylinder shaft 113. That is, when the hydraulic cylinder 140 is extended, the hydraulic cylinder 140 pushes a mobile hook hinge shaft 131, moves the cylinder shaft portion 141b, and makes the cylinder shaft 113 to be placed at the left of the slot 141a. When the hydraulic cylinder 140 is contracted, the hydraulic cylinder 140 pulls the mobile hook hinge shaft 131, moves the cylinder shaft portion 141b in the opposite direction, and makes the cylinder shaft 113 to be placed at the right of the slot 141 a. When the extension and contraction operations of the hydraulic cylinder 140 occur, the cylinder shaft portion

141b reciprocates along the length of the slot 141 a.

[0024] A lower end panel 114 is disposed in the frame 110, and the lower end panel 114 stops rotation of the mobile hook 130 when the hydraulic cylinder 140 performs a contraction operation. When an operation of the mobile hook 130 is first performed when the hydraulic cylinder 140 is contracted, and rotation of the mobile hook 130 is stopped by the lower end panel 114, the cylinder shaft 113 moves along the slot 141a due to further contraction of the hydraulic cylinder 140, and the cylinder body 141 moves leftward.

[0025] The cylinder rod 142 is rotatably coupled to the mobile hook 130. The cylinder rod 142 may be connected to the mobile hook hinge shaft 131 that penetrates through an upper end of the mobile hook 130. In another example, although not illustrated, the slot 141a may be formed in the cylinder rod 142, and the cylinder body 141 may be rotatably coupled to the mobile hook 130. The hydraulic cylinder 140 may be located at the center of an inside of the coupler body 110. A cylinder hook 143c is formed near the slot 141a.

[0026] The hydraulic cylinder 140 couples or releases the mobile hook 130 to or from the second coupling pin 12 according to the extension or contraction operation.

That is, when the hydraulic cylinder 140 performs the extension or contraction operation, the mobile hook hinge shaft 131 connected to the cylinder rod 142 moves leftward and rightward, and the mobile hook 130 may be coupled to or released from the second coupling pin 12 by rotating about the mobile hook shaft 112.

[0027] The rotary key 150 is rotatably coupled to the coupler body 110. The rotary key 150 may be arranged at an upper end of an opening of the fixed hook 120 and may be coupled to a rotary key shaft 115 protruding from the frame 111. The rotary key 150 includes a rotary key protrusion 151 that is inserted into or withdrawn from a coupling groove of the fixed hook 120 according to a rotary position. The rotary key 150 prevents detachment of the first coupling pin 11 from the coupling groove of the fixed hook 120 by the rotary key protrusion 151 being maintained in a state of being inserted into the coupling groove of the fixed hook 120 by an elastic force of rotary key springs 152. For example, the rotary key 150 may be maintained in a state in which the rotary key protrusion 150 heads downward by the rotary key springs 152 disposed at left and right sides. The rotary key springs 152 may be formed as a torsion spring.

[0028] Consequently, when the first coupling pin 11 of the attachment 10 enters the coupling groove of the fixed hook 120, the rotary key 150 rotates clockwise and the rotary key protrusion 151 is automatically lifted. Then, as soon as the first coupling pin 11 is seated on the coupling groove of the fixed hook 120, the rotary key 150 rotates counterclockwise and the rotary key protrusion 151 moves downward. Here, because the rotary key 150 is locked so as not to further rotate counterclockwise, the first coupling pin 11 is not detached from the coupling groove of the fixed hook 120. In this way, the rotary key

150 can mechanically automatically fix the first coupling pin 11.

[0029] The stopper 160 includes a stopper hook 161 coupled to or separated from a cylinder hook 141c. The stopper 160 is supported by an elastic force of stopper springs 162. The stopper springs 162 may be formed as a torsion spring. The stopper 160 rotates the rotary key 150 so that the rotary key protrusion 151 is withdrawn from the coupling groove of the fixed hook 120 when the hydraulic cylinder 140 performs the contraction operation while the stopper hook 161 is coupled to the cylinder hook 141c.

[0030] The stopper 160 may include stopper wings 160a at left and right sides. The stopper wings 160a extend to an upper end of a stopper guide 116 of the frame 111. The stopper wings 160a collide with an inclined surface 116a of an upper end of the stopper guide 116 and makes the stopper 160 vertically move.

[0031] That is, when the stopper wings 160a move along the inclined surface 116a of the upper end of the stopper guide 116 and reaches a predetermined position, the stopper wings 160a lift the stopper 160 due to the shape of the upper end of the stopper guide 116. Consequently, coupling between the stopper hook 161 and the cylinder hook 141c is released. Here, the slot 141a which has an elliptical shape makes the cylinder shaft portion 141b to simultaneously descend at a position at which the cylinder hook 141c is released from the stopper hook 161, thereby allowing the stopper 160 and the cylinder shaft portion 141b to be completely released from each other.

[0032] An intermediate body 166 may be arranged between the stopper 160 and the rotary key 150. The intermediate body 166 has a central portion rotatably coupled to the coupler body 110 while one side portion is rotatably coupled to the stopper 160. As the one side portion of the intermediate body 166 is pulled by the stopper 160, the other side portion thereof withdraws the rotary key protrusion 151 from the coupling groove of the fixed hook 120.

[0033] That is, the intermediate body 166 may be coupled to an intermediate body shaft 117 protruding from the frame 111 and rotate about the intermediate body shaft 117. The intermediate body 166 interferes with the rotary key 150 while rotating and causes rotation of the rotary key 150. The intermediate body 166 has the stopper springs 162 installed at left and right sides and is connected to the stopper 160 via a stopper shaft 163 at an upper end. Consequently, the stopper 160 may also be elastically biased downward by the stopper springs 162.

[0034] An upper end of the intermediate body 166 may be coupled to the stopper 160 at the left side via the stopper shaft 163. Consequently, when the stopper 160 horizontally moves, the intermediate body 166 also rotates about the intermediate body shaft 117. When the intermediate body 166 rotates, the stopper 160 also horizontally moves.

[0035] A rotary key wing 150a may be disposed at the left side of the rotary key 150. The rotary key wing 150a overlaps the intermediate body 166 at a side surface. When the intermediate body 166 rotates counterclockwise, the rotary key wing 150a interferes with the intermediate body 166 and is lifted. Consequently, because the rotary key 150 rotates clockwise, the rotary key protrusion 151 is lifted above the fixed hook 120. Conversely, when the rotary key protrusion 151 is pushed upward by the first coupling pin 11 and located at an upper end of the fixed hook 120, rotation of the intermediate body 166 does not occur.

[0036] The action of the stopper 160 will be described. Because the stopper 160 is elastically biased downward by the stopper springs 162, when the stopper hook 161 is located at an upper end of the left side of the cylinder hook 141c, the stopper hook 161 is automatically coupled to the cylinder hook 141a.

[0037] In this state, when the cylinder shaft portion 141b of the hydraulic cylinder 140 moves leftward, the cylinder hook 141c pulls the stopper hook 161 leftward. Here, because the cylinder shaft portion 141b moves leftward along the slot 141a, the intermediate body 166 rotates counterclockwise about the intermediate body shaft 117 as the stopper 160 is pulled leftward. Consequently, as the rotary key 150 rotates clockwise, the rotary key protrusion 151 is lifted to the upper end of the fixed hook 120.

[0038] Then, when the first coupling pin 11 completely exits the coupling groove of the fixed hook 120, the intermediate body 166 automatically rotates clockwise, the rotary key 150 rotates counterclockwise, and the rotary key protrusion 151 moves downward to a lower end of the fixed hook 120. As a result, the first coupling pin 11 of the attachment 10 can be completely released from the quick coupler.

[0039] A locking mechanism may be provided at the mobile hook 130. The locking mechanism locks the mobile hook 130 to prevent the second coupling pin 12 from being detached from the mobile hook 130 while the mobile hook 130 is coupled to the second coupling pin 12 when the coupler body 110 is located at positions other than that at an angle for mounting or releasing the attachment 10.

[0040] The locking mechanism may include a gab 171 and a weight 176. The gab 171 is rotatably coupled to the coupler body 110 to limit a movement range of the mobile hook hinge shaft 131 while the mobile hook 130 is coupled to the second coupling pin 12.

[0041] The gab 171 may be arranged at the left side of the mobile hook hinge shaft 131. The gab 171 rotates about a gab shaft 118 at an upper end of the mobile hook hinge shaft 131. A gab hook 172 is disposed at a front end of the gab 171. The gab hook 172 allows the mobile hook hinge shaft 131 to be locked. A flat portion 131a is provided at a front end of the mobile hook hinge shaft 131 so that it is easy for the gab 171 to lock the mobile hook hinge shaft 131.

[0042] The quick coupler mounts or releases the attachment 10 while the attachment 10 is placed on the ground. Here, the gab 171 may be located by being rotated so as not to lock the mobile hook hinge shaft 131.

[0043] The weight 176 is rotatably coupled to the coupler body 110 to apply a load to the gab 171 while the gab 171 is locking the mobile hook hinge shaft 131. The weight 176 may be arranged at the left of the gab 171. The weight 176 freely rotates due to gravity about a weight shaft 119 at a lower end of the gab 171. The weight shaft 119 protrudes from the frame 111. The weight 176 is relatively heavier than the gab 171 and may be formed of an iron material having a thickness of about 7 cm.

[0044] The weight 176 may change the position of the gab 171 having a relatively light weight. That is, a relatively angle of inclination of the gab 171 with respect to the mobile hook hinge shaft 131 may change according to the position of the weight 176. Here, because an angle of inclination in which the mobile hook hinge shaft 131 can move without being interfered by the gab 171 is determined according to the shapes and positions of the gab 171 and the weight 176, the shapes and positions of the gab 171 and the weight 176 may change according to a desired angle of inclination.

[0045] An example of actions of the gab 171 and the weight 176 will be described with reference to FIGS. 6 and 7. As illustrated in FIG. 6, while the quick coupler is located at an angle at which the attachment 10 may fall during work, no matter how hard a driver may advertently operate the hydraulic cylinder 140 to release the second coupling pin 12 of the attachment 10 from the quick coupler, the releasing is impossible. This is because, even when the hydraulic cylinder 140 is contracted, the cylinder rod 142 is caught in the gab hook 172 of the gab 171 and cannot be contracted more.

