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(54) LOCKING DEVICE FOR LOCKING OUTRIGGER IN ENGINEERING MACHINERY

(57) A locking device for locking an outrigger in engineering machinery comprises a housing (1) having a limited chamber inside and having a left end provided with an opening (10); a latch (2) disposed in the chamber, capable of moving between a first position and a second position in a left/right direction, and provided with a protruding shoulder(21) arranged at a predetermined distance away from a left end thereof, wherein when in the first position, the left end of the latch extends out of the chamber from the opening and the protruding shoulder abuts against a left side wall of the chamber, and when in the second position, the left end of the latch retracts into the chamber; an elastic member (3) sleeving the latch and pressing the protruding shoulder in a leftward direction in a biased manner; and a driving assembly (5), the driving assembly being used for driving the latch to move from the first position to the second position. The locking device is capable of reducing labor intensity and is reliable in locking.

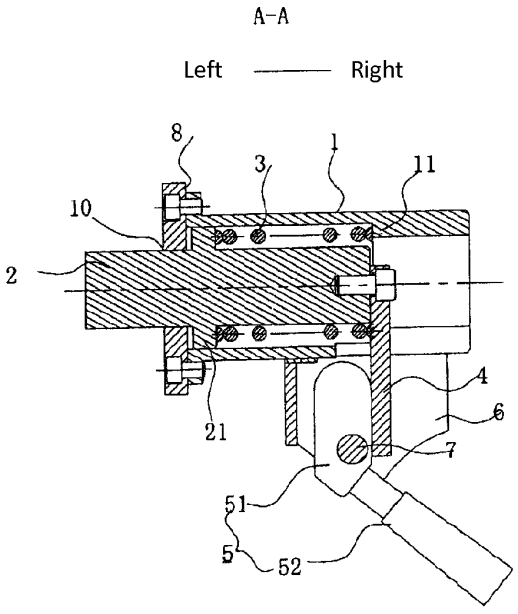

Fig. 4

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Description

Field of the Invention

[0001] The present invention relates to engineering machinery field, in particular to engineering machinery in which outriggers can be locked, and a locking device thereof.

Background of the Invention

[0002] In engineering machinery such as pump trucks and hoist cranes, an outrigger will extend to increase stability when the boom stretches or lifts up a heavy load, and the outrigger will retract to reduce the size and meet the traveling requirement after the work is done. As specified in the design specifications for engineering machinery such as pump trucks, the outrigger must be locked up with a mechanical locking device after it retracts, to prevent the outrigger from swing out unexpectedly when the truck travels. To this end, all pump trucks have a mechanical locking device nowadays.

[0003] At present, all such locking devices are manually operated, i.e., the outrigger can extend after the locking device is released manually; the mechanical locking device will be locked up after the outrigger retracts at the end of the work. That is to say, the operating cycle is always as follows: unlock the outrigger manually -- extend the outrigger -- retract the outrigger -- lock up the outrigger manually. Thus, in each operating cycle, the outrigger locking device has to be operated twice; therefore, the labor intensity is high, and missing locking may occur due to human factors.

Summary of the Invention

[0004] The object of the present invention is to solve at least one of the technical problems in the prior art. To this aim, one object of the present invention is to provide a locking device for locking an outrigger in engineering machinery, which is helpful for reducing labor intensity and can achieve reliable locking.

[0005] According to an embodiment of the present invention, the locking device comprises: a housing defining a chamber inside and having a left end provided with an opening; a latch, disposed in the chamber and capable of moving between a first position and a second position in a left/right direction, a protruding shoulder is arranged at a predetermined distance away from the left end of the latch, wherein, when in the first position, the left end of the latch extends out of the chamber from the opening and the protruding shoulder abuts against a left side wall of the chamber, and when in the second position, the left end of the latch retracts into the chamber; an elastic member sleeving the latch and applying elastic pressure on the protruding shoulder in a leftward direction; and, a driving assembly, driving the latch to move from the first position to the second position.

[0006] Thus, in the present invention, with the cooperating among the latch, elastic member, and driving assembly, the latch can return automatically without manual intervention; therefore, the locking device in the present invention is helpful for reducing labor intensity; in addition, since the latch has to be moved from the first position to the second position before the outrigger can retract, missing locking will not occur after the outrigger 100 retracts, and the locking is reliable.

[0007] In addition, the locking device for locking an outrigger in engineering machinery in the present invention further has the following additional technical feature:

[0008] Preferably, a right end of the latch is connected with a push rod, the upper part of the push rod extends into the chamber and is connected to the latch perpendicularly, and the lower part of the push rod extends out of the housing; the driving assembly is pivotally connected to the housing and is used to push the lower part of the push rod to move rightwards, so as to drive the latch to move from the first position to the second position.

