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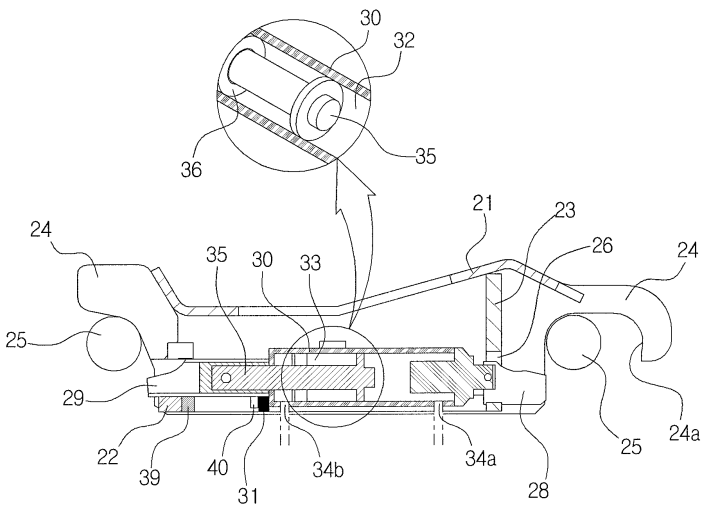
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# (54) QUICK COUPLER FOR CONSTRUCTION MACHINE

(57) A quick coupler for a construction machine according to the present invention comprises: a main body provided with hook parts respectively protruding from a left side wall and a right side wall in order to support a coupling-clamp pin; a hydraulic cylinder including a large chamber and a small chamber, a wedge fixing member fixed to the inlet of the large chamber and a rod for performing an extension operation and a retraction operation by oil pressure and moving in the opposite direction from the wedge fixing member during the extension operation; a first wedge fixed to the outside end portion of the wedge fixing member and coupled to or released from the coupling-clamp pin by the movement of the hydraulic cylinder; a second wedge provided with a guide protruding from a body part and fixed to the outside end portion of the rod so as to be coupled to or released from the coupling-clamp pin by moving in the opposite direction from the first wedge; and a stopper provided between the hydraulic cylinder and the second wedge and setting a coupling-releasing position in the main body so as to restrain the movement of the hydraulic cylinder and the second wedge.

【FIG. 2】




EP 3 040 482 A1

## Description

### TECHNICAL FIELD

**[0001]** The present invention relates to a quick coupler for a construction machine. More particularly, the present invention relates to such a quick coupler for a construction machine in which first and second wedges, a hydraulic cylinder, and a rod are moved within a preset range for the replacement or the installation and removal of an attachment such as a bucket or a breaker so that the coupling and decoupling operation between the wedges and fastening pins can be performed in a secure and safe manner.

### BACKGROUND OF THE INVENTION

**[0002]** In general, a construction machine such as an excavator is utilized to load and transport or crush earth and sand or wood on a construction site. For example, in the case where a bucket as a work apparatus or an attachment of the excavator is assembles, the construction machine is advantageous to the digging or the loading and transport. In the case where the bucket is replaced with a breaker or a crusher assembled to the construction machine as an option apparatus, the construction machine is suitable for crush the ground surface of a road or rocks and concrete.

**[0003]** As such, the construction machine is configured to replace or assemble an arm or a bucket of the construction machine with attachments including various work apparatuses and option apparatuses so as to fit the use of a work required using a quick coupler. The research and development on the quick coupler is in progress.

**[0004]** As one of the prior arts related to the above-mentioned quick coupler, a quick coupler for a heavy construction machine is disclosed in Korean Patent Laid-Open Publication No. 2012-0071839 (laid-opened on July 3, 2012). Fig. 1 is a schematic view showing a quick coupler for a heavy construction machine in accordance with the prior art.

**[0005]** Referring to Fig. 1, in the conventional quick coupler used to mount an attachment such as a bucket to the heavy construction machine, a cylinder 3 for driving wedges 1 and 2 fastened to the attachment 4 is installed in the quick coupler 10, and the wedges 1 and 2 are installed at both sides of the cylinder 3, respectively. The wedges 1 and 2 are moved by the drive of the cylinder 3 so as to be fastened to the attachment 4. The quick coupler 10 is typically mounted at a front end portion of an arm, and the wedges 1 and 2 are moved by the articular motion of link members (not shown) connected to the cylinder 3 for the coupling and fixing of the wedges to a pair of opposed fastening pins 5.