[0046] Further, in this state, even when the cylinder rod 142 of the hydraulic cylinder 140 is broken during work as illustrated in FIG. 7, because the gab 171 locks the mobile hook hinge shaft 131 and the mobile hook 130 is not opened by a predetermined interval or more, the second coupling pin 12 of the attachment 10 is unable to exit the mobile hook 130. Even when the hydraulic cylinder 140 is naturally contracted due to internal leakage of oil or an incorrect operation occurs due to a failure of a switch that is caused by an overload current flowing to a quick coupler controller, the second coupling pin 12 of the attachment 10 cannot be released from the quick coupler due to the gab 171.

[0047] In this way, when the quick coupler is located at a predetermined angle, e.g., only when the quick coupler is located at an angle of mounting or demounting the attachment 10, the releasing is possible according to normal extension and contraction operations of the hydraulic cylinder 140, and when the quick coupler is located at other angles, the gab 171 is located at a position of locking the mobile hook hinge shaft 131 due to the action of the weight 176, and the attachment 10 cannot be released.

[0048] As illustrated in FIG. 8, a weight 176' according to another example may be arranged above a gab 171'. The gab 171' may include protrusions 171a' at an upper end. A lower end portion of the weight 176' is inserted between the protrusions 171 a' .

[0049] The weight 176' is installed to rotate about a weight shaft 119' at a cover 110a of the quick coupler. The weight 176' may cause an angle of inclination of the gab 171 to change according to the position of the weight 176'. The weights 176 and 176' may be installed anywhere in the frame 111 and are not necessarily installed at a shaft protruding from the frame 111. The weights 176 and 176' may be installed in various ways within the scope in which the above-described functions are performed.

[0050] Because the above-described quick coupler is able to secure a relatively large empty inner space, when impurities or the like enter the inner space, the impurities can immediately exit the inner space without the possibility of assigning load or applying pressure to elements such as the hydraulic cylinder located in the inner space of the quick coupler. Consequently, problems such as an incorrect operation of an element inside the quick coupler do not occur.

[0051] A process in which the quick coupler according to an embodiment of the present disclosure is mounted to or separated from the attachment 10 will be described with reference to FIGS. 9 to 13.

[0052] First, as illustrated in FIG. 9, the bottom of the attachment 10 is placed on a ground 1. In this state, as illustrated in FIG. 10, the quick coupler moves and allows the first coupling pin 11 of the attachment 10 to enter the coupling groove of the fixed hook 120. Here, the first coupling pin 11 enters by pushing the rotary key protrusion 151, and accordingly, the rotary key protrusion 151 rotates clockwise, is withdrawn from the coupling groove of the fixed hook 120, and is lifted.

[0053] Then, when the first coupling pin 11 is completely seated on the coupling groove of the fixed hook 120, the rotary key 151 rotates counterclockwise due to the rotary key springs 152 and is inserted again into the coupling groove of the fixed hook 120 so that the rotary key protrusion 151 blocks 1/3 or more of an inlet of the fixed hook 120. Consequently, the first coupling pin 11 may be fixed to the coupling groove of the fixed hook 120. In this state, at the mobile hook 130, the weight 176 heads downward due to gravity, and the gab 171 is located so as not to lock the mobile hook hinge shaft 131 by the weight 176.

[0054] Then, when the hydraulic cylinder 140 extends as illustrated in FIG. 11, the mobile hook 130 rotates counterclockwise about the mobile hook shaft 112, and the second coupling pin 12 of the attachment 10 is coupled to a coupling groove of the mobile hook 130.

[0055] In this way, when the fixed hook 120 and the mobile hook 130 are respectively coupled to the first coupling pin 11 and the second coupling pin 12, the attachment 10 is not released from the quick coupler in a proc-

ess in which work such as excavation is performed. This is because the first coupling pin 11 coupled to the fixed hook 120 cannot be detached from the fixed hook 120 due to the angle of the fixed hook 120 and the rotary key protrusion 171, and the second coupling pin 12 cannot be detached from the mobile hook 130 due to the gab 171 even when the hydraulic cylinder 140 is contracted by operation mistake of a worker, is damaged, or is unable to perform its own function.

[0056] Then, the attachment 10 can be released from the quick coupler as below from the state of being mounted to the quick coupler. When the bottom of the attachment 10 reaches the ground, as illustrated in FIG. 9, the quick coupler has an angle of inclination that is the same as when the attachment 10 is initially mounted.

[0057] In this state, as illustrated in FIG. 12, when the hydraulic cylinder 140 performs the contraction operation, the mobile hook 130 rotates clockwise about the mobile hook shaft 112 without being locked by the gab 171. Then, when the mobile hook 130 stops due to the lower end panel 114, the cylinder shaft portion 141b moves leftward due to further contraction of the hydraulic cylinder 140. Accordingly, because the stopper hook 161 is pulled leftward while being coupled to the cylinder hook 141c, the intermediate body 166 rotates counterclockwise, and the rotary key protrusion 151 is withdrawn from the fixed hook 120. Consequently, the first coupling pin 11 may be detached from the fixed hook 120.

[0058] In this state, as illustrated in FIG. 13, when the cylinder body 141 further moves leftward due to the contraction operation of the hydraulic cylinder 140, the stopper hook 161 is detached from the cylinder hook 141c. Here, the cylinder body 141 descends by being guided by the slot 141 a of the cylinder shaft portion 141b and is able to assist detachment of the stopper hook 161. As a result, the stopper 160 moves rightward. Further, as the rotary key 150 rotates counterclockwise, the intermediate body 166 rotates clockwise while the rotary key protrusion 151 is inserted into the fixed hook 120. As a result, the attachment 10 can be completely released from the quick coupler.

[0059] As another example, as illustrated in FIGS. 14 and 15, a rotary key 150' may be mounted to the cylinder shaft 113. The rotary key 150' has a shaft hole 150a' fitted to the cylinder shaft 113. The rotary key is formed in the shape of covering the upper end of the intermediate body 166.

[0060] During the contraction operation of the hydraulic cylinder 140, the stopper 160 is pulled while the stopper hook 161 is engaged with the cylinder hook 141 c, and here, the intermediate body 166 rotates counterclockwise and lifts the rotary key 150'. Then, when the first coupling pin 11 is separated from the fixed hook 120, the stopper 160 is lifted by a stopper protrusion 153' of the rotary key 150'. Consequently, after the stopper hook 161 is released from the cylinder hook 141c, the intermediate body 166 rotates clockwise, and the rotary key 150' moves downward to the lower end.

[0061] As another example, as illustrated in FIGS. 16 and 17, a rotary key 150" may be directly coupled to a stopper 160" while the intermediate body 166 is omitted. The stopper 160" is rotatably coupled to the rotary key 150" via a stopper shaft 160a". When the stopper 160" is pulled by the cylinder shaft portion 141b due to the contraction operation of the hydraulic cylinder 140, the stopper 160" directly lifts the rotary key 150". Also, the rotary key 150" may be mounted to the cylinder shaft 113.

[0062] FIG. 18 is a configuration diagram of a quick coupler according to another embodiment of the present disclosure. FIG. 19 is a perspective view of FIG. 18. FIG. 20 is a view illustrating a state in which an extension operation is performed by a hydraulic cylinder in FIG. 18. FIG. 21 is a view illustrating an action example of a stopper weight in FIG. 20.

[0063] Referring to FIGS. 18 to 21, in the quick coupler, a rotary key 250 is rotatably coupled to the rotary key shaft 115 of the frame 111, and a stopper 260 is rotatably coupled to the rotary key 250. The rotary key 250 may be rotatably coupled to the stopper 260 via a stopper shaft 263. The rotary key 250 is elastically biased so that a rotary key protrusion 251 is located in the coupling groove of the fixed hook 120 due to a rotary key spring 252.

[0064] A stopper spring 262 may be elastically deformed due to the rotary key 250 when a stopper hook 261 is separated from the cylinder hook 141c and apply an elastic force to the stopper 260. The stopper spring 262 may be formed as a torsion spring. The stopper spring 262 has a central portion fitted to the rotary key shaft 115. The stopper spring 262 has one side portion, which is withdrawn from the central portion arranged to come into contact with the frame 111, and the other side portion, which is withdrawn from the central portion bent to come into contact with an upper end of the rotary key 250 and then bent to come into contact with a lower central portion of the stopper 260. Consequently, the stopper spring 262 supports the rotary key 250 and the stopper 260 between them.

[0065] When the stopper hook 261 is coupled to the cylinder hook 141c while the contraction operation of the hydraulic cylinder 140 is not completely performed, the stopper spring 262 does not provide an elastic force to the stopper 260.

[0066] As illustrated in FIG. 18, in a state in which a roller 253 of the rotary key protrusion 251 enters and is located in the coupling groove of the fixed hook 120 during the contraction operation of the hydraulic cylinder 140, the roller 253 is lifted when the first coupling pin 11 enters the coupling groove of the fixed hook 120 or is separated from the coupling groove of the fixed hook 120. Thus, the stopper hook 261 moves toward the cylinder hook 141c and forms an interval that allows detachment from the cylinder hook 141c, and the upper end of the rotary key 250 is lifted. Here, the upper end of the rotary key 250 lifts a portion of the stopper spring 262 adjacent thereto, and the stopper spring 262 supports

the stopper 260. Consequently, the stopper hook 261 receives an elastic force for detaching from the cylinder hook 141 c, is detached from the cylinder hook 141c, and is placed on a right side of an end of the cylinder hook 141c. Here, the stopper hook 261 maintains to be in contact with the right side of the end of the cylinder hook 141c due to the stopper spring 162.

