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(54) Title: **LOADER WORKING DEVICE**

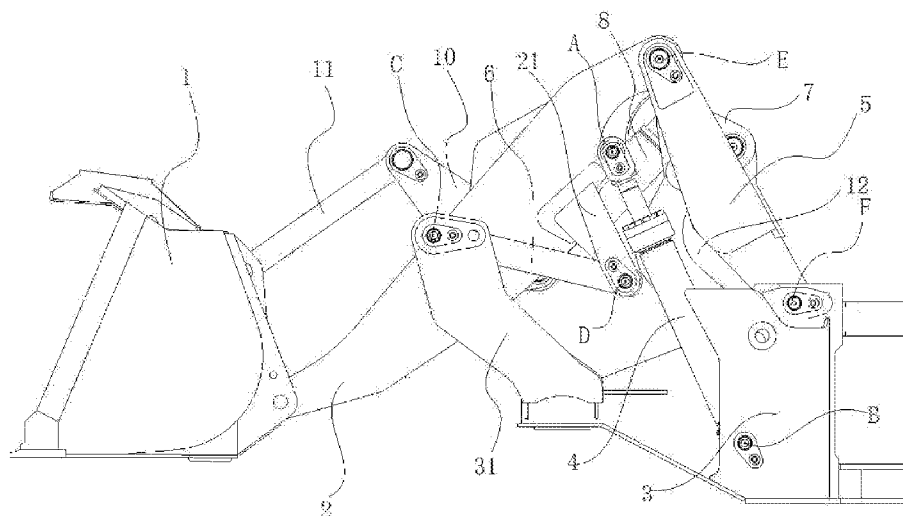


Fig.2

(57) **Abstract:** A loader working device for solving the problem of more parts and difficult arrangement of the part used in a vertical lifting mechanism of existing loader. The loader working device comprises an accessory, an accessory overturning mechanism, and an accessory lifting mechanism including a movable arm (2), a movable arm oil cylinder (4), a front link rod (6) and a rear link rod (5). Two ends of the movable arm oil cylinder (4) are correspondingly hinged to a point A on the movable arm (2) and a point B on a front frame (3). A front end of the front link rod (6) is hinged to a point C on a support of the front frame (3), and a rear end is hinged to a point D on the movable arm (2). Two ends of the rear link rod (5) are hinged to a point E at a rear end of the movable arm (2) and a point F on the front frame (3). A convex quadrilateral is formed by connecting lines of the hinge points A, E, F and D. The connecting lines of the hinge points C, E and D form a triangle. The point D is located below the connecting line of the point C and the point E. The accessory lifting mechanism does not cause the accessory to interfere with a rocker arm (10) and a front axle package, and a connecting



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OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,
SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
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LOADER WORKING DEVICE

[1] TECHNICAL FIELD

[2] The present disclosure relates to a working device, and more particularly, to a vertically lifted loader working device.

[3] BACKGROUND

[4] A working device is one of important components on a construction machinery loader, and different functions of a whole machine can be realized through different working device mechanisms. At present, a common working device mechanism of the loader includes a six-link rod mechanism and an eight-link rod mechanism. The biggest market share is the six-link rod mechanism, but this type of working device mechanism has the problem that a tilting ability of the whole machine is insufficient, the increase of tilting will lead to an increase in the weight of the whole machine, the insufficient ease of operation and an increase in oil consumption of the whole machine. With the improvement of technical ability of the loader, the vertical lifting mechanism solves this problem well, the vertical lifting mechanism has a short load moment arm in a lifting process, which can realize a larger tilting load with smaller weight of the whole machine and make the operation process of the whole machine more stable. At the same time, due to the short load moment arm, useless work in the lifting process of the working device is reduced, and the lifting ability of the working device is stronger. The currently used vertical lifting mechanism realizes all operation functions of the loader through three sets of four-link rod mechanisms, compared with other link mechanisms, the vertical lifting mechanism uses more parts, which are arranged in the middle of the working device with limited arrangement space. At present, an inverted bucket mechanism used in vertical lifting, an overturning oil cylinder is connected to an upper hinge point of a rocker arm and a short link rod, with a high mounting position, which affects the visual field before operation. At the same time, the arrangement structure of the bucket mechanism is compact, at present, the arrangement requirements of the rocker arm are met through compressing a stroke of the overturning oil cylinder and changing an external structure of a bucket, for example, an opening angle of the bucket and a receiving angle of the bucket of the working device are reduced to meet the mechanism requirements, which affects the bucket performance and the operation performance of the working device to a certain extent, thus resulting in poor bucket filling rate, and the bucket needs to avoid the front hinge point of the rocker arm, making the bucket structure complicated.