**[0006]** However, the conventional quick coupler entails a problem in that it includes a plurality of link members, leading to complexity of a structure thereof.

**[0007]** Besides, the above-mentioned link type quick coupler, a single lock type quick coupler in which one sides of the wedges are fixed is also used on a construction site. However, such a single lock type quick coupler encounters a problem in that one of two wedges is moved and coupled to one of the fastening pins in a state in which the other of two wedges is fixed to a main body of the quick coupler, and thus the coupling between the wedges and the fastening pins is performed incompletely. In addition, the single lock type quick coupler has a disadvantage in that when any one of the wedges is decoupled from the fastening pin or the coupling between the wedges and the fastening pins is performed incompletely, a safety accident may occur.

### SUMMARY OF THE INVENTION

**[0008]** Accordingly, the present invention has been made to solve the aforementioned problems occurring in the prior art, and it is an object of the present invention to provide a quick coupler for a construction machine in which the movement of first and second wedges and the movement of a hydraulic cylinder and a rod are effectively performed within a preset range for the replacement or the installation and removal of an attachment such as a bucket or a breaker so that the coupling and decoupling operation between the wedges and fastening pins can be performed in a secure and safe manner.

**[0009]** Another object of the present invention is to provide a quick coupler for a construction machine in which the quick coupler is structurally assembled in a simple manner so that it can be installed and removed in a rapid and easy manner although various attachments are replaced depending on a specification of the machine on a construction site.

### TECHNICAL SOLUTION

**[0010]** To achieve the above object, in accordance with an embodiment of the present invention, there is provided a quick coupler for a construction machine, including:

a main body having a pair of opposed hook parts formed protrudingly outwardly from a left side wall and a right side wall thereof, respectively, to support a pair of opposed coupling fastening pins;

a hydraulic cylinder including a large chamber, a small chamber, a wedge fixture fixed to an inlet of the large chamber, and a rod driven to be extended or retracted by hydraulic pressure and moved in a direction opposite to the wedge fixture when the rod is driven to be extended;

a first wedge fixed to an outer end portion of the wedge fixture and coupled to or decoupled from one of the coupling fastening pins through the movement of the hydraulic cylinder;

a second wedge including a guide formed protrudingly downwardly from the main body, the second wedge being fixed to an outer end portion of the rod and moved in a direction opposite to the first wedge when the rod is extended or retracted so that the second wedge is coupled to or decoupled from the other of the coupling fastening pins; and

a stopper installed between the hydraulic cylinder and the second wedge and configured to restrict the movement of the hydraulic cylinder which is moved to allow the second wedge to be decoupled from the fastening pin and the movement of the second wedge.

**[0011]** The quick coupler for a construction machine in accordance with the present invention may further includes an elastic member installed inside the large chamber of the hydraulic cylinder, the elastic member being configured to elastically support a rear end portion of the wedge fixture at one side thereof and a front end portion of the rod at the other side thereof.

**[0012]** Also, the quick coupler for a construction machine in accordance with the present invention may further include a rod stopper configured to restrict a maximum extending range of the rod in the hydraulic cylinder so that the coupling state between the first wedge, the second wedge and the coupling fastening pins is securely maintained.

**[0013]** In addition, the quick coupler for a construction machine in accordance with the present invention may further include a support block configured to restrict a maximum projecting range of the second wedge in a state where the left side wall of the main body is bought into close contact with the guide of the second wedge so that the coupling state between the second wedge and the other of the coupling fastening pins is securely maintained.

**[0014]** In the quick coupler for a construction machine in accordance with a preferred embodiment of the present invention, the main body of the quick coupler may be fixedly installed on a base end portion of an arm so that various attachments required depending on a construction site or a **work object** can be easily replaced.

## ADVANTAGEOUS EFFECT

**[0015]** The quick coupler for a construction machine in accordance with the present invention as constructed above has the following advantages.

**[0016]** The movement of the hydraulic cylinder and the wedges is restricted by the stopper in an initial wedge decoupling position for the removal of the attachment, and the movement of the wedges and the movement of the hydraulic cylinder and the rod are restricted by the guide and the rod stopper in a wedge coupling position for the installation of the attachment so that the removal and installation operation of the attachment is effectively performed.

**[0017]** In addition, the quick coupler for a construction machine in accordance with the present invention has an advantage in that the coupling and decoupling operation between the wedges and the coupling fastening pins can be performed in a secure and safe manner within a preset range during the installation or removal of the attachment.