[0067] The roller 253 may be rotatably mounted to the rotary key protrusion 251. The roller 253 converts a frictional force that is generated when the first coupling pin 11 enters or is detached from the coupling groove of the fixed hook 120 into rotation of the rotary key protrusion 251 and minimizes friction to reduce wear. While the stopper hook 261 is in contact with the cylinder hook 141c and towed during the contraction operation of the hydraulic cylinder 140, the roller 253 is located at an upper end in the coupling groove of the fixed hook 120. When the first coupling pin 11 is detached from the coupling groove of the fixed hook 120, the roller 253 is pushed by the first coupling pin 11 and allows the rotary key 250 to rotate clockwise. As a result, the stopper hook 261 can be separated from the cylinder hook 141c.

[0068] An example of actions of the rotary key 250 and the stopper 260 will be described below. When the hydraulic cylinder 140 performs the contraction operation so that a mobile hook 230 is completely narrowed toward the fixed hook 120, the stopper hook 261 comes into contact with the cylinder hook 141c and is towed, and the roller 253 is located in a standby state in which the roller 253 protrudes from the upper end of the coupling groove of the fixed hook 120. In this state, when the first coupling pin 11 enters the coupling groove of the fixed hook 120 or is detached from the coupling groove of the fixed hook 120, the roller 253 is pushed and lifted by the first coupling pin 11, and the stopper hook 261 and the cylinder hook 141c begin to be detached from each other. When the first coupling pin 11 is seated on the coupling groove of the fixed hook 120, the roller 253 returns to the coupling groove of the fixed hook 120 due to the rotary key spring 252. Here, the stopper hook 261 may be detached from the cylinder hook 141c from the state of being engaged with the cylinder hook 141c and be placed on a right side of an upper end of the cylinder hook 141c.

[0069] Then, when the hydraulic cylinder 140 performs the extension operation, as illustrated in FIG. 20, the cylinder hook 141c moves toward the rotary key 250, is coupled to the stopper hook 261, and comes into contact with a lower end of the stopper 260. Here, because the stopper 260 is not locked by the cylinder hook 141c, the stopper 260, which lost a towing force, and the rotary key 250 sharply rotate counterclockwise due to elastic forces of the stopper spring 262 and the rotary key spring 252 and come into contact with a portion of the frame 111 located at a right side of the coupling groove of the fixed hook 120 so that the rotary key 250 is locked so as not to further rotate counterclockwise. Consequently, the first coupling pin 11 is not detached from the coupling groove of the fixed hook 120 due to the rotary key protrusion 251.

[0070] Then, when the hydraulic cylinder 140 performs the contraction operation, the stopper 260 rotating by the stopper shaft 263 at the rotary key 250 is towed leftward by the cylinder hook 141c, and accordingly, the rotary key 250 rotates clockwise, and the rotary key protrusion 251 is located at the upper end of the coupling groove of the fixed hook 120. In this state, when the first coupling pin 11 moves in a direction of detaching from the coupling groove of the fixed hook 120, the roller 253 is pushed upward by the first coupling pin 11. Accordingly, an interval at which the stopper hook 261 may be detached from the portion at which the stopper hook 261 is engaged with the cylinder hook 141c is generated. Here, because the stopper spring 262 is supported at the upper end of the rotary key 250, the stopper hook 261 is detached from the cylinder hook 141c. After the detachment of the first coupling pin 11, the rotary key protrusion 251 is returned to its original position due to the rotary key spring 252.

[0071] As illustrated in FIGS. 19 and 21, a stopper weight 264 may be disposed at one side of the stopper 260. The stopper weight 264 locks the hydraulic cylinder when the coupler body 110 is located at positions other than that at an angle for mounting or releasing the attachment 10.

[0072] One end of the stopper weight 264 is rotatably coupled to the frame 111, and the other end of the stopper weight 264 includes a weight hook 264a. The weight hook 264a is coupled to or separated from the cylinder hook 141c.

[0073] In a state in which the fixed hook 120 is lifted and an angle of inclination of the quick coupler is about 65°, when the hydraulic cylinder 140 attempts to perform the contraction operation so that the mobile hook 230 is completely narrowed, the weight hook 264a is separated from the cylinder hook 141c. Also, when the hydraulic cylinder 140 performs the extension operation while the angle of inclination of the quick coupler is 65° or smaller, the weight hook 264a is coupled to the cylinder hook 141c. Consequently, even when the hydraulic cylinder 140 is damaged or a first weight 271 and a second weight 276 do not operate in a process in which work such as excavation is performed, the hydraulic cylinder 140 is locked by the stopper weight 264 and does not move toward the mobile hook 230.

[0074] The mobile hook 230 may rotate in a direction away from the fixed hook 120 and be fitted to the second coupling pin 12 when the hydraulic cylinder 140 performs the extension operation. For example, when the mobile hook 230 is arranged at the left of the fixed hook 120, the mobile hook 230 may rotate clockwise and be fitted to the second coupling pin 12. Although a slot 241a of the hydraulic cylinder 140 is illustrated as being formed to horizontally move with respect to the cylinder shaft 113, embodiments are not limited thereto.

[0075] The mobile hook 230 has a coupling groove to which the second coupling pin 12 is fitted formed at one end and a mobile hook protrusion 231 protruding in the

direction away from the fixed hook 120 formed at the opposite end. The locking mechanism may include the first weight 271.

[0076] One end of the first weight 271 is rotatably coupled to the coupler body 110, i.e., a weight shaft 219 of the frame 111, and the other end of the first weight 271 includes a first locking part 272 configured to interact with the mobile hook protrusion 231 and limit a movement range of the mobile hook protrusion 231 while the mobile hook 230 is coupled to the second coupling pin 12. The first locking part 272 may be formed in the shape of a groove recessed from an outer side surface of the first weight 271. The first locking part 272 may have an inclined surface at a portion far from the mobile hook protrusion 231.

[0077] When the mobile hook 230 rotates counterclockwise to be fitted to the second coupling pin 12 in a state in which the first locking part 272 is deviated from the mobile hook protrusion 231, the first weight 271 rotates clockwise, and the mobile hook protrusion 231 is fitted to the first locking part 272. In this state, even when the hydraulic cylinder 140 is damaged in a process in which work such as excavation is performed, because the first locking part 272 locks the mobile hook protrusion 231 and the mobile hook 230 is not opened by a predetermined interval or more, the second coupling pin 12 of the attachment 10 is unable to exit the mobile hook 230.

[0078] The locking mechanism may further include the second weight 276. One end of the second weight 276 is rotatably coupled to the weight shaft 219, and the other end of the second weight 276 includes a second locking part 277 configured to interact with the mobile hook protrusion 231 and limit the movement range of the mobile hook protrusion 231 while the mobile hook 230 is coupled to the second coupling pin 12.

[0079] The second locking part 277 may be formed in the same shape as the first locking part 272. However, a length from the weight shaft 219 to the second locking part 277 may be formed to be different from a length between the first locking part 272 and the weight shaft 219. For example, the length from the weight shaft 219 to the second locking part 277 may be formed to be longer than the length between the first locking part 272 and the weight shaft 219.

[0080] An interval between the first coupling pin 11 and the second coupling pin 12 may be different according to types of the attachment 10. When the interval between the first coupling pin 11 and the second coupling pin 12 is small as illustrated in FIG. 21, because a distance in which the mobile hook 230 rotates counterclockwise is small, the mobile hook protrusion 231 enters only the first locking part 272 and remains deviated from the second locking part 277. Consequently, the mobile hook protrusion 231 is locked by the first locking part 272, and detachment of the second coupling pin 12 from the mobile hook 230 can be prevented.

[0081] When the interval between the first coupling pin 11 and the second coupling pin 12 is large as illustrated

in FIG. 22, because the distance in which the mobile hook 230 rotates counterclockwise is large, the mobile hook protrusion 231 enters both the first locking part 272 and the second locking part 277. In this state, even when the hydraulic cylinder 140 is damaged in a process in which work such as excavation is performed, the mobile hook protrusion 231 is locked by the second locking part 277, and the detachment of the second coupling pin 12 from the mobile hook 230 can be prevented.

[0082] The locking mechanism may include weight springs 273. The weight springs 273 elastically bias the first weight 271 and the second weight 276 toward the mobile hook protrusion 231. Consequently, when the mobile hook 230 rotates counterclockwise to be fitted to the second coupling pin 12, the first weight 271 and the second weight 276 quickly rotate clockwise, and the mobile hook protrusion 231 may be fitted to the first locking part 272 and the second locking part 277. The weight springs 273 may be formed as compression coil springs and respectively installed between the cover 110a and the first and second weights 271 and 276.

[0083] When the quick coupler is located at an angle for releasing the attachment 10 as illustrated in FIG. 23, forces due to the weight springs 273 may be set to be smaller than forces due to loads of the first weight 271 and the second weight 276 so that the first weight 271 and the second weight 276 deviate from the mobile hook protrusion 231. Consequently, when the height of the fixed hook 120 is larger than the height of the mobile hook 230, the first weight 271 may be located so as not to lock the mobile hook protrusion 231. Here, the second weight 276 may also be located so as not to lock the mobile hook protrusion 231.

[0084] Also, when the quick coupler is located to mount or release the second coupling pin 12 of the attachment 10, because the stopper weight 264 rotates to a position at which it is easy for the weight hook 264a to be detached from the cylinder hook 141c, the weight hook 264a may be separated from the cylinder hook 141c during the contraction operation of the hydraulic cylinder.

[0085] When performing the contraction operation, the hydraulic cylinder 140 may be configured to perform the contraction operation after a delay of a predetermined amount of time, e.g., about 3 seconds, from a time point at which the rotary key protrusion 151 is withdrawn from the coupling groove of the fixed hook 120. When the hydraulic cylinder 140 is delayed for about 3 seconds while the rotary key protrusion 151 is lifted due to the contraction operation of the hydraulic cylinder 140, time at which the rotary key protrusion 151 moves downward may be delayed. Consequently, a phenomenon in which the rotary key protrusion immediately moves downward and blocks the fixed hook 120 before the first coupling pin 11 is detached from the fixed hook 120 can be prevented.