[0009] Preferably, the driving assembly comprises a hand lever and a cam connected to one end of the hand lever, and the driving assembly is arranged in a way that the hand lever can rotate freely by a predetermined angle in a counter-clockwise direction when the latch is in the second position.

[0010] Moreover, the locking device further comprises two connecting plates disposed at the front side and rear side of the driving assembly and connected to the housing respectively; and a pin shaft with two ends supported between the two connecting plates, wherein, the driving assembly is pivotally arranged on the pin shaft.

[0011] Preferably, a first slope and a linear section are formed at the front side of the left end of the latch, wherein the linear section intersects the first slope and is disposed at the right side of the first slope.

[0012] Preferably, a second slope is formed at the rear side of the left end of the latch, wherein, the extension length of the first slope in a left/right direction is smaller than the extension length of the second slope in the left/right direction, and the inclination angle of the first slope in relation to the left/right direction is essentially equal to the inclination angle of the second slope in relation to the left/right direction.

[0013] Preferably, the latch is a cylindrical shape with its axis in the left/right direction, and the protruding shoulder is formed around the latch.

[0014] Preferably, the housing is a hollow cylinder with its axis in the left/right direction, and the chamber has an annular boss formed on it inner wall near the right side wall, wherein, the rear end of the elastic member abuts against the front surface of the boss, the elastic member is a compression spring, and the rear end of the compression spring abut against the front surface of the boss.

[0015] Furthermore, the locking device further comprises an end cap, wherein, the left side of the housing is open, the end cap seals the left side of the housing, and the opening is formed on the end cap.

[0016] The upper part of the push rod is connected to the latch with screws.

[0017] Additional aspects and advantages of the present invention will be shown and become apparent in the following description partially, or can be understood in the actual operating process of the locking device in the present invention.

Description of the Drawings

[0018] The above-mentioned and/or additional aspects and advantages of the present invention will become more apparent and more easily to understand in the description of a preferred embodiment with reference to the accompanying drawings. Among the drawings:

Fig.1 is a front view of the latch of the locking device in the first position according to a preferred embodiment of the present invention;

Fig.2 is a top view of the locking device shown in Fig.1;

Fig.3 is a left view of the locking device shown in Fig.1;

Fig.4 is a sectional view in A-A direction shown in Fig.3;

Fig.5 is a front view of the latch of the locking device in a preferred embodiment of the present invention in the second position;

Fig.5 is a top view of the locking device shown in Fig.5 in locked state;

Fig.7 is a left view of the locking device shown in Fig.5;

Fig.8 is a sectional view in B-B direction shown in Fig.7; and

Fig.9-11 are schematic diagrams of free rotation action of the driving assembly when the latch is in the second position in the locking device according to a preferred embodiment of the present invention.

Detailed Description of the Embodiments

[0019] Hereafter a preferred embodiment of the present invention will be detailed. The preferred embodiment is illustrated in the accompanying drawings, wherein, identical or similar marks indicate identical or similar elements or elements with identical or similar functions. It should be noted that the preferred embodiment described with reference to the accompanying drawings is only exemplary and is provided only to explain the present invention instead of any limitation to the present invention.

[0020] In the description of the present invention, it should be appreciated that the terms indicating orientation or positional relations such as "up", "down", "front", "rear", "left", "right", "vertical", etc. are based on the orientation or positional relations shown in the accompanying drawings, and are used only to simplify the description of the present invention, instead of indicating or implying that the referred device or element must has the specified orientation or must be constructed or operated in the specified orientation; therefore, they should not be comprehended as any limitation to the present invention. In addition, the terms "first" and "second" are only for description purpose, and should not be understood as indicating or implying relative importance.

[0021] In the description of the present invention, it should be noted: unless otherwise specified or defined, the terms "mount", "joint", and "connect" should be understood in a broad sense, for example, a connection can be fixed connection, or removable connection, or integral connection; can be mechanical connection; can be direct connection, or indirect connection via an intermediate media, or internal communication between two elements. Those having ordinary skills in the prior art can understand the specific meanings of the terms in the present invention in their context.

[0022] In addition, in the description of the present invention, "plurality" means two or more, unless otherwise stated.

[0023] Hereafter the locking device for locking an outrigger in engineering machinery according to a preferred embodiment of the present invention will be detailed with reference to Fig.1~11.