**[0018]** Further, the quick coupler for a construction machine in accordance with the present invention has another advantage in that it is driven by the hydraulic pressure and the mechanical coupling between the stopper and the guide so that the replacement operation of the attachment can be easily performed in a construction site.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0019]** The above objects, other features and advantages of the present invention will become more apparent by describing the preferred embodiments thereof with reference to the accompanying drawings, in which:

Fig. 1 is a schematic view showing a quick coupler for a heavy construction machine in accordance with the prior art; and

Fig. 2 is a schematic cross-sectional view showing a quick coupler for a construction machine in accordance with one embodiment of the present invention;

Fig. 3 is a schematic cross-sectional view showing the coupling state of the wedges in a quick coupler as shown in Fig. 2; and

Fig. 4 is a schematic cross-sectional view showing a quick coupler for a construction machine in accordance with another embodiment of the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

**[0020]** Now, a quick coupler for a construction machine in accordance with preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings. The matters defined in the description, such as the detailed construction and elements, are nothing but specific details provided to assist those of ordinary skill in the art in a comprehensive understanding of the invention, and the present invention is not limited to the embodiments disclosed hereinafter.

**[0021]** In order to definitely describe the present invention, a portion having no relevant to the description will be omitted, and through the specification, like elements are designated by like reference numerals.

**[0022]** In the specification and the claims, when a portion includes an element, it is meant to include other elements, but not exclude the other elements unless otherwise specifically stated herein.

**[0023]** The terms or words used in the specification and the claims of the present invention should not be

construed as being typical or dictionary meanings, but should be construed as meanings and concepts conforming to the technical spirit of the present invention on the basis of the principle that an inventor can properly define the concepts of the terms in order to describe his or her invention in the best way.

**[0024]** Fig. 2 is a schematic cross-sectional view showing a quick coupler for a construction machine in accordance with one embodiment of the present invention, Fig. 3 is a schematic cross-sectional view showing the coupling state of the wedges in a quick coupler as shown in Fig. 2, and Fig. 4 is a schematic cross-sectional view showing a quick coupler for a construction machine in accordance with another embodiment of the present invention.

**[0025]** In the drawings, a reference numeral 21 denotes a main body of a quick coupler in accordance with the present invention, a reference numeral 28 denotes a first wedge, a reference numeral 29 denotes a second wedge, a reference numeral 30 denotes a hydraulic cylinder, a reference numeral 31 denotes a stopper, a reference numeral 32 denotes a large chamber, a reference numeral 33 denotes a small chamber, a reference numeral 35 denotes a rod, a reference numeral 36 denotes a rod stopper, a reference numeral 39 denotes a support block, and a reference numeral 40 denotes a guide.

**[0026]** The quick coupler for a construction machine in accordance with the present invention can easily perform the installation and removal operation of an attachment 4 for the replacement of the attachment 4 while the movement of the first wedge 28 and the second wedge 29 and the movement of the hydraulic cylinder 30 and the rod 35 in left and right directions are performed.

**[0027]** Referring to Figs. 2 and 3, the quick coupler for a construction machine in accordance with the present invention includes the main body 21 having hook parts 24 formed protrudingly outwardly from a left side wall 22 and a right side wall 23 thereof, respectively, to support a pair of opposed coupling fastening pins 25. The main body 21 and the hook parts 24 may have an external appearance of the same structure as that of typical known elements, and openings 26 for the withdrawal of the wedges may be formed on the main body 21 or the left side wall 22 and the right side wall 23.

**[0028]** In addition, the hook parts 24 may be formed as a pair of curved structures having the same shapes, which are protruded toward the left and right side of the main body, and contact faces 24a of the hook parts 24 may have a structure in which the contact faces surround the outer circumferences of the coupling fastening pins 25

**[0029]** Preferably, the quick coupler for a construction machine in accordance with the present invention includes a hydraulic cylinder 30, a first wedge 28, a second wedge 29, and a stopper that restricts the movement of the hydraulic cylinder 30 an the second wedge 29.

**[0030]** More specifically, the hydraulic cylinder 30 includes a large chamber 32, a small chamber 33, a wedge fixture 37 fixed to an inlet of the large chamber 32, and a rod 35 driven to be extended or retracted in the hydraulic cylinder 30 by hydraulic pressure.