[0086] The hydraulic cylinder 140 will be described with reference to FIGS. 24 to 27. Here, FIG. 24 is a cross-sectional view illustrating an inside of a hydraulic cylinder. FIG. 25 is a view illustrating a piston head in FIG. 24.

FIG. 26 is a view illustrating a region A in FIG. 24. FIG. 27 is a view illustrating a contraction operation of the hydraulic cylinder in FIG. 26.

[0087] The cylinder body 141 is divided into a rod space x at a portion of the cylinder rod 142 and a shaft portion space y at a portion of the cylinder shaft portion by a piston head 143. A moving direction of the piston head 143 is determined according to which of the rod space x and the shaft portion space y an oil is supplied. Partitions 143a, 143b, 143c, and 143d may be formed in the piston head 143. A piston seal (not illustrated) may be mounted in a seal space 143e between the partitions 143a and 143b and a seal space 143f between the partitions 143c and 143d.

[0088] A plug 144 is accommodated in an inner space of the piston head 143. A plug spring 145 is mounted in an inner space of the plug 144. A washer 146 is mounted at an opening of the plug 144 and prevents the plug spring 145 from being detached from the plug 144.

[0089] A protrusion is formed at a lower end of the plug 144. The protrusion allows an oil discharge central hole 147a to be blocked as the plug 144 moves. A plug through-hole 144a smaller than the oil discharge central hole 147a is disposed at the center of the protrusion. The plug 144 serves to adjust a flow rate by blocking or opening the oil discharge central hole 147a while moving in the inner space of the piston head 143 according to a direction of the oil and the position of the piston head 143 to allow an operation speed of the hydraulic cylinder 140 to change.

[0090] That is, an oil discharge passage 147b which is radially formed is included from the oil discharge central hole 147a to an oil space 143g between the partition 143b and the partition 143c. The oil space 143g and the oil discharge central hole 147a communicate via the oil discharge passage 147b, and the oil discharge central hole 147a communicates with the inner space of the piston head 143. The plug 144 serves to open or close a portion between the oil discharge central hole 147a and the inner space of the piston head 143 while reciprocating in a space between the oil discharge central hole 147a and a head opening 143h.

[0091] Due to this structure, the oil moves from the head opening 143h to the oil discharge central hole 147a via the inside of the plug 144 and the plug through-hole 144a and then flows back to the oil space 143g via the oil discharge passage 147b. Conversely, the oil flows from the oil space 143g to the oil discharge central hole 147a via the oil discharge passage 147b. Here, due to a pressure of the oil, the plug 144 is pushed toward the head opening 143h. Accordingly, a portion of the oil flows to the head opening 143h via the plug through-hole 144a, and most of the oil flows along a sidewall of the plug 144 and then flows to the head opening 143h via a side hole 144b of the plug 144.

[0092] As illustrated in FIGS. 26 and 27, when oil is injected via a rod pipe 148a for the contraction operation of the hydraulic cylinder 140, the oil is supplied to the rod

space x, and the cylinder rod 142 moves into the cylinder body 141. Here, the oil that was in the shaft portion space y exits via a shaft portion pipe 148b.

[0093] Until the partition 143d of the piston head 143 reaches an inlet of the shaft portion pipe 148b, because a discharge flow rate of the oil is constant, the speed of the hydraulic cylinder 140 is not changed. However, when the partition 143d passes the position of the shaft portion pipe 148b, the piston seal in the seal space 143f blocks the shaft portion pipe 148b. Consequently, the oil in the shaft portion space y is unable to exit the shaft portion pipe 148b.

[0094] The oil in the shaft portion space y exists via the head opening 143h, the inside of the plug 144, and the plug through-hole 144a, flows from the oil discharge central hole 147a to the oil discharge passage 147b, and then finally flows to the shaft portion pipe 148b. Here, because an amount of the oil flowing to the shaft portion pipe 148b is very small, a speed of the cylinder rod 142 moving into the cylinder body 141 is considerably decreased. Consequently, the contraction operation of the hydraulic cylinder 140 may be delayed for about 3 seconds.

[0095] Although the present disclosure has been described with reference to the embodiments illustrated in the accompanying drawings, the embodiments are merely illustrative, and one of ordinary skill in the art should understand that various modifications and other equivalent embodiments are possible from the above embodiments. Consequently, the actual scope of the present disclosure should be defined only by the claims below.

Claims

1. A quick coupler located at a front end of an arm of a boom pole disposed in heavy equipment to attach or detach an attachment, the quick coupler comprising:

- a coupler body connected to the front end of the arm of the heavy equipment;
- a fixed hook formed in the coupler body and to which a first coupling pin of the attachment is fitted;
- a mobile hook rotatably coupled to the coupler body and to which a second coupling pin of the attachment is fitted;
- a hydraulic cylinder having a slot formed in any one of a cylinder rod and a cylinder body and fitted to a cylinder shaft of the coupler body and the other one rotatably coupled to the mobile hook, including a cylinder hook formed near the slot, and configured to rotate the mobile hook to be coupled to or released from the second coupling pin according to an extension or contraction operation;
- a rotary key rotatably coupled to the coupler

- body, including a rotary key protrusion that is inserted into or withdrawn from a coupling groove of the fixed hook according to a rotary position, wherein the rotary key protrusion is maintained in a state of being inserted into the coupling groove of the fixed hook by an elastic force of a rotary key spring and prevents detachment of the first coupling pin from the coupling groove of the fixed hook; and a stopper including a stopper hook coupled to or separated from the cylinder hook, supported by an elastic force of a stopper spring, and configured to rotate the rotary key so that the rotary key protrusion is withdrawn from the coupling groove of the fixed hook during a contraction operation of the hydraulic cylinder in a state in which the stopper hook is coupled to the cylinder hook.
2. The quick coupler of claim 1, wherein:
- the stopper is rotatably coupled to the rotary key; and
the stopper spring is elastically deformed by the rotary key when the stopper hook is separated from the cylinder hook to apply an elastic force to the stopper.
3. The quick coupler of claim 2, further comprising a stopper weight configured to lock the hydraulic cylinder when the coupler body is located at positions other than that at an angle for mounting or releasing the attachment, wherein the stopper weight has a weight hook having one end rotatably coupled to the attachment and the other end coupled to or released from the cylinder hook.
4. The quick coupler of claim 1, further comprising an intermediate body having a central portion rotatably coupled to the coupler body while one side portion is rotatably coupled to the stopper, wherein, as the one side portion is pulled by the stopper, the other side portion pulls the rotary key and withdraws the rotary key protrusion from the coupling groove of the fixed hook.
5. The quick coupler of claim 1, wherein the rotary key is rotatably coupled to the cylinder shaft.
6. A quick coupler located at a front end of an arm of a boom pole disposed in heavy equipment to attach or detach an attachment, the quick coupler comprising:
- a coupler body connected to the front end of the arm of the heavy equipment;
a fixed hook formed in the coupler body and to which a first coupling pin of the attachment is fitted;
a mobile hook rotatably coupled to the coupler body and to which a second coupling pin of the attachment is fitted;
a hydraulic cylinder configured to rotate the mobile hook to be coupled to or released from the second coupling pin according to an extension or contraction operation; and
a locking mechanism configured to lock the mobile hook to prevent the second coupling pin from being detached from the mobile hook while the mobile hook is coupled to the second coupling pin when the coupler body is located at positions other than that at an angle for mounting or releasing the attachment.
7. The quick coupler of claim 6, wherein:
- the mobile hook is coupled by a mobile hook hinge shaft of the coupler body to rotate in a direction approaching the fixed hook during the extension operation of the hydraulic cylinder; and
the locking mechanism includes:
a gab rotatably coupled to the coupler body to limit a movement range of the mobile hook hinge shaft while the mobile hook is coupled to the second coupling pin; and
a weight rotatably coupled to the coupler body to apply a load to the gab while the gab is locking the mobile hook hinge shaft.
8. The quick coupler of claim 6, wherein:
- the mobile hook is coupled to the coupler body to rotate in a direction away from the fixed hook during the extension operation of the hydraulic cylinder and has a coupling groove, to which the second coupling pin is fitted, formed at one end and a mobile hook protrusion, protruding in the direction away from the fixed hook, formed at the other end;
the locking mechanism includes a first weight; and
one end of the first weight is rotatably coupled to a weight shaft of the coupler body, and the other end of the first weight includes a first locking part configured to interact with the mobile hook protrusion and limit a movement range of the mobile hook protrusion while the mobile hook is coupled to the second coupling pin.
9. The quick coupler of claim 8, wherein:
- the locking mechanism further includes a second weight;

one end of the second weight is rotatably coupled to the weight shaft, and the other end of the second weight includes a second locking part configured to interact with the mobile hook protrusion and limit the movement range of the mobile hook protrusion while the mobile hook is coupled to the second coupling pin; and a length from the weight shaft to the second locking part is different from a length between the first locking part and the weight shaft.

5
10

10. The quick coupler of claim 9, wherein the locking mechanism further includes weight springs configured to elastically bias the first weight and the second weight toward the mobile hook.

15

11. The quick coupler of claim 1, wherein, when performing the contraction operation, the hydraulic cylinder performs the contraction operation after a delay of a predetermined amount of time from a time point at which the rotary key protrusion is withdrawn from the coupling groove of the fixed hook.

20

12. The quick coupler of claim 6, wherein, when performing the contraction operation, the hydraulic cylinder performs the contraction operation after a delay of a predetermined amount of time from a time point at which the rotary key protrusion is withdrawn from the coupling groove of the fixed hook.