[0024] According to a preferred embodiment of the present invention, the locking device comprises a housing 1, a latch 2, an elastic member 3, a push rod 4, and a driving assembly 5. Hereafter the present invention will be described, on a presumption that the outrigger is blocked by the front side of the locking device.

[0025] As shown in Fig.1~4, there is a defined chamber in the housing, and the housing has a left end provided with an opening 10. A latch 2 is disposed in the chamber, capable of moving between a first position and a second position in a left/right direction, and is provided with a protruding shoulder 21 arranged at a predetermined distance away from a left end thereof. The latch 2 has a first slope 22 formed at the front side of its left end. For example, as shown in Fig.2, at the front side of the left end of the latch 2, the latch 2 has a first slope 22 and a linear section 24 intersecting the first slope 22 . As shown in Fig.4, when the latch 2 is in the first position, the left end of the latch 2 extends out of the chamber from the opening 10 and the protruding shoulder 21 abuts against the left side wall of the chamber; in that state, the linear section 24 at the front side of the latch 2 abuts against the outrigger 100, so that the outrigger 100 is retained in locked state. As shown in Fig.5 and Fig.8, when the latch 2 is in the second position, the left end of the latch 2 retracts into the chamber; in that state, the outrigger 100 is not locked up, and can swing out over the latch 2.

[0026] The elastic member 3 sleeves the latch 2 and applyes elastic pressure on the protruding shoulder 21 in a leftward direction. Optionally, the elastic member 3 is a compression spring. To enable the latch to move from the first position to the second position, in this embodiment, a push rod 4 is connected to the right end of

the latch, the upper part of the push rod 4 extends into the chamber and is connected to the latch 2 perpendicularly, and is optionally connected to the latch 2 via screws, the lower part of the push rod 4 extends out of the housing 1. In addition, the locking device further comprises a driving assembly 5. In this embodiment, the driving assembly 5 is pivotally connected to the housing 1 and is designed to push the lower part of the push rod 4 to move rightward, so as to drive the latch 2 to move from the first position to the second position.

[0027] When the outrigger 100 is not used, the latch 2 is in the first position as shown in Fig.4, and abuts against the outrigger 100. To set out the outrigger 100, the driving assembly 5 pushes the push rod 4 to move the latch 2 to the second position firstly, i.e., the outrigger 100 is no longer locked up, which is to say, the outrigger locking device is released. In that state, the outrigger 100 can move over the locking device and operate normally; after the outrigger moves over the locking device, the latch will return to the first position automatically under the action of the elastic member 5. After the work of the outrigger 100 is done, to retract the outrigger 100 while the latch 2 must be driven to the second position firstly; after the outrigger 100 retracts, the latch 2 will return to the first position automatically under the action of the elastic member 5 and locks up the outrigger 100. Thus, with the cooperating among the latch, elastic member, and driving assembly, the latch can return automatically without manual intervention; therefore, the locking device in the present invention is helpful for reducing labor intensity; in addition, since the latch has to be moved from the first position to the second position before the outrigger can retract, missing locking will not occur after the outrigger 100 retracts, and the locking is reliable.

[0028] Hereafter the preferred embodiment of the present invention and its operating process will be detailed, with reference to the accompanying drawings. In the preferred embodiment, through the coordinated movement of the driving assembly 5, push rod 4, and elastic member 3, the locking device has to be operated manually only once (i.e., unlock the outrigger) in the entire operating cycle of the outrigger, which is to say, the step of relocking up the outrigger manually is omitted. In other words, the conventional operating method with which the locking device has to be operated twice in an operating cycle is improved to an operating method with which the locking device has to be operated only once in an operating cycle.

[0029] According to the preferred embodiment of the present invention, as shown in Fig.4, the driving assembly 5 comprises a hand lever 52 and a cam 51 connected to one end of the hand lever 52, and the driving assembly 5 is arranged in a way that the hand lever 52 can rotate freely by a predetermined angle in a counter-clockwise direction when the latch 2 is in the second position. Initially, as shown in Fig.4, the cam 51 is in vertical position. When the hand lever 52 is turned in a clockwise direction, the cam 51 will push the push rod 4 to move rightwards, as shown in Fig.8; when the push rod 4 is pushed to a specific position, the cam 51 will disengage from the push rod 4 and stay in free state; now, the cam 51 and hand lever 52 are in the state shown in Fig.9; then, the hand lever 52 will rotate by a predetermined angle in a counter-clockwise direction under gravity, as shown in Fig.10, till it returns to the position shown in Fig.11. The predetermined angle can be defined in the design. Now, the left end of the latch 2 will extends leftwards under the action of the elastic member 3 and consequently the linear section 24 will be exposed, as shown in Fig.4, and thereby the outrigger 100 is locked up.