**[0031]** The rod 35 is moved in a direction opposite to the wedge fixture 37 when the rod 35 is driven to be extended, and the hydraulic cylinder 30 includes through-holes 34a and 34b formed therein in such a manner as to fluidically communicate with the large chamber 32 and the small chamber 33 to perform the action of the hydraulic pressure. The hydraulic cylinder 30 can be supplied with hydraulic fluid from a hydraulic tank (not shown). In addition, it will be easily understood by a person of ordinary skill in the art that when the hydraulic pressure is supplied to the hydraulic cylinder 30 through the through-hole 34a of the large chamber 32, it can be returned to the hydraulic tank (not shown).

**[0032]** The first wedge 28 in accordance with the present invention is fixed to an outer end portion of the wedge fixture 37 and is coupled to or decoupled from one of the coupling fastening pins 25 through the movement of the hydraulic cylinder 30. The second wedge29 includes a guide 40 formed protrudingly downwardly from the main body 21 and is fixed to an outer end portion of the rod 35. The wedge fixture 37 and the first wedge 28 are fixedly fastened in a fastening manner by a pin 41 or a bolt fastening manner during the assembly thereof, and the rod and the second wedge 29 may also be fixedly fastened in a fastening manner by a pin 41 or a bolt fastening manner during the assembly thereof.

**[0033]** The second wedge 29 is moved in a direction opposite to the first wedge 28 when the rod 35 is extended or retracted so that the second wedge is coupled to or decoupled from the other of the coupling fastening pins 25. For example, the first wedge 28 and the second wedge 29 are moved in a direction far away from each other when the rod 35 is extended so that the first wedge 28 and the second wedge 29 can be coupled to the coupling fastening pins 25. On the other hand, the first wedge 28 and the second wedge 29 are moved in a direction close to each other when the rod 35 is retracted so that the first wedge 28 and the second wedge 29 can be decoupled from the coupling fastening pins 25.

**[0034]** The stopper 31 in accordance with the present invention is installed between the hydraulic cylinder 30 and the second wedge 29 and is configured to restrict the movement of the hydraulic cylinder 30 which is moved to allow the second wedge to be decoupled from the fastening pin 25 and the movement of the second wedge 29.

**[0035]** The stopper 31 may be configured as a rectangular block unit made of a steel material to support a force acting on the hydraulic cylinder 30 and the second wedge 29, and the force may act on the hydraulic cylinder 30 and the second wedge 29 simultaneously or separately from both sides of the stopper 31.

**[0036]** In accordance with this embodiment, the stopper 31 may be formed as a rectangular structure having a left side surface and a right side surface, which are protruded outwardly from a bottom of the main body 21,

and various geometric modifications of the stopper 31 are possible in consideration of a stress or an external force required for the first wedge 28 and the second wedge 29.

**[0037]** In accordance with another embodiment, as shown in Fig. 4, the quick coupler includes an elastic member 42 installed inside the large chamber 32 of the hydraulic cylinder 30. The elastic member elastically supports a rear end portion of the wedge fixture 37 at one side thereof and a front end portion of the rod 35 at the other side thereof.

**[0038]** The quick coupler for a construction machine in accordance with the present invention includes a rod stopper 36 installed in the hydraulic cylinder 30 so that a maximum extending range of the rod 35 is restricted by the rod stopper 36. When the rod 35 is extended to the outside of the hydraulic cylinder 30 in a maximum extending range, the coupling state between the first wedge 28/the second wedge 29 and the coupling fastening pins 25 is securely maintained by the hydraulic pressure formed in the hydraulic cylinder 30.

**[0039]** Meanwhile, in accordance with one embodiment of the present invention, the quick coupler may include a support block 39 configured to restrict a maximum projecting range of the second wedge 29 in a state where the left side wall 22 of the main body 21 is bought into close contact with the guide 40 of the second wedge 29. The support block 39 may be integrally formed with the left side wall 22 of the bottom surface of the main body 21.

**[0040]** In the quick coupler for a construction machine in accordance with a preferred embodiment of the present invention, the main body 21 of the quick coupler is fixedly installed on a base end portion of an arm. In this case, an operator may replace a bucket with various attachments including a breaker and the like.

## MODE FOR CARRYING OUT INVENTION

**[0041]** The embodiment and operating principle of the quick coupler for a construction machine in accordance with the present invention will be described hereinafter with reference to the accompanying drawing.

**[0042]** In the quick coupler for a construction machine in accordance with the present invention, the hydraulic cylinder 30 and the first and second wedges 28 and 29 are driven from an initial position for the decoupling of the wedges to a mounting position for the coupling of the wedges.