[5] SUMMARY

[6] The technical problem to be solved by the present disclosure is to provide a loader

working device for vertical lifting aiming at the problem that a vertical lifting mechanism of existing loader uses more parts, which are arranged in the middle of the working device and have limited arrangement space.

- [7] The technical solution of the present disclosure to achieve the purpose thereof is as follows: a loader device is arranged, which comprises an accessory, an accessory lifting mechanism connected between the accessory and a front frame of the loader, and an accessory overturning mechanism, wherein the accessory lifting mechanism is symmetrical left and right about a central plane, and comprises a movable arm and a movable arm oil cylinder on left and right sides; one end of the movable arm oil cylinder is hinged to a point A on the movable arm, the other end is hinged to a point B on the front frame, and a movable arm beam is fixedly connected between the two movable arms; the loader working device further comprises a front link rod and a rear link rod; a front end of the front frame is provided with a support;
- [8] a front end of the front link rod is hinged to a point C on the support, and a rear end of the front link rod is hinged to a point D on the movable arm;
- [9] an upper end of the rear link rod is hinged to a point E at the rear end of the movable arm, and a lower end is hinged to a point F on the front frame; and
- [10] a convex quadrilateral is formed by connecting lines between projection points of the hinge points A, E, F and D on a central plane; the connecting lines between projection points of the hinge points C, E and D on the central plane form a triangle, and a projection point of the point D is located below the connecting line of the projection points of the point C and the point E. In the present disclosure, the accessory lifting mechanism is formed by superposing two four-link rods to realize vertical lifting, and a first four-link rod mechanism consisting of the movable arm, the rear link rod, the front frame and the movable arm oil cylinder realizes a lifting movement of the movable arm; and a second four-link rod consisting of the movable arm, the front link rod, the front frame and the movable arm oil cylinder realizes horizontal restraint in a lifting process, so that a distance between the accessory and a front wheel is basically kept unchanged in the lifting process, so as to realize vertical lifting. In the present disclosure, the accessory can be a loader bucket, a pallet fork or a holding fork, etc.
- [11] Preferably, in the loader working device above, the movable arm is provided with a front link rod hinge arm extending downwardly, the rear end of the front link rod is hinged to a lower end of the front link rod hinge arm, and the front link rod hinge arm is located between the movable arm oil cylinder and the support at the front end of the front frame.
- [12] Preferably, in the loader working device above, the accessory overturning mechanism comprises a pulling rod, a rocker arm, a overturning oil cylinder, a three-hinge point holder and a self-leveling link rod; the rear link rods at left and right sides

are connected into an H shape by a middle beam, a middle portion of the rocker arm is hinged to the movable arm beam, an upper end of the rocker arm is hinged to a rear end of the pulling rod, a front end of the pulling rod is hinged to the accessory, a lower end of the rocker arm is hinged to a front end of the overturning oil cylinder, a rear end of the overturning oil cylinder is hinged to a G hinge point of the three-hinge point holder, an H hinge point of the three-hinge point holder is hinged to the middle beam, an I hinge point of the three-hinge point holder is hinged to an upper end of the self-leveling link rod, a lower end of the self-leveling link rod is hinged to an L hinge point on the front frame, the G hinge point is located above the I hinge point, and the H hinge point is located at a rear side of a connecting line between the G hinge point and the I hinge point. Preferably, a forward Z-shaped six-link rod consisting of the accessory, the pulling rod, the rocker arm, the movable arm, the overturning oil cylinder and the three-hinge point holder at the front end of the accessory overturning mechanism realizes an overturning action of the accessory, and controls an overturning angle of the accessory and a digging force of the accessory. The overturning oil cylinder can be mounted at the lower end of the rocker arm, and the pulling rod can be mounted at the upper end of the rocker arm, thus reducing a mounting height of the overturning oil cylinder and improving a front visual field. Meanwhile, an overturning movement direction of the accessory is consistent with a movement direction of the rocker arm, which is beneficial to increasing the overturning angle of the accessory. Preferably, a four-link rod mechanism consisting of the three-hinge point holder, the self-leveling link rod, the rear link rod and the front frame at the rear end of the accessory overturning mechanism realizes automatic leveling in an accessory overturning process, which is intended to solve the problem of asynchronous angle turnover of the lifting mechanism and the accessory overturning mechanism, and the four-link rod structure at the rear end controls the change of the accessory overturning angle in the lifting process of the lifting mechanism, so that the change of the accessory angle relative to the ground is smaller. The three-hinge point holder skillfully solves the connection problem of the overturning oil cylinder, the rear link rod and the self-leveling link rod, and reduces the assembly difficulty.