[0030] Moreover, preferably, the locking device further comprises two connecting plates 6 and a pin shaft 7, as shown in Fig.1~11; the two connecting plates 6 are disposed at the front side and the rear side of the driving assembly 5 and connected to the housing 1 respectively; the two ends of the pin shaft 7 are supported between the two connecting plates 6, wherein, the driving assembly 5 is pivotally arranged on the pin shaft 7.

[0031] Preferably, as shown in Fig.1, a second slope 23 formed at the rear side of the left end of the latch, wherein, the extension length of the first slope 22 in a left/right direction is smaller than the extension length of the second slope 23 in the left/right direction, and the inclination angle of the first slope 22 in relation to the left/right direction is approximately equal to the inclination angle of the second slope 23 in relation to the left/right direction.

[0032] Moreover, as shown in Fig.4, the latch 2 is in a cylindrical shape with its axis in the left/right direction, and the protruding shoulder 21 is formed around the latch 2.

[0033] Optionally, as shown in Fig.4, the housing 1 is a hollow cylinder with its axis in the left/right direction, i.e., the chamber is also in a cylindrical shape with its axis in left/right direction. The chamber has an annular boss 11 formed on its inner wall near the right side wall, and the rear end of the elastic member 3 abuts against the front surface of the boss 11.

[0034] As shown in Fig.4, the locking device further comprises an end cap 8, wherein, the left side of the housing 1 is open and the end cap 8 seals the left side of the housing 1, and the opening 10 is formed on the end cap 8, which is to say, the left end of the latch 2 can move in the left/right direction through the opening 10 on the end cap 8.

[0035] Hereafter the locking and unlocking process of the outrigger 100 carried out by the locking device according to the preferred embodiment of the present invention will be described with reference to Fig.1~11.

[0036] In Fig.1~4, the outrigger 100 is shown in locked state. In that state, the rear end of the elastic member 3 sleeved on the latch 2 abuts against the front surface of the annular boss 11 of the housing 1, and the front end of the elastic member 3 abuts against the protruding shoulder 21 of the latch 2; therefore, the protruding shoulder 21 of the latch 2 abuts against the right surface of

the end cap 8. In that state, as shown in Fig.1 and Fig.4, the cam 51 is in vertical position, the first slope 22 and second slope 23 of the latch 2 completely extends out, and, as shown in Fig.3, the linear section of the latch 2 will block the outrigger 100 from swinging out, i.e., the outrigger 100 is locked in a specified position.

[0037] In Fig.5~8, the outrigger 100 is shown in operating state. To enable the outrigger to swing out, the hand lever 52 of the driving assembly 5 is pressed to rotate in a clockwise direction, i.e., rotate from the position of hand lever 52 shown in Fig.4 to the position of hand lever 52 shown in Fig.8; thereby, the cam 51 connected to the hand lever 52 pushes the push rod 4 to move rightwards, which in turn drives the latch 2 to move rightwards and further compress the elastic member 3; now, the latch 2 will retract, and the first slope 22 of the latch 2 will enter into the position shown in the top view in Fig.6. In that state, the first slope 22 of the latch 2 aligns to the outrigger 100 (as shown in the top view in Fig.6). Thus, the outrigger 100 can be operated to swing out from front to back; in that process, the outrigger 100 will hit the first slope 22, so that the latch 2 retracts further and thereby the outrigger 100 is released from the outrigger locking device, i.e., in that way, the outrigger is unlocked.

[0038] In that process, when the outrigger 100 hits the first slope 22, the latch 2 will move rightwards further and compress the elastic member 3, and thereby drives the push rod 4 to move rightwards; consequently, as shown in Fig.9, the push rod 4 disengages from the surface of the cam 51 and the cam 51 enters into free state; under gravity action, the driving assembly 5 will rotate by a predetermined angle in a counter-clockwise direction to the position shown in Fig.10. After the outrigger 100 swings out, the push rod 4 will move leftwards under spring force and collide with the cam 51 that has rotated by the predetermined angle. As a result, a force moment that drives the hand lever 52 to rotate in the counter-clockwise direction is generated, as shown in Fig.9; therefore, the hand lever 52 is driven to return to the original state shown in Fig.1~4, i.e., the latch 2 extends out completely.