25

30

35

40

45

50

55

FIG. 1

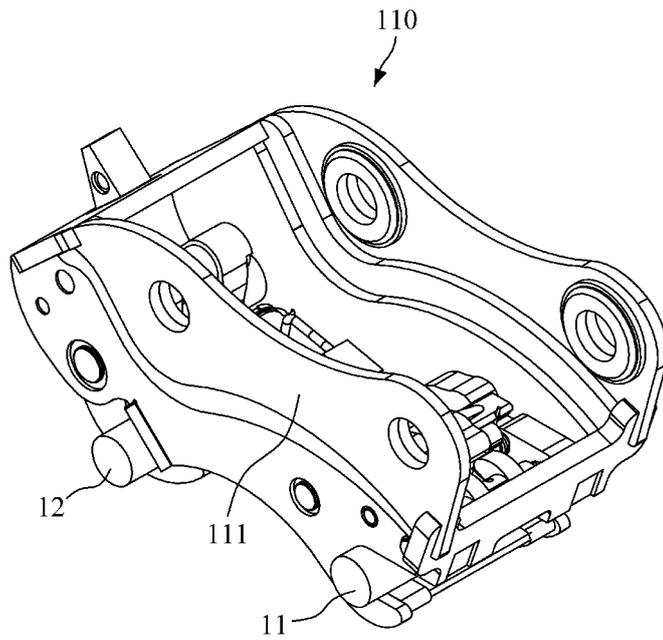


FIG. 2

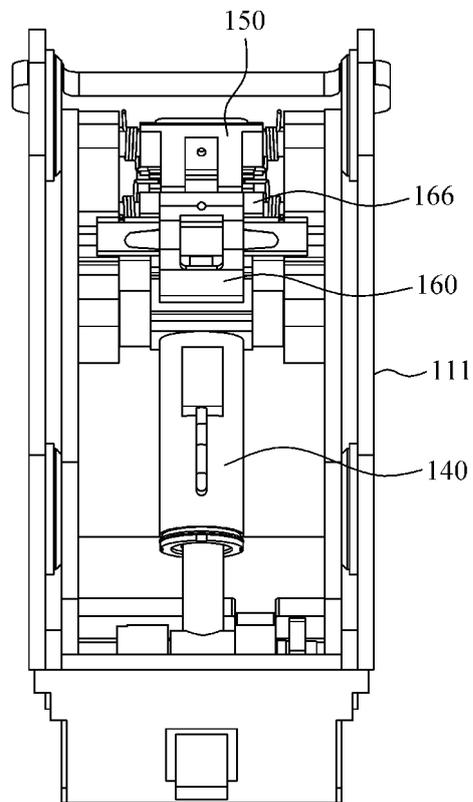


FIG. 3

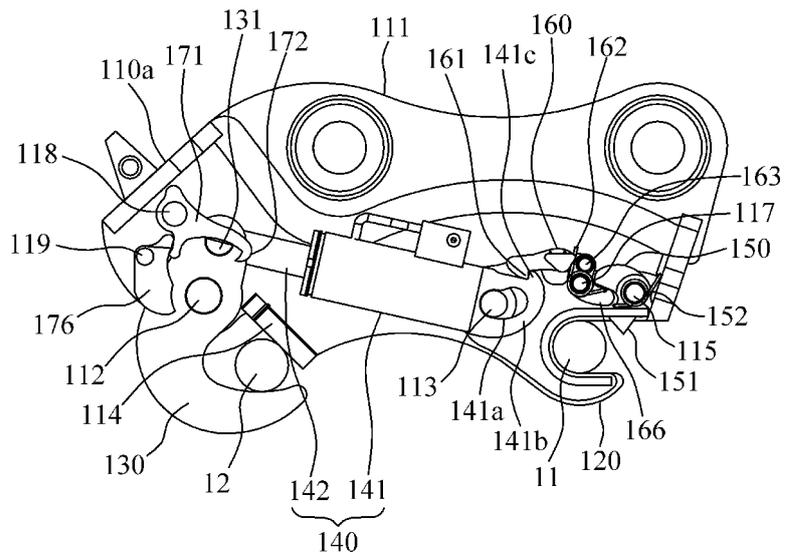


FIG. 4

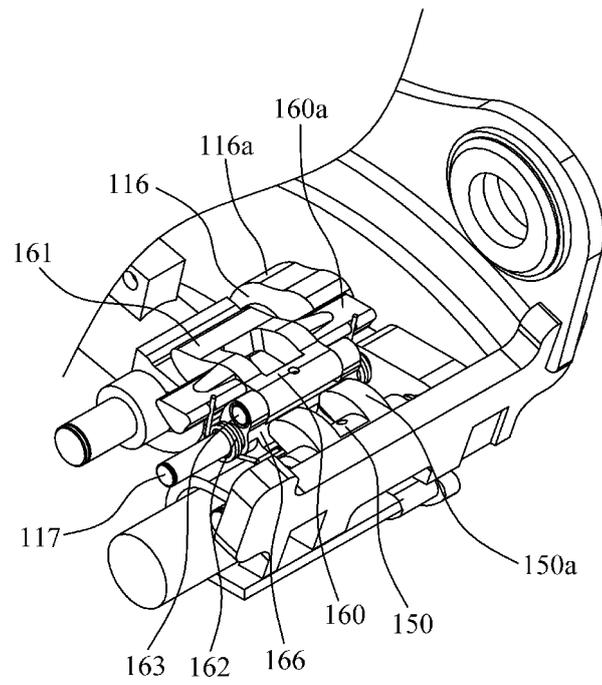


FIG. 5

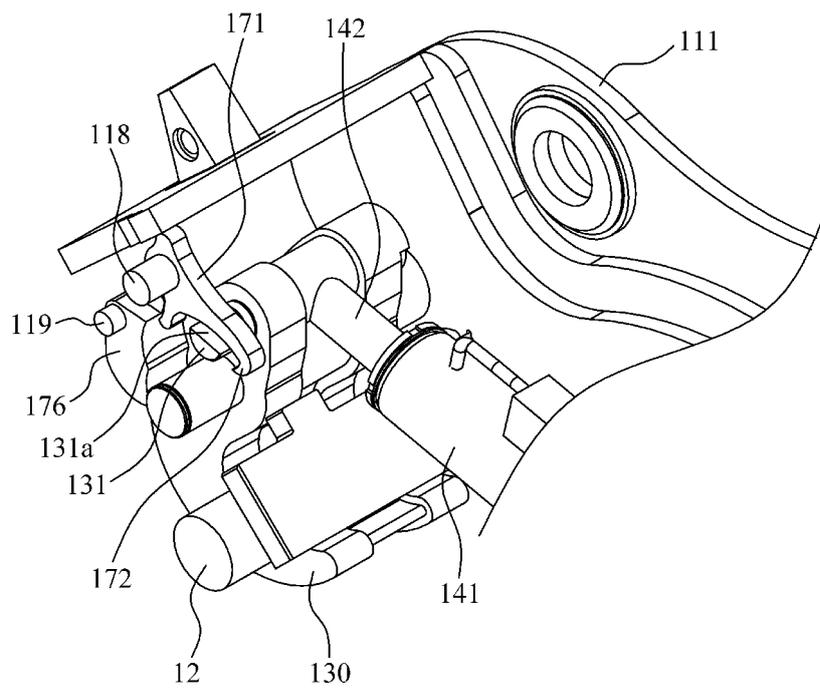


FIG. 6

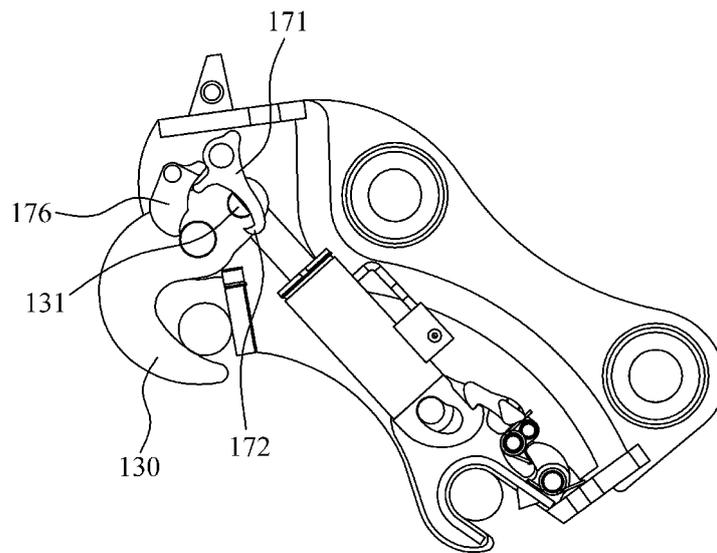


FIG. 7

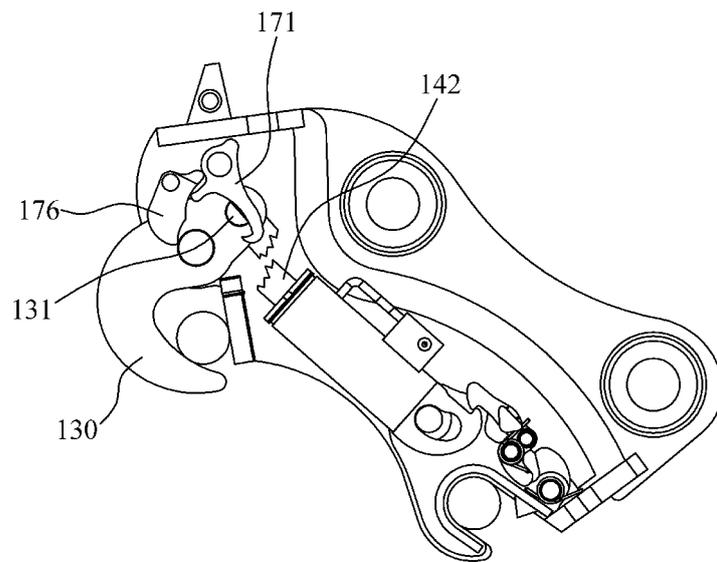


FIG. 8

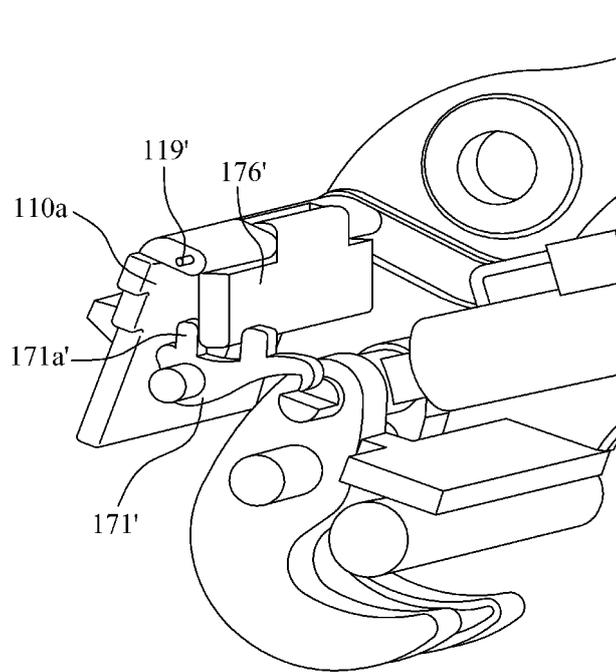


FIG. 9

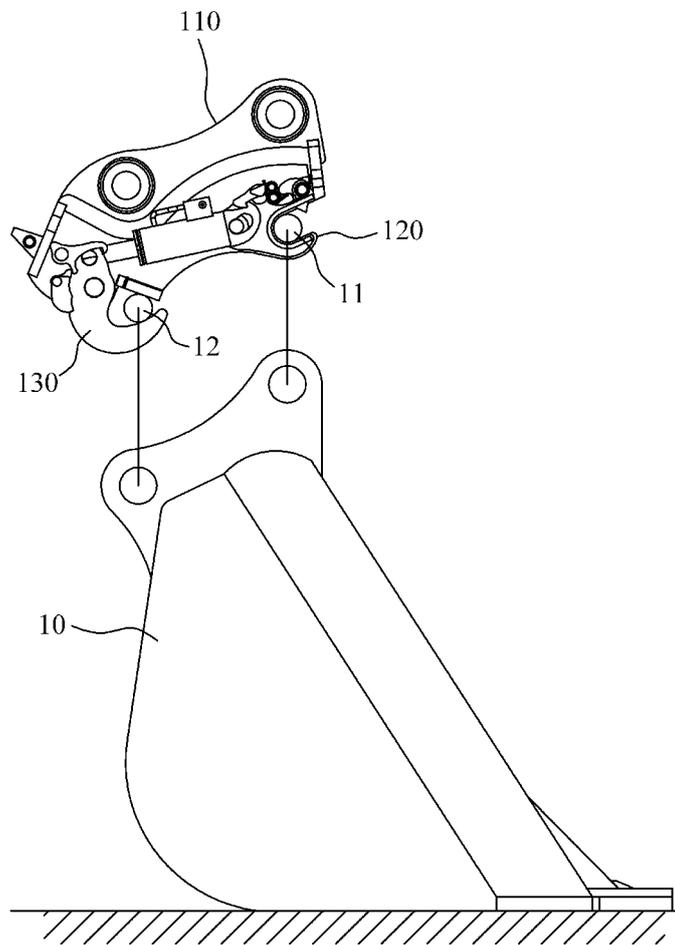


FIG. 10

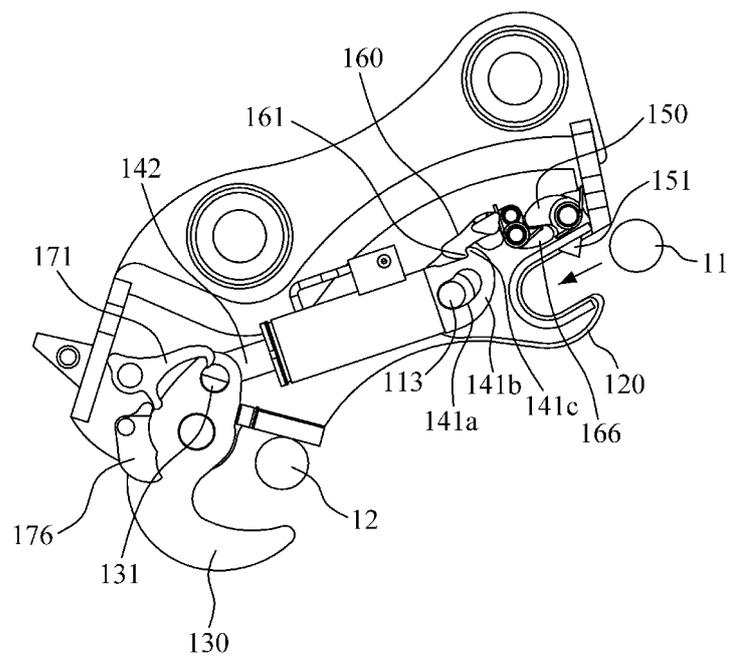


FIG. 11

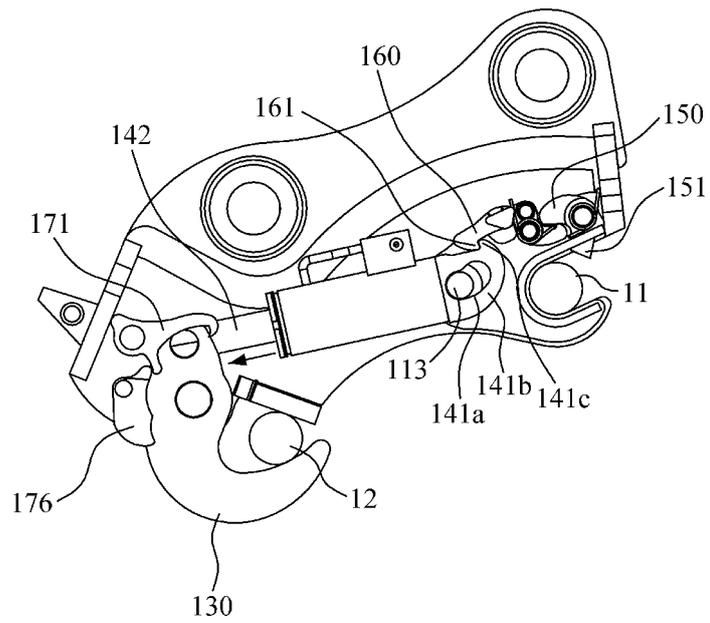


FIG. 12

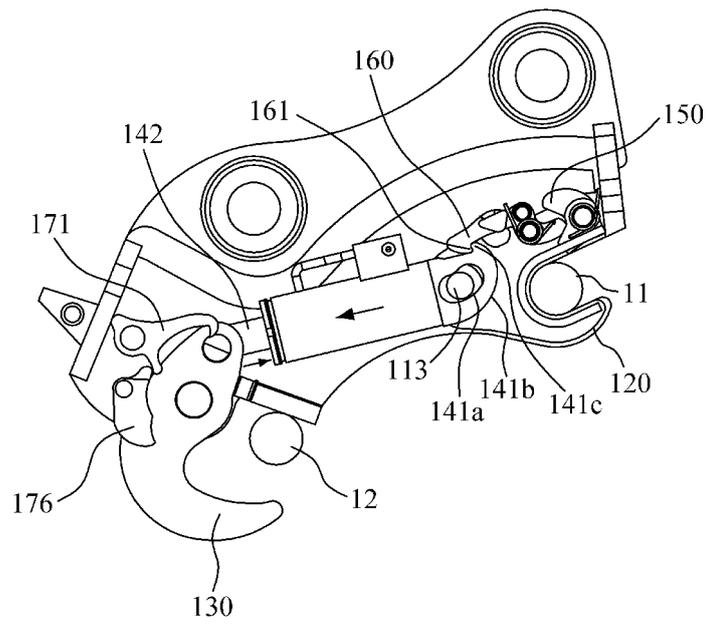


FIG. 13

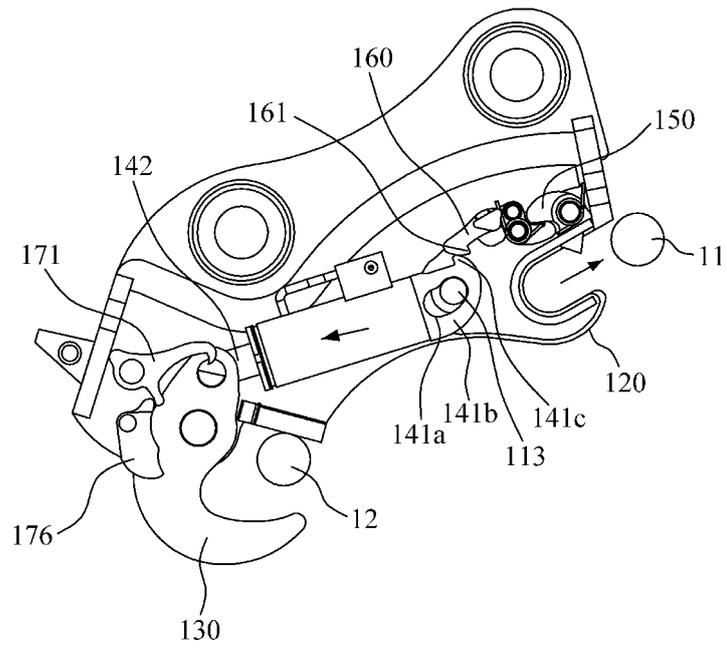


FIG. 14

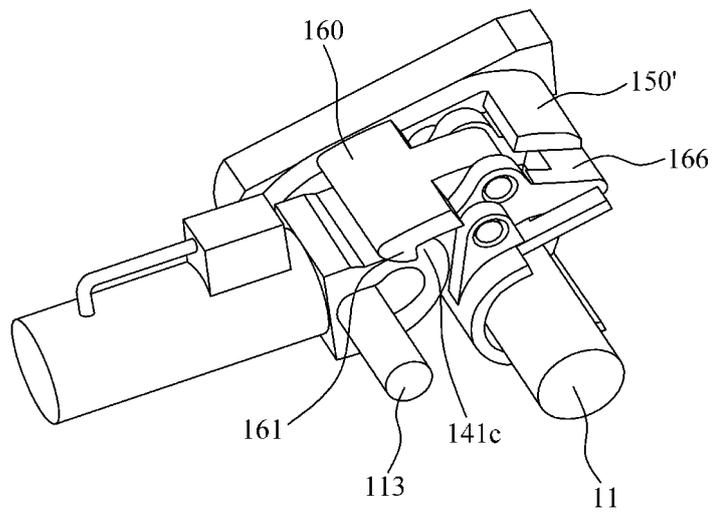


FIG. 15

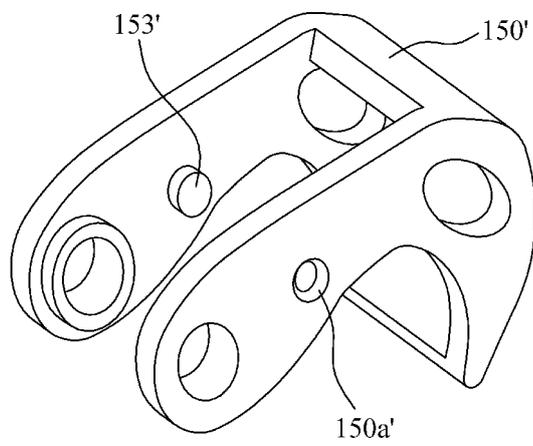


FIG. 16

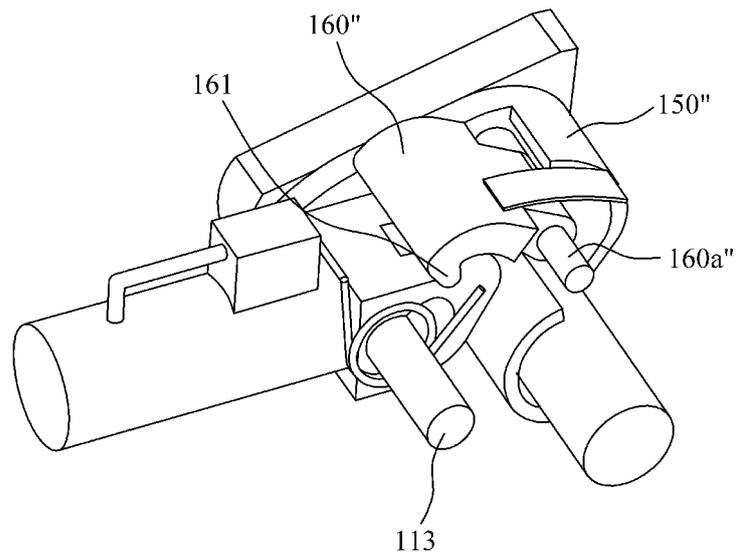


FIG. 17

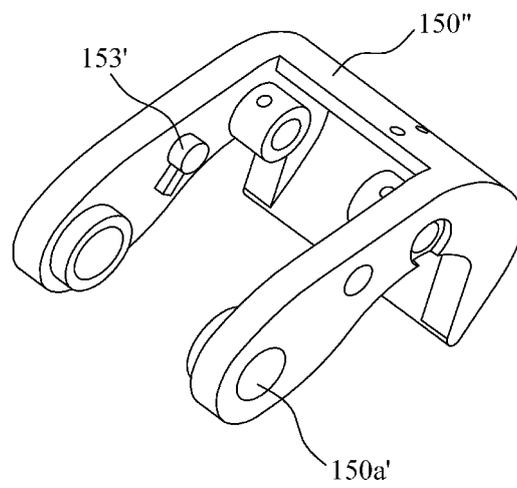


FIG. 18

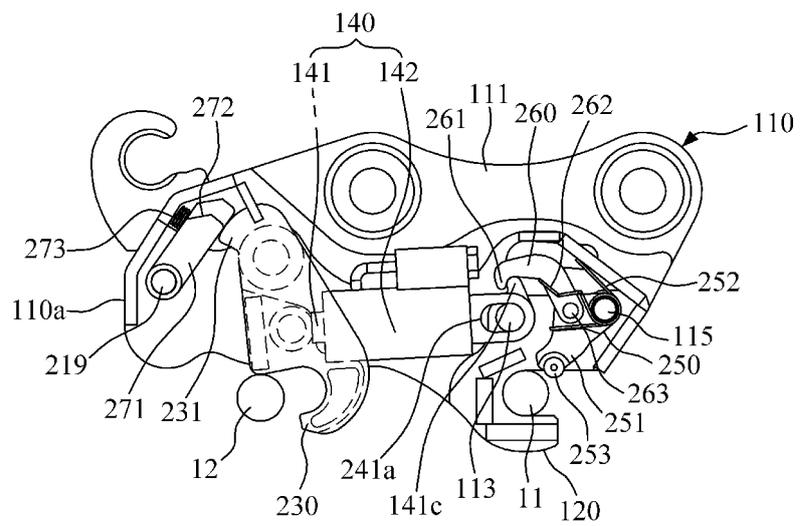


FIG. 19

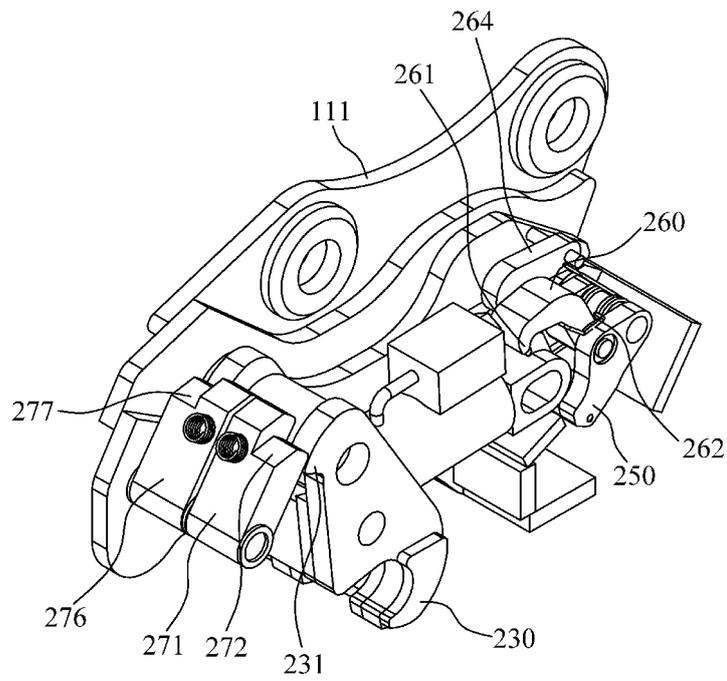