- [13] Preferably, in the loader working device above, connecting lines of the G hinge point, the H hinge point and the I hinge point of the three-hinge point holder form an equilateral triangle.
- [14] Preferably, in the loader working device above, connecting lines between projection points of the I hinge point, the H hinge point, the F hinge point and the L hinge point on a central plane form a parallelogram.
- [15] Preferably, in the loader working device above, the self-leveling link rod is L-shaped, and an upper section thereof is bent backwardly.

[16] Preferably, in the loader working device above, the overturning oil cylinder is located below a movable arm beam.

[17] Compared with the prior art, the forward overturning mechanism is used in the vertical lifting mechanism according to the present disclosure, the overturning movement direction of the rocker arm is consistent with that of the accessory, the overturning oil cylinder can be arranged at the lower end of the rocker arm, and the pulling rod can be connected to the upper end of the rocker arm, so that the overturning oil cylinder moves downwardly, the working field at the front end of the working device is improved, and better operation performance is provided for the user. According to the present disclosure, the forward accessory overturning mechanism used in the vertical lifting mechanism does not cause the accessory to interfere with the rocker arm and the front axle package, and the connecting and mounting point of the movable arm and the accessory can be moved backwardly, thus being beneficial to improving the digging force and the tilting load at the low position of the working device. The mechanism has the self-leveling link rod to ensure little change in the angle of the accessory during lifting. The rear link rod, the overturning oil cylinder and the self-leveling link rod can be connected and mounted by adopting the three-hinge point holder, thus greatly reducing the assembly difficulty and improving the assembly efficiency.

[18] BRIEF DESCRIPTION OF THE DRAWINGS

[19] Fig. 1 is a structural diagram of a loader working device according to the present disclosure.

[20] Fig. 2 is a side view of the loader working device according to the present disclosure.

[21] Fig. 3 is a sectional view of the loader working device according to the present disclosure.

[22] DETAILED DESCRIPTION

[23] The detailed embodiment is described with reference to the drawings.

[24] As shown in Fig. 1 and Fig. 2, a loader working device in the embodiment is a loader bucket working device, which comprises an accessory bucket, a bucket lifting mechanism connected between the bucket and a front frame of the loader, and a bucket overturning mechanism, wherein the bucket lifting mechanism is symmetrical left and right about a vertical central plane, and comprises a movable arm 2, a movable arm oil cylinder 4, a front link rod 6 and a rear link rod 5 on left and right sides; and the two movable arms 2 are fixedly connected by a movable arm beam 9. A front end of the front frame 3 is provided with a support 31. One end of the movable arm oil cylinder 4 is hinged to a point A on the movable arm 2, and the other end is hinged to a point B on the front frame 3; a front end of the front link rod 6 is hinged to a point C on the support 31, the movable arm 2 is provided with a front link rod hinge arm 21 extending

downwardly, a rear end of the front link rod 6 is hinged to a lower end of the front link rod hinge arm 21, and the hinge point is a point D. An upper end of the rear link rod 5 is hinged to a point E at the rear end of the movable arm, and a lower end is hinged to a point F on the front frame. A convex quadrilateral is formed by connecting lines between projection points of the hinge points A, E, F and D on a central plane; the connecting lines between projection points of the hinge points C, E and D on the central plane form a triangle, a projection point of the point D is located below the connecting line of the projection points of the point C and the point E, and the hinge point D is located between the movable arm oil cylinder 4 and the support 31 of the front frame at the front end.