**[0043]** For example, as shown in Fig. 2, the hydraulic cylinder 30 and the first and second wedges 28 and 29 are positioned in an initial position for the decoupling of the wedges from the coupling fastening pins 25. In this case, as shown in Fig. 2, the hydraulic cylinder 30 connected to the first wedge 28 is positioned in proximity to the right side of the stopper 31, and the second wedge 29 connected to the hydraulic cylinder 30 through the rod 35 is positioned in proximity to the left side of the stopper 31.

**[0044]** Preferably, the guide 40 of the second wedge 29 connected to the hydraulic cylinder 30 through the rod 35 is installed in proximity to the left side of the stopper 31.

**[0045]** In this process, the hydraulic cylinder 30 maintains a balanced state or a stationary state where there is no movement of the rod to the left or right on the drawing sheet by means of the hydraulic pressure formed in the large chamber 32 and the small chamber 33 thereof.

**[0046]** Thus, the first wedge 28 and the second wedge 29 are maintained in a state of being decoupled from the coupling fastening pins 25, respectively.

**[0047]** On the contrary, the mounting state for the coupling of the wedges to the coupling fastening pins 25 is shown in Fig. 3. In other words, the hydraulic cylinder 30, the rod 35, the first wedge 28, and the second wedge 29, which are moved in the main body 21, are positioned in the mounting position for the coupling of the wedges to the coupling fastening pins 25.

**[0048]** For example, when the hydraulic fluid is injected into the large chamber 32 of the hydraulic cylinder 30 through the through-hole 34a and simultaneously the hydraulic fluid in the small chamber 33 is discharged to the outside through the through-hole 34a, the rod 35 is extended from the hydraulic cylinder 30 by the hydraulic pressure formed in the large chamber 32 and the first wedge 28 connected to the hydraulic cylinder 30 through the wedge fixture 37 is moved to the right on the drawing sheet by its reaction force.

**[0049]** In this case, the movement of the first wedge 28 is restricted by the contact support between the wedge fixture 37 and the right side wall 23 of the main body 21, and an inclined face of the first wedge 28 supports the outer circumference of one of the coupling fastening pins 25.

**[0050]** In addition, the second wedge 29 is moved to the maximum extending range of the rod 35. In this case, when the second wedge 29 is moved to a position where an inclined face of the second wedge 29 sufficiently supports the outer circumference of the other of the coupling fastening pins 25, the movement of the second wedge 29 is restricted by the contact support between the guide 40 and the left side wall 22 of the main body 21 or the support block 39.

**[0051]** In the meantime, in accordance with another embodiment of the present invention, as shown in Fig. 4, in the case where the elastic member 42 such as a spring is assembled in the large chamber, the hydraulic pressure and an elastic force are simultaneously exerted to the rod 35 in the mounting position of the wedges, and thus the mounting position of the wedges is maintained in a more secure and safe manner.

**[0052]** If the hydraulic pressure is supplied to the small chamber of the hydraulic cylinder for the replacement of the attachment 4 and simultaneously the hydraulic pressure is discharged from the large chamber of the hydraulic cylinder to the outside, the hydraulic cylinder 30, the rod 35, the first wedge 28 and the second wedge 29 in the main body 21 are moved to a direction opposite to

the mounting position of the wedges so that the hydraulic cylinder 30, the rod 35, the first wedge 28 and the second wedge 29 return to the initial position for the decoupling of the wedges from the coupling fastening pins 25.

**[0053]** As such, in accordance with the quick coupler for a construction machine in accordance with the present invention, the coupling and decoupling position of the wedges for the replacement or installation/removal of the attachment is set accurately, and thus an operator can perform the assembly and replacement operation of the attachment in an easy and safe manner on a construction site.

## INDUSTRIAL APPLICABILITY

**[0054]** The quick coupler for a construction machine of the present invention as constructed above is useful for safe and efficient replacement and assembly of various attachments including a breaker or other option apparatus required depending on construction site or a work object.

**[0055]** While the present invention has been described in connection with the specific embodiments illustrated in the drawings, they are merely illustrative, and the invention is not limited to these embodiments. It is to be understood that various equivalent modifications and variations of the embodiments can be made by a person having an ordinary skill in the art without departing from the spirit and scope of the present invention. Therefore, the true technical scope of the present invention should not be defined by the above-mentioned embodiments but should be defined by the appended claims and equivalents thereof.