[0039] After the work is done, the outrigger 100 can be controlled to move towards the front side and hit the locking device; since the latch 2 has returned to its original position automatically and the second slope 23 of the latch 2 abuts against the outrigger 100, the outrigger 100 will hit the second slope 23 of the latch 2; thus, the latch 2 retracts, the outrigger 100 moves over the latch 2 towards the front side, and the latch 2 returns to its original position (as shown in Fig.1~4) under the action of the elastic member 3. Now, the linear section of the latch 2 aligns to the outrigger 100 and the outrigger 100 can't swing freely. In that way, the purpose of safe locking is attained.

[0040] In summary, the locking device for locking an outrigger in engineering machinery according to an preferred embodiment of the present invention, the conventional outrigger operating method with which the locking device has to be operated twice in an operating cycle is changed to an operating method with which the locking device has to be operated only once in an operating cycle, i.e., the only operation is to operate the locking device manually to unlock the outrigger simply. In other words, the operations can be reduced by 50% in the entire process. The locking device attains the purpose of automatic locking, is helpful for reducing labor intensity, and is more reliable when compared with conventional manual locking devices, i.e., no missing locking will occur due to human factors.

[0041] In the description in this document, the reference terms "an embodiment", "some embodiments", "exemplary embodiment", "preferred embodiment", "example", "specific example", or "some example", etc. imply that the specific features, structures, materials, or characteristics described in the embodiments or examples are included in at least one embodiment or example of the present invention. In this document, the exemplary expression of the above terms may not necessarily refer to the same embodiment or example. Moreover, the specific features, structures, materials, or characteristics described can be combined appropriately in any one or more embodiments or example.

[0042] While the present invention has been illustrated and described with reference to some preferred embodiments, the present invention is not limited to these. Those skilled in the art should recognize that various variations and modifications can be made without departing from the spirit and scope of the present invention as defined by the accompanying claims.

Claims

1. A locking device for locking an outrigger in engineering machinery, comprising:

   a housing, defining a chamber inside and having a left end provided with an opening;
   a latch, disposed in the chamber and capable of moving between a first position and a second position in a left/right direction, a protruding shoulder is arranged at a predetermined distance away from the left end of the latch, wherein when in the first position, the left end of the latch extends out of the chamber from the opening and the protruding shoulder abuts against a left side wall of the chamber, and when in the second position, the left end of the latch retracts into the chamber;
   an elastic member, sleeving the latch and applying elastic pressure on the protruding shoulder in a leftward direction; and
   a driving assembly, driving the latch to move from the first position to the second position.

2. The locking device according to claim 1, wherein, a right end of the latch is connected with a push rod,

the upper part of the push rod extends into the chamber and is connected to the latch perpendicularly, and the lower part of the push rod extends out of the housing; the driving assembly is pivotally connected to the housing and is used to push the lower part of the push rod to move rightwards, so as to drive the latch to move from the first position to the second position.

3. The locking device according to claim 2, wherein, the driving assembly comprises a hand lever and a cam connected to one end of the hand lever, and the driving assembly is arranged in a way that the hand lever can rotate freely by a predetermined angle in a counter-clockwise direction when the latch is in the second position.

4. The locking device according to claim 3, further comprising:

two connecting plates, disposed at the front side and rear side of the driving assembly respectively, and connected to the housing respectively; and
a pin shaft, with its two ends supported between the two connecting plates, wherein, the driving assembly is pivotally arranged on the pin shaft.

5. The locking device according to claim 1, wherein, a first slope and a linear section are formed at the front side of the left end of the latch, wherein the linear section intersects the first slope and is disposed at the right side of the first slope.

6. The locking device according to claim 5, wherein, a second slope is formed at the rear side of the left end of the latch, wherein, the extension length of the first slope in a left/right direction is smaller than the extension length of the second slope in the left/right direction, and the inclination angle of the first slope in relation to the left/right direction is essentially equal to the inclination angle of the second slope in relation to the left/right direction.

7. The locking device according to any of claims 1-6, wherein, the latch is a cylindrical shape with its axis in the left/right direction, and the protruding shoulder is formed around the latch.

8. The locking device according to claim 7, wherein, the housing is a hollow cylinder with its axis in the left/right direction, and the chamber has an annular boss formed on it inner wall near the right side wall, wherein, the elastic member is a compression spring, and the rear end of the compression spring abuts against the front surface of the boss.

9. The locking device according to claim 1, further comprising:

an end cap, wherein, the left side of the housing is open, the end cap seals the left side of the housing, and the opening is formed on the end cap.

10. The locking device according to claim 2, wherein, the upper part of the push rod is connected to the latch with screws.