[25] As shown in Fig. 3, a bucket overturning mechanism comprises a pulling rod 11, a rocker arm 10, an overturning oil cylinder 8, a three-hinge point holder 7 and a self-leveling link rod 12; the rear link rods at left and right sides are connected into an H shape by a middle beam, a middle portion of the rocker arm 10 is hinged to the movable arm beam 9, an upper end of the rocker arm 10 is hinged to a rear end of the pulling rod 11, a front end of the pulling rod 11 is hinged to the bucket 1, a lower end of the rocker arm 10 is hinged to a front end of the overturning oil cylinder 8, a rear end of the overturning oil cylinder 8 is hinged to a G hinge point of the three-hinge point holder 7, an H hinge point of the three-hinge point holder 7 is hinged to the middle beam, an I hinge point of the three-hinge point holder 7 is hinged to an upper end of the self-leveling link rod 12, a lower end of the self-leveling link rod 12 is hinged to an L hinge point on the front frame 3, the G hinge point is located above the I hinge point, and the H hinge point is located at a rear side of a connecting line between the G hinge point and the I hinge point. Connecting lines of the G hinge point, the H hinge point and the I hinge point of the three-hinge point holder form an equilateral triangle. Connecting lines between projection points of the I hinge point, the H hinge point, the F hinge point and the L hinge point on a central plane form a parallelogram. The self-leveling link rod is L-shaped, and an upper section thereof is bent backwardly, thus avoiding interference between the self-leveling link rod and the middle beam connecting the two rear link rods. The overturning oil cylinder is located below the movable arm beam.

[26] In the present disclosure, the bucket lifting mechanism is formed by superposing two four-link rods to realize vertical lifting, and a first four-link rod mechanism consisting of the movable arm 2, the rear link rod 5, the front frame 3 and the movable arm oil cylinder 4 realizes a lifting movement of the movable arm 2; and a second four-link rod consisting of the movable arm 2, the front link rod 6, the front frame 3 and the movable arm oil cylinder 4 realizes horizontal restraint in a lifting process, and controls a load moment arm to swing in a small range, so that a distance between the

bucket 1 and a front wheel is basically kept unchanged in the lifting process, so as to realize vertical lifting.

- [27] A forward Z-shaped six-link rod consisting of the bucket 1, the pulling rod 11, the rocker arm 10, the movable arm 2, the overturning oil cylinder 8 and the three-hinge point holder 7 at the front end of the accessory overturning mechanism realizes an overturning action, and controls an overturning angle of the bucket and a digging force of the bucket. The overturning oil cylinder 8 is mounted at the lower end of the rocker arm 10, and the pulling rod 11 is mounted at the upper end of the rocker arm 10, thus reducing a mounting height of the overturning oil cylinder 8 and improving a front visual field. Meanwhile, an overturning movement direction of the bucket is consistent with a movement direction of the rocker arm 10, which is beneficial to increasing the overturning angle of the bucket. A four-link rod mechanism consisting of the three-hinge point holder 7, the self-leveling link rod 12, the rear link rod 5 and the front frame 3 at the rear end of the bucket overturning mechanism realizes automatic leveling in an overturning process, which solves the problem of asynchronous angle turnover of the bucket lifting mechanism and the bucket overturning mechanism, and the four-link rod structure at the rear end controls the change of the bucket overturning angle in the lifting process of the bucket lifting mechanism, so that the change of the bucket angle relative to the ground is smaller. The three-hinge point holder 7 skillfully solves the connection problem of the overturning oil cylinder 8, the rear link rod 5 and the self-leveling link rod 12, and reduces the assembly difficulty.

Claims

- [Claim 1] A loader working device, comprising:
a front frame, wherein a front end of the front frame is provided with a support;
an accessory;
an accessory lifting mechanism connected between the accessory and a front frame of the loader, wherein the accessory lifting mechanism is symmetrical left and right about a central plane, and comprises:
a movable arm on each of left and right sides, wherein a movable arm beam is fixedly connected between two movable arms;
a movable arm oil cylinder on each of left and right sides, wherein one end of the movable arm oil cylinder is hinged to a point A on the movable arm, the other end is hinged to a point B on the front frame;
an accessory overturning mechanism connected between the accessory and a front frame of the loader;
a front link rod, wherein a front end of the front link rod is hinged to a point C on the support, and a rear end of the front link rod is hinged to a point D on the movable arm; and
a rear link rod, an upper end of the rear link rod is hinged to a point E at the rear end of the movable arm, and a lower end of the rear link rod is hinged to a point F on the front frame;
wherein:
a convex quadrilateral is formed by connecting lines between projection points of the hinge points A, E, F and D on a central plane;
the connecting lines between projection points of the hinge points C, E and D on the central plane form a triangle, and a projection point of the point D is located below the connecting line of the projection points of the point C and the point E.
- [Claim 2] The loader working device according to claim 1, wherein the movable arm is provided with a front link rod hinge arm extending downwardly, the rear end of the front link rod is hinged to a lower end of the front link rod hinge arm, and the front link rod hinge arm is located between the movable arm oil cylinder and the support at the front end of the front frame.
- [Claim 3] The loader working device according to claim 1, wherein: the accessory overturning mechanism comprises a pulling rod, a rocker arm, a overturning oil cylinder, a three-hinge point holder and a self-leveling