FIG. 20

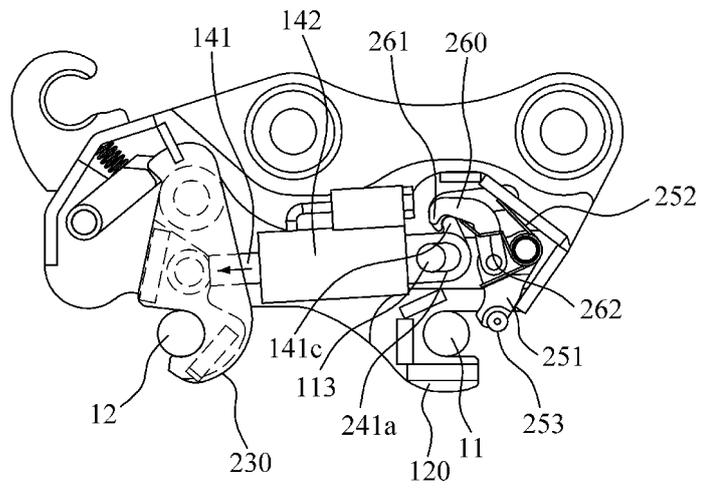


FIG. 21

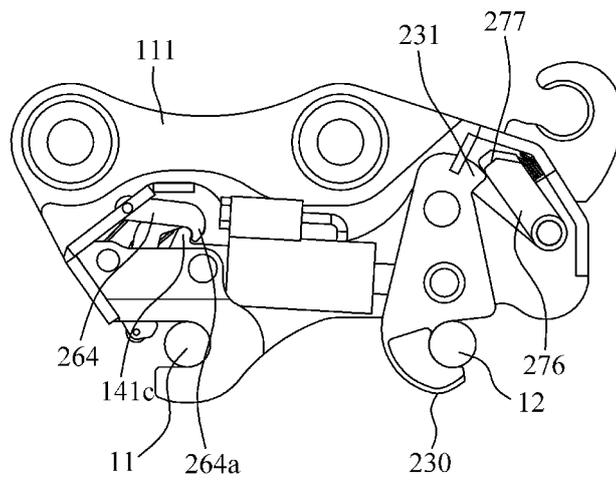


FIG. 22

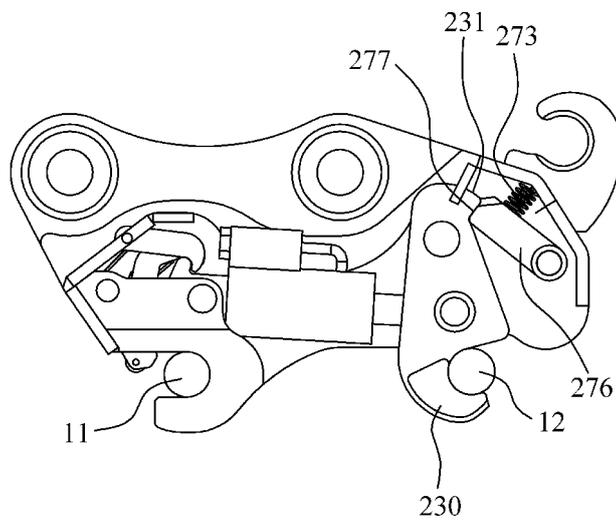


FIG. 23

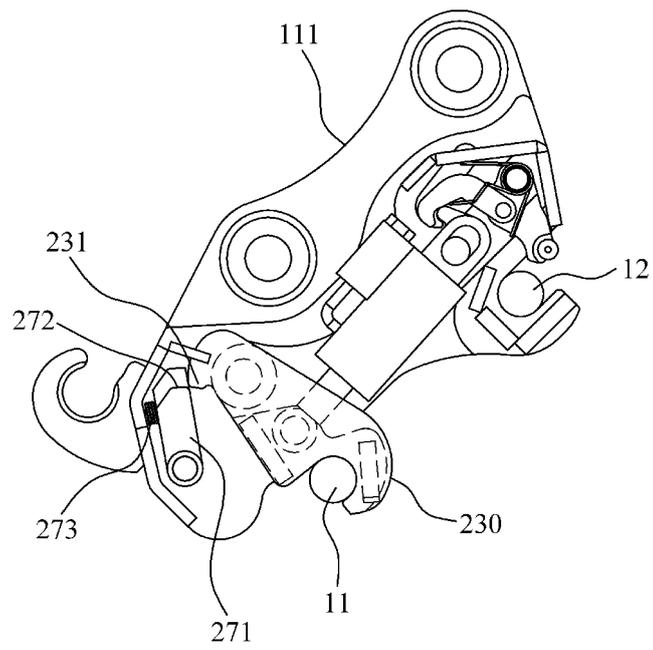


FIG. 24

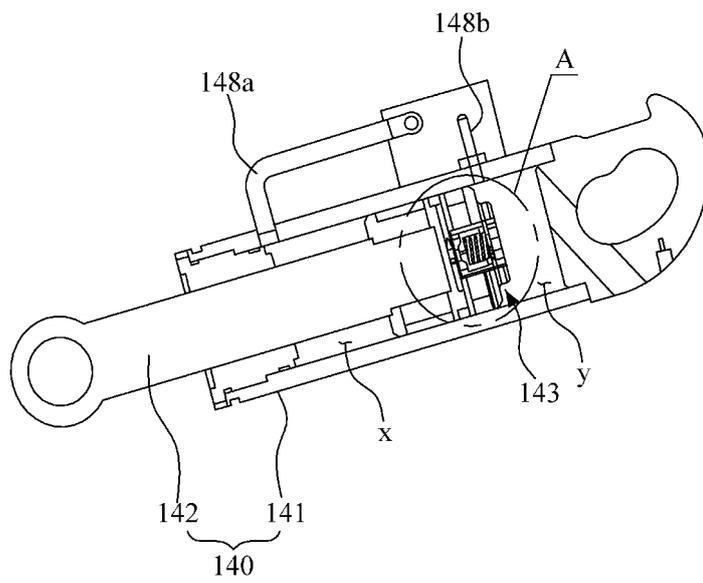


FIG. 25

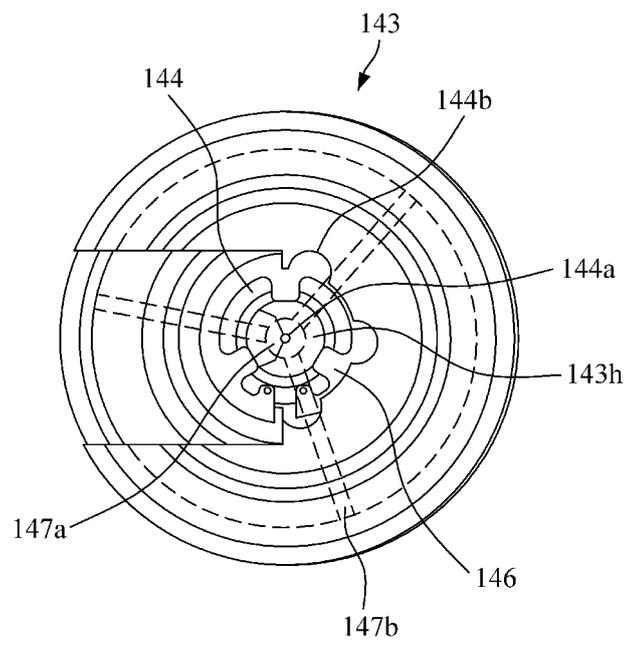


FIG. 26

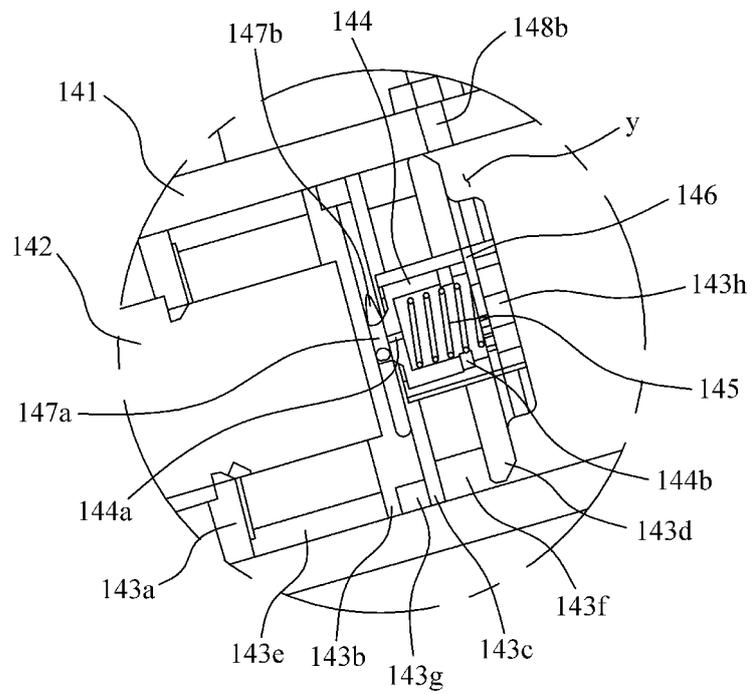
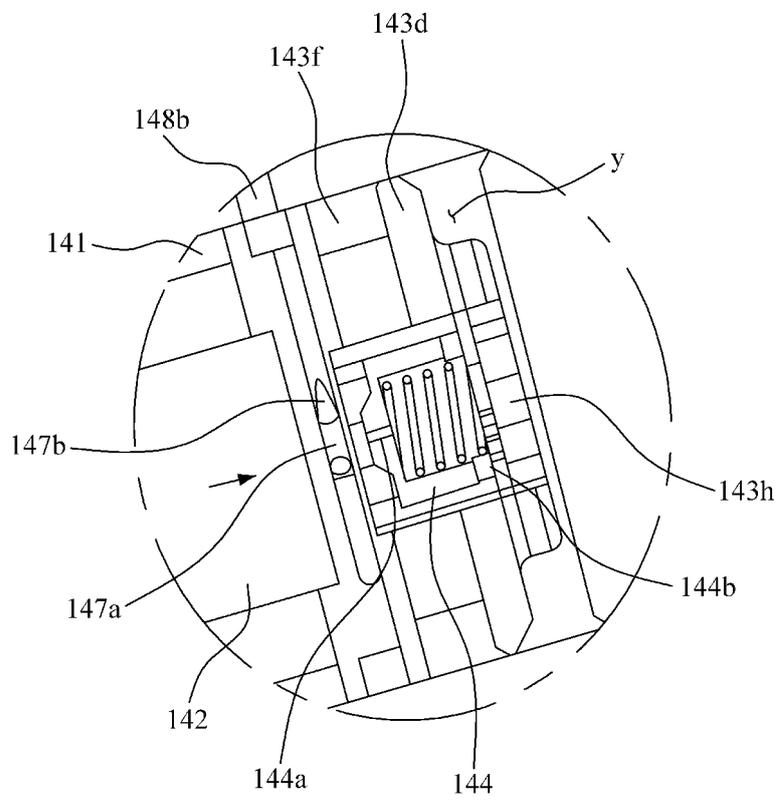


FIG. 27



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2016/000553

5	A. CLASSIFICATION OF SUBJECT MATTER <i>E02F 3/36(2006.01)i, E02F 3/96(2006.01)i</i> 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) E02F 3/36; E02F 3/40; E02F 3/96	
	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Korean Utility models and applications for Utility models: IPC as above Japanese Utility models and applications for Utility models: IPC as above	
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) eKOMPASS (KIPO internal) & Keywords: attachment, heavy equipment, fixing hook, drive hook, hydraulic cylinder, rotation key, stopper	