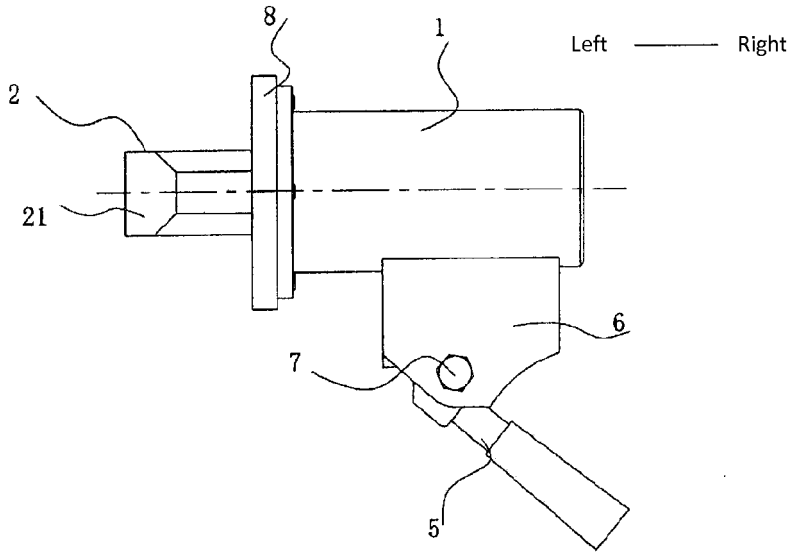

Fig. 1

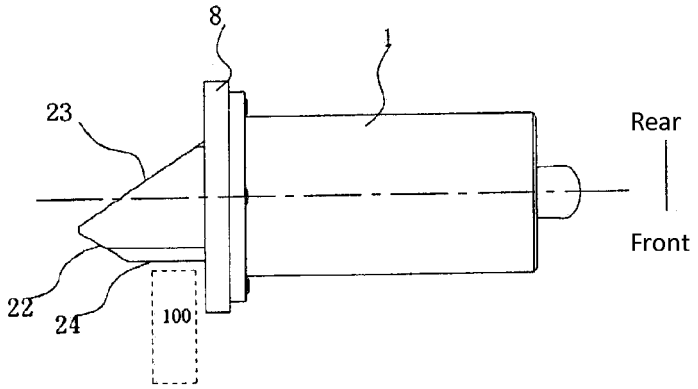

Fig. 2

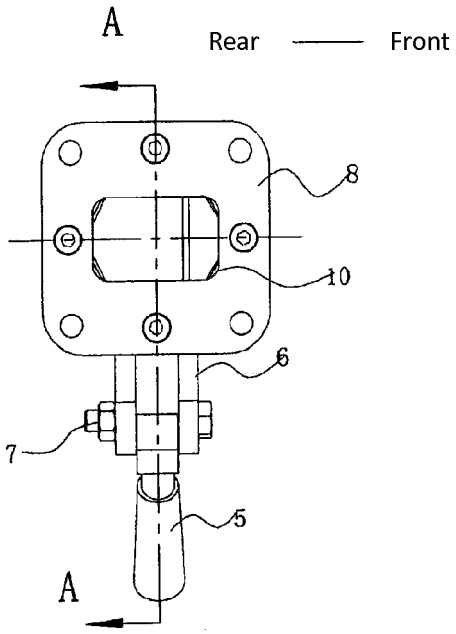

Fig. 3

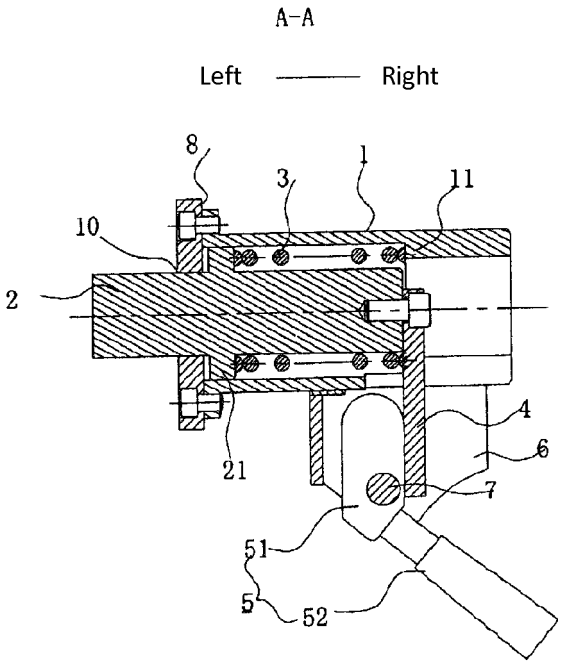

Fig. 4

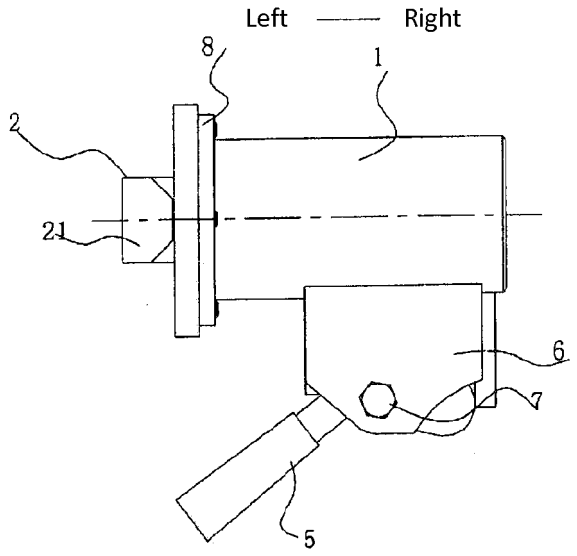

Fig. 5

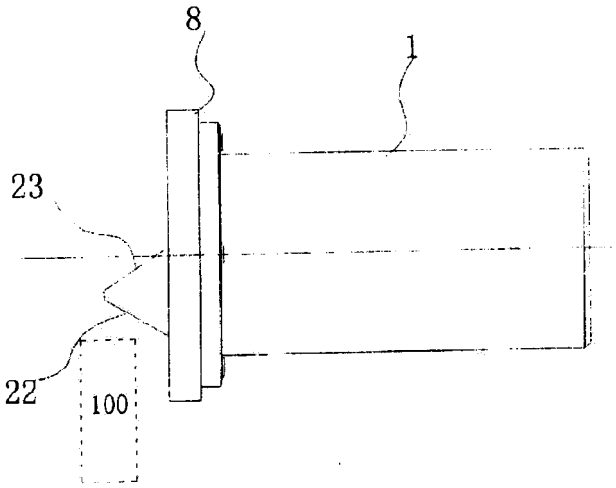

Fig. 6

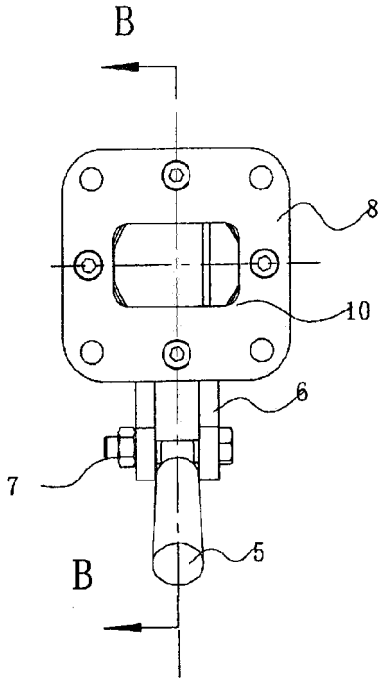

Fig. 7

Left ——— Right

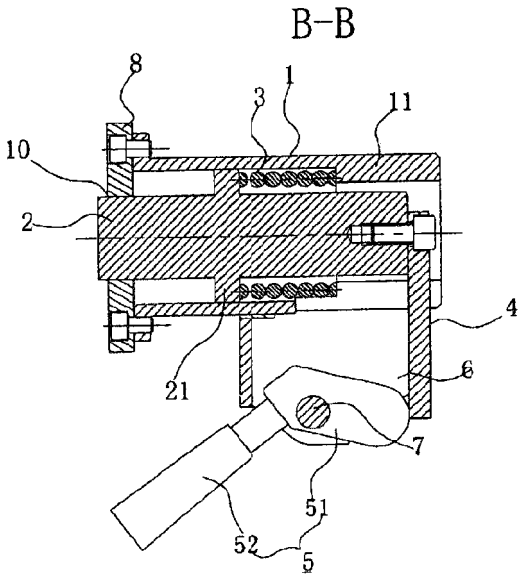

Fig. 8

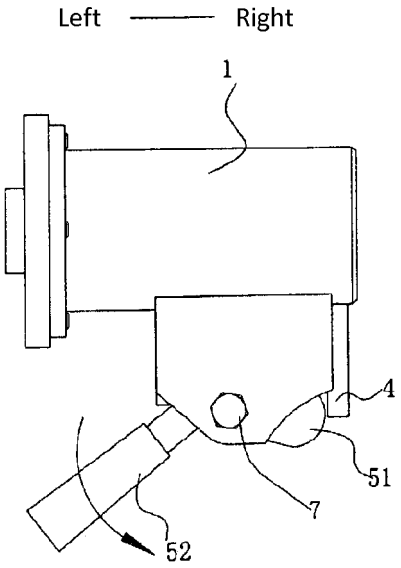

Fig. 9

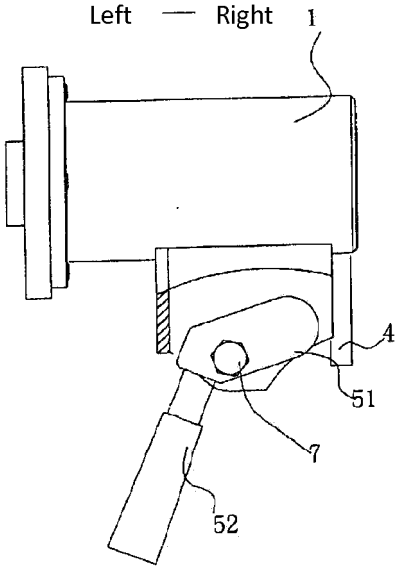

Fig. 10

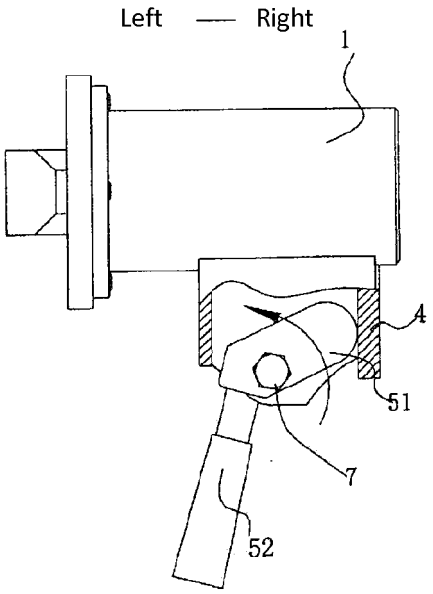

Fig. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/075579

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet
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)

IPC: B60S9/-, B66C23/78

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

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

EPODOC, WPI, CNPAT: lock+, spring, elastic