## Claims

1. A quick coupler for a construction machine, comprising:

   a main body having a pair of opposed hook parts formed protrudingly outwardly from a left side wall and a right side wall thereof, respectively, to support a pair of opposed coupling fastening pins;

   a hydraulic cylinder including a large chamber, a small chamber, a wedge fixture fixed to an inlet of the large chamber, and a rod driven to be extended or retracted by hydraulic pressure and moved in a direction opposite to the wedge fixture when the rod is driven to be extended;

   a first wedge fixed to an outer end portion of the wedge fixture and coupled to or decoupled from one of the coupling fastening pins through the movement of the hydraulic cylinder;

   a second wedge including a guide formed protrudingly downwardly from the main body, the second wedge being fixed to an outer end portion of the rod and moved in a direction opposite to the first wedge when the rod is extended or retracted so that the second wedge is coupled to or decoupled from the other of the coupling fastening pins; and

   a stopper installed between the hydraulic cylinder and the second wedge and configured to restrict the movement of the hydraulic cylinder which is moved to allow the second wedge to be decoupled from the fastening pin and the movement of the second wedge.

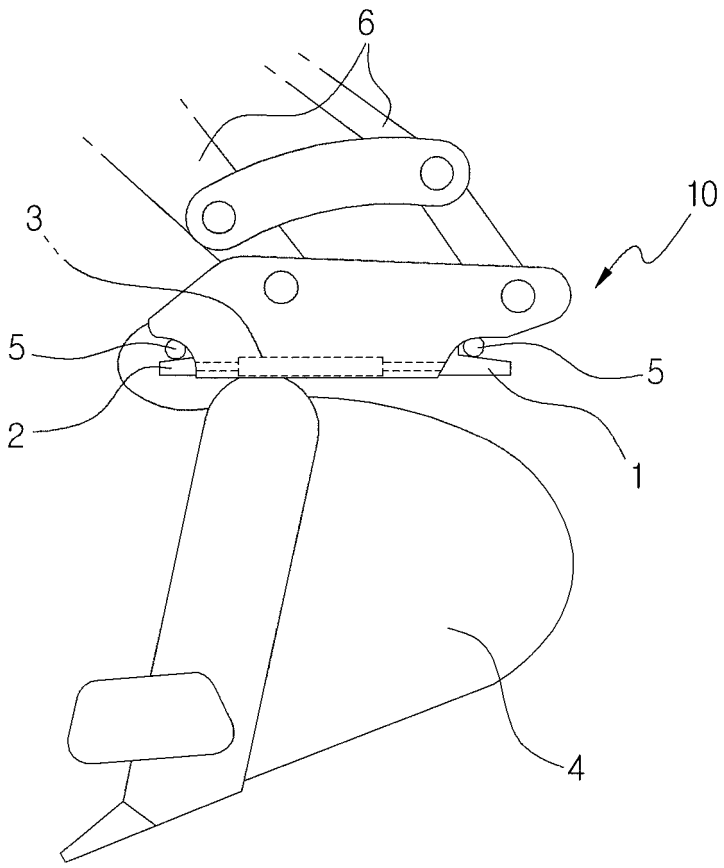
2. The quick coupler for a construction machine according to claim 1, further comprising an elastic member installed inside the large chamber of the hydraulic cylinder, the elastic member being configured to elastically support a rear end portion of the wedge fixture at one side thereof and a front end portion of the rod at the other side thereof.

3. The quick coupler for a construction machine according to claim 2, further comprising a rod stopper configured to restrict a maximum extending range of the rod in the hydraulic cylinder.