link rod; the rear link rods at left and right sides are connected into an H shape by a middle beam; a middle portion of the rocker arm is hinged to the movable arm beam; an upper end of the rocker arm is hinged to a rear end of the pulling rod; a front end of the pulling rod is hinged to the accessory; a lower end of the rocker arm is hinged to a front end of the overturning oil cylinder; a rear end of the overturning oil cylinder is hinged to a G hinge point of the three-hinge point holder; an H hinge point of the three-hinge point holder is hinged to the middle beam; an I hinge point of the three-hinge point holder is hinged to an upper end of the self-leveling link rod; a lower end of the self-leveling link rod is hinged to an L hinge point on the front frame; the G hinge point is located above the I hinge point; and the H hinge point is located at a rear side of a connecting line between the G hinge point and the I hinge point.

[Claim 4] The loader working device according to claim 2, wherein: the accessory overturning mechanism comprises a pulling rod, a rocker arm, a overturning oil cylinder, a three-hinge point holder and a self-leveling link rod; the rear link rods at left and right sides are connected into an H shape by a middle beam; a middle portion of the rocker arm is hinged to the movable arm beam; an upper end of the rocker arm is hinged to a rear end of the pulling rod; a front end of the pulling rod is hinged to the accessory; a lower end of the rocker arm is hinged to a front end of the overturning oil cylinder; a rear end of the overturning oil cylinder is hinged to a G hinge point of the three-hinge point holder; an H hinge point of the three-hinge point holder is hinged to the middle beam; an I hinge point of the three-hinge point holder is hinged to an upper end of the self-leveling link rod; a lower end of the self-leveling link rod is hinged to an L hinge point on the front frame; the G hinge point is located above the I hinge point; and the H hinge point is located at a rear side of a connecting line between the G hinge point and the I hinge point.

[Claim 5] The loader working device according to claim 3, wherein connecting lines of the G hinge point, the H hinge point and the I hinge point of the three-hinge point holder form an equilateral triangle.

[Claim 6] The loader working device according to claim 3, wherein connecting lines between projection points of the I hinge point, the H hinge point, the F hinge point and the L hinge point on a central plane form a parallelogram.

- [Claim 7] The loader working device according to claim 5, wherein the self-leveling link rod is L-shaped, and an upper section thereof is bent backwardly.
- [Claim 8] The loader working device according to claim 3, wherein the overturning oil cylinder is located below a movable arm beam.