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN201013083Y (SANY HEAVY IND CO., LTD.) 30 Jan. 2008(30.01.2008) see figure 1	1-10
A	CN201843348U (XUGONG GROUP ENGINEERING MACHINERY CO., LTD. CONSTRUCTION MACHINERY BRANCH) 25 May 2011 (25.05.2011) see the whole document	1-10
A	US5470167A (PUTZMEISTER-WERK MASCHINENFABRIK GMBH) 28 Nov. 1995 (28.11.1995) see the whole document	1-10
A	US4243256A (Robert R. Frydrych) 06 Jan. 1981(06.01.1981) see the whole document	1-10
A	CN2789086Y (XUZHOU HEAVY MACHINERY CO., LTD.) 21 Jun. 2006(21.06.2006) see the whole document	1-10
A	CN201095160Y (SANY HEAVY IND CO., LTD.) 06 Aug. 2008(06.08.2008) see the whole document	1-10

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

* Special categories of cited documents:

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

"E" earlier 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

Date of the actual completion of the international search	Date of mailing of the international search report
27 Jul. 2012(27.07.2012)	23 Aug. 2012(23.08.2012)
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10)62019451	Authorized officer WANG, Qinghua Telephone No. (86-10)62019451

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2012/075579

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN201013083Y	30.01.2008	NONE	
CN201843348U	25.05.2011	NONE	
US5470167A	28.11.1995	DE4211493A	07.10.1993
		WO9319957A1	14.10.1993
		EP0633847A	18.01.1995
		EP0633847B1	21.08.1996
		JPH07508475A	21.09.1995
		AT141559T	15.09.1996
		ES2092283T	16.11.1996
US4243256A	06.01.1981	WO8000725A1	17.04.1980
		JPS55500768A	09.10.1980
		JP61039476B	04.09.1986
		DE2953087A	15.01.1981
		GB2054721A	18.02.1981
		GB2054721B	25.08.1982
CN2789086Y	21.06.2006	NONE	
CN201095160Y	06.08.2008	NONE	

Form PCT/ISA/210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/075579

Continuation of: second sheet A. CLASSIFICATION OF SUBJECT MATTER

B66C23/78 (2006.01) i

B60S9/04 (2006.01) i