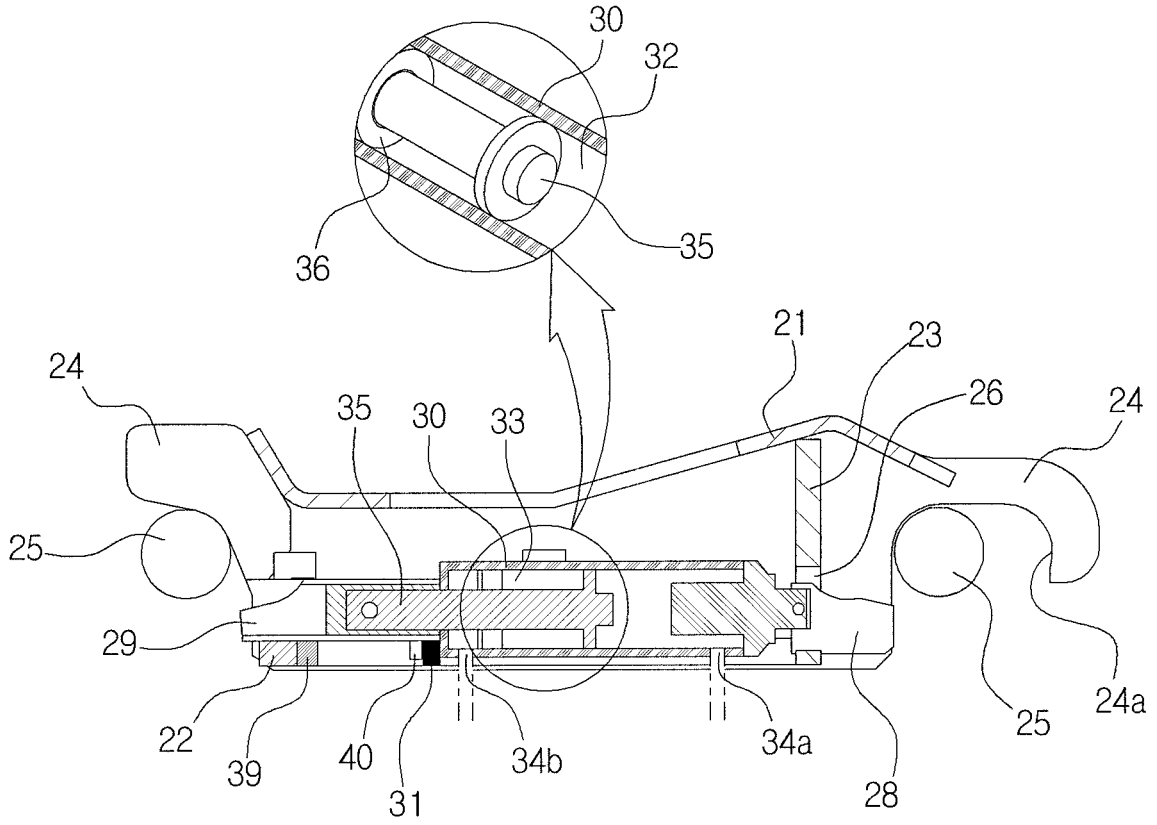
4. The quick coupler for a construction machine according to claim 3, further comprising a support block configured to restrict a maximum projecting range of the second wedge in a state where the left side wall of the main body is bought into close contact with the guide of the second wedge.

5. The quick coupler for a construction machine according to claim 1 or 3, wherein the main body of the quick coupler is fixedly installed on a base end portion of an arm.