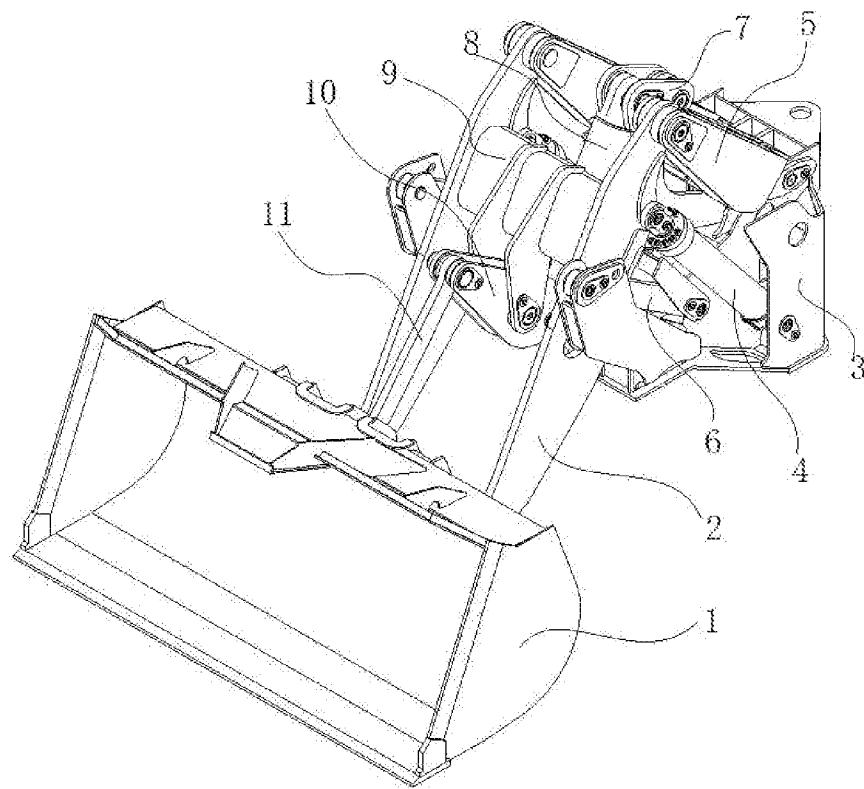


Fig.1

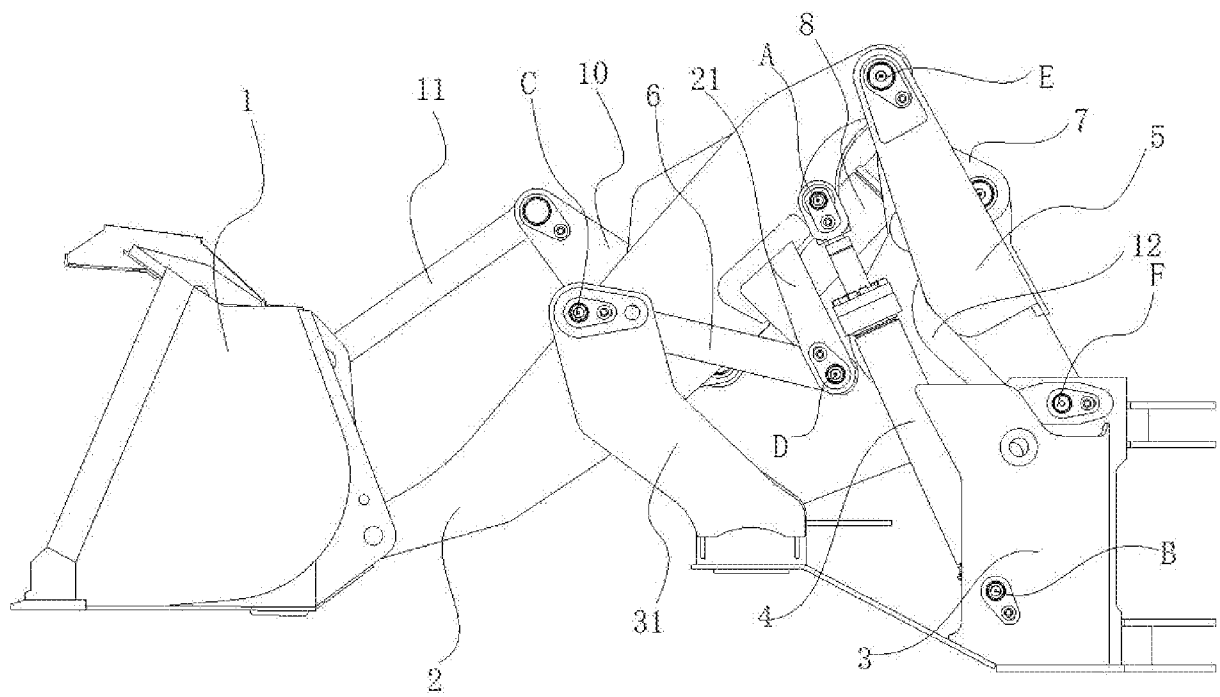


Fig.2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2019/073111

A. CLASSIFICATION OF SUBJECT MATTER E02F 3/28(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) E02F3/- 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) CNABS, SIPOABS, DWPI, CNTXT: loader, loading machine, loading attachment, grabbing device, excavating gear, excavator, excavating machine, bucket, accessory, lifting mechanism, turnover mechanism, movable arm, moving arm, movable armer, movable arm beam, movable arm oil cylinder, lifting oil cylinder, hoisting oil cylinders, bucket rotating oil cylinder, front connecting rod, rear connecting rod, front frame, front vehicle frame, rocker arm, rocking arm, rockerarm		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 108301448 A (GUANGXI LIUGONG MACHINERY CO. LTD.) 20 July 2018 (2018-07-20) claims 1-7, paragraphs [0003]-[0013]	1-8
A	CN 201280730 Y (CHANGLIN CO. LTD. ET AL.) 29 July 2009 (2009-07-29) page 2 paragraph 7- page 3 paragraph 1, figures 1-2	1-8
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☐ 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 15 March 2019	Date of mailing of the international search report 27 March 2019	
Name and mailing address of the ISA/CN National Intellectual Property Administration, PRC 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088 China Facsimile No. (86-10)62019451	Authorized officer KONG, Deming Telephone No. 86-(10)-53962928	

INTERNATIONAL SEARCH REPORT
Information on patent family members

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CN	101942845	A	12 January 2011	CN	101942845	B	25 April 2012
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