	C. DOCUMENTS CONSIDERED TO BE RELEVANT	
20	Category*	Citation of document, with indication, where appropriate, of the relevant passages
		Relevant to claim No.
	Y	KR 10-1021926 B1 (EVERDIGM CO., LTD.) 17 March 2011 See paragraphs [0003], [0026]-[0028], [0030]-[0032], [0034]-[0036] and figures 1, 3-6.
	A	1-2,4-6,11-12 3,7-10
25	Y	JP 2008-174920 A (MUROTO TEKKOSHO K.K.) 31 July 2008 See paragraph [0010] and figure 1.
		1,2,4,5,11
	Y	KR 10-2008-0069470 A (EVERDIGM CO., LTD.) 28 July 2008 See paragraph [0059] and figure 8.
		6,12
30	A	KR 10-2014-0046361 A (IM, Yong Tae) 18 April 2014 See paragraphs [0071]-[0079] and figures 16-20.
		1-12
	A	KR 20-0355987 Y1 (SOOSAN HEAVY INDUSTRIES CO., LTD.) 12 July 2004 See abstract, claim 1 and figure 3.
		1-12
35	<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> 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 application or patent 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	
40	Date of the actual completion of the international search	Date of mailing of the international search report
	03 MAY 2016 (03.05.2016)	04 MAY 2016 (04.05.2016)
45	Name and mailing address of the ISA/KR  Korean Intellectual Property Office Government Complex-Daejeon, 159 Seonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer Telephone No.
50		
55		

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2016/000553

5
10
15
20
25
30
35
40
45
50
55

Patent document cited in search report	Publication date	Patent family member	Publication date
KR 10-1021926 B1	17/03/2011	KR 10-2010-0053065 A	20/05/2010
JP 2008-174920 A	31/07/2008	JP 05237561 B2 US 2008-0170933 A1 US 7473067 B2	17/07/2013 17/07/2008 06/01/2009
KR 10-2008-0069470 A	28/07/2008	KR 10-0927044 B1	17/11/2009
KR 10-2014-0046361 A	18/04/2014	KR 10-1499298 B1	18/03/2015
KR 20-0355987 Y1	12/07/2004	NONE	

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- KR 20211608 [0004]