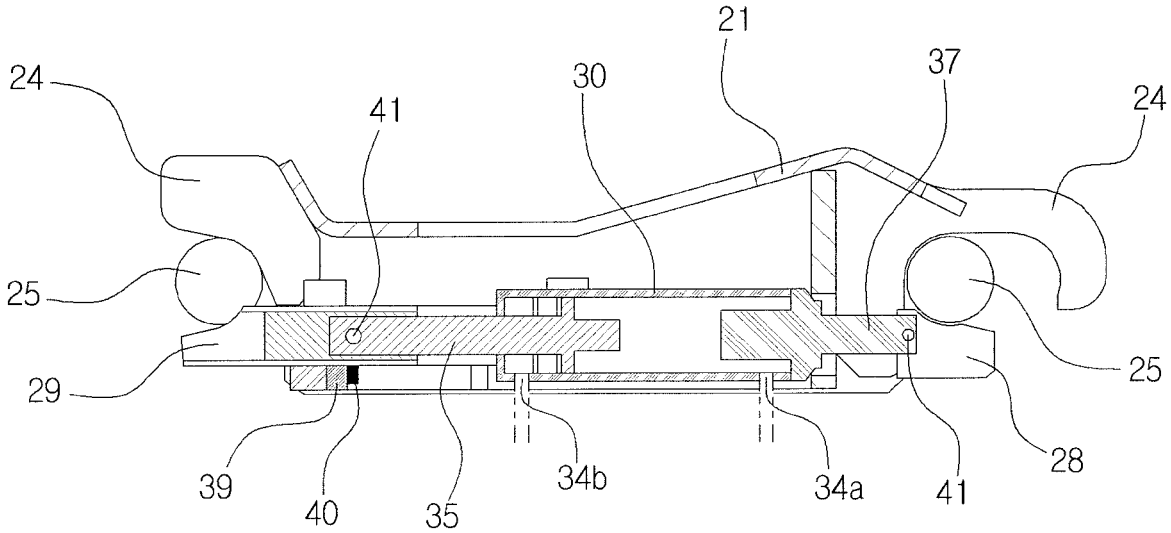
【FIG. 1】



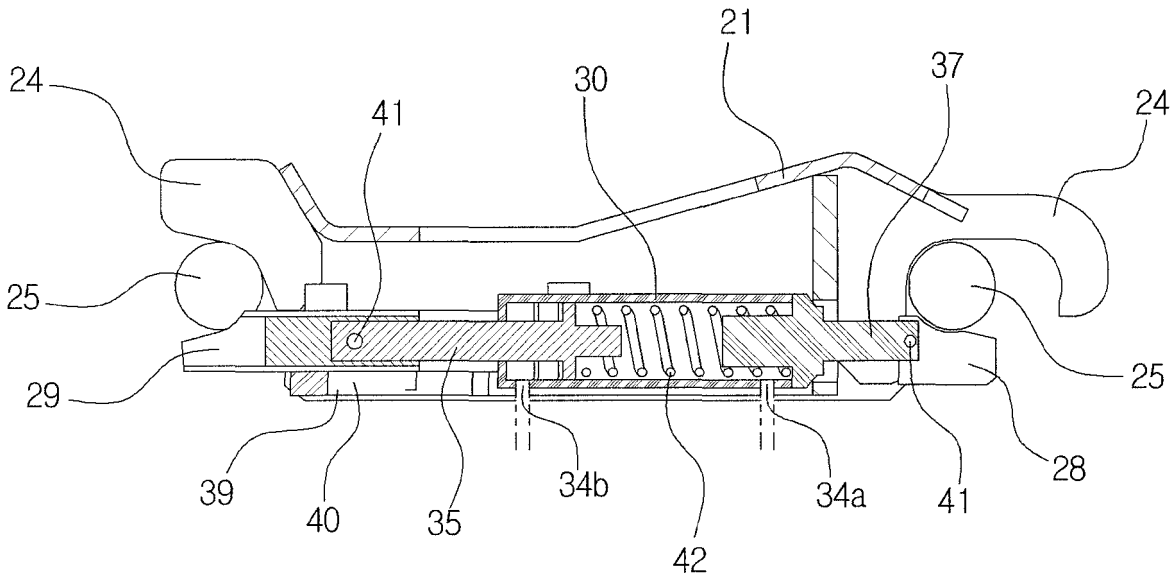
【FIG. 2】


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24a

【FIG. 3】


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34b
34a
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【FIG. 4】



INTERNATIONAL SEARCH REPORT

International application No.
**PCT/KR2013/007851**

A. CLASSIFICATION OF SUBJECT MATTER

***E02F 3/96(2006.01)i, E02F 3/38(2006.01)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 3/96; E02F 3/40; E02F 3/00; E02F 3/36; E02F 3/38

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & Keywords: construction equipment, quick coupler, coupler, hook part, wedge, hydraulic cylinder, stopper, hydraulic cylinder, stopper, rod, piston

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 2009-0311086 A1 (STEIG, Jr. et al.) 17 December 2009<br>See paragraphs 26, 30-36 and figures 3-5. | 1-2,5 |
| Y | | 3-4 |
| Y | KR 10-1210833 B1 (FEEL INDUSTRIAL ENGINEERING CO., LTD.) 11 December 2012<br>See paragraph 39 and figure 5. | 3-4 |
| A | EP 0578447 A1 (FERMEC MANUFACTURING LIMITED) 12 January 1994<br>See claim 1 and figure 1. | 1-5 |
| A | KR 10-2012-0071839 A (VOLVO CONSTRUCTION EQUIPMENT AB) 03 July 2012<br>See paragraph 15 and figures 1-2. | 1-5 |
| A | JP 2008-174920 A (MUROTO TEKKOSHO K.K.) 31 July 2008<br>See paragraph 8 and figure 1. | 1-5 |

☐ 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
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| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 23 MAY 2014 (23.05.2014) | **23 MAY 2014 (23.05.2014)** |
| Name and mailing address of the ISA/**KR**<br>Korean Intellectual Property Office<br>Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701, Republic of Korea<br>Facsimile No. 82-42-472-7140 | Authorized officer<br><br>Telephone No. |

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2013/007851

| Patent document cited in search report | Publication date | Patent family member | Publication date |
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