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(72) Inventor: **KIM, Joong-Ho**
Okcheon-gun
Chungcheongbuk-do 373-831 (KR)

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(74) Representative: **Gille Hrabal**
Patentanwälte
Brucknerstrasse 20
40593 Düsseldorf (DE)

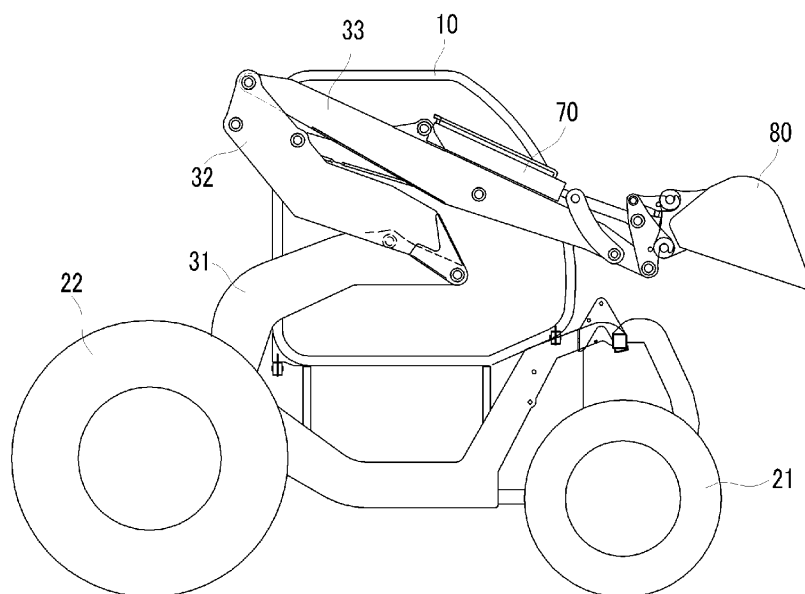
(71) Applicant: **Daeho Co., Ltd.**
Chungbuk 373-831 (KR)

(54) **TRACTOR INSTALLED ROTATABLE ARM**

(57) The present invention provides a tractor with a rotatable articulated arm in which a rotating shaft is installed around a driver cab of the tractor, and the articulated arm is coupled to the rotating shaft so that the articulated arm can rotate around the rotating shaft within as large an angular range as possible, whereby an operating radius and working efficiency of an operating im-

plement mounted to an end of the articulated arm can be markedly improved. In the present invention, the driver cab which is provided with a driver seat is disposed on a body frame at a position displaced to one side from a central portion of the body frame. The rotating shaft is installed around the driver cab. The articulated arm is installed on the rotating shaft so that the articulated arm can rotate around the rotating shaft.

[FIG 4]



Description

Technical Field

[0001] The present invention relates, in general, to tractors with rotatable articulated arms and, more particularly, to a tractor with a rotatable articulated arm in which a rotating shaft is installed around a driver cab of the tractor, and the articulated arm is coupled to the rotating shaft so that the articulated arm can rotate around the rotating shaft within as large an angular range as possible, whereby an operating radius and working efficiency of an operating implement mounted to an end of the articulated arm can be markedly improved.

Background Art

[0002] Generally, a tractor is an engineering vehicle designed to deliver a high tractive force and conduct different kinds of work in the agriculture or construction field. At present, tractors for agriculture typically include a front loader provided on a front end of a tractor body, and an attachment mounted to the front loader so as to conduct various kinds of work, such as transportation, unloading, loading, etc.

[0003] Recently, a technique in which a backhoe having an articulated arm is installed on a front or rear end of a tractor to perform various kinds of work was proposed.

[0004] However, as described above, in the case where the loader is installed on the front end of the tractor or the backhoe is provided on the rear end thereof, a workable area of the tractor is limited to an area either in front of or to the rear of the tractor. Therefore, if it is required to perform work in an area located to either side of the driver cab, the tractor must be rotated in a direction corresponding to the target area. This makes the work complicated and increases the time required to conduct the work.

Disclosure

Technical Problem

[0005] Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide a tractor with a rotatable articulated arm in which a rotating shaft is installed around a driver cab of the tractor, and the articulated arm is coupled to the rotating shaft so that the articulated arm can rotate around the rotating shaft within as large an angular range as possible, whereby an operating radius and working efficiency of an operating implement mounted to an end of the articulated arm can be markedly improved.

Technical Solution

[0006] In order to accomplish the above object, in an aspect, the present invention provides a tractor with a rotatable articulated arm, wherein a driver cab is provided with a driver seat and disposed on a body frame at a position displaced to one side from a central portion of the body frame, a rotating shaft is installed around the driver cab, and the articulated arm is installed on the rotating shaft so that the articulated arm can rotate around the rotating shaft.

[0007] The articulated arm may include: a rotating boom coupled to the rotating shaft; a first arm hinged to the rotating boom and vertically bent by a first hydraulic cylinder; a second arm hinged to the first arm and vertically bent by a second hydraulic cylinder, with an attachment provided on an end of the second arm.

[0008] In another aspect, the present invention provides a tractor with a rotatable articulated arm, wherein a rotating shaft is installed around a driver cab, and the articulated arm is coupled to the rotating shaft so that the articulated arm can rotate around the rotating shaft, the articulated arm including: a rotating boom coupled to the rotating shaft; a first arm hinged to the rotating boom and vertically bent by a first hydraulic cylinder; a second arm hinged to the first arm and vertically bent by a second hydraulic cylinder, wherein the first arm and the second arm are folded, the first arm and the second arm form a Z shape along with the rotating boom.

[0009] Furthermore, a bucket may be mounted to the end of the second arm.

[0010] The rotating boom may be curved in an arc shape.

[0011] When the first arm and the second arm are completely folded, the first arm and the second arm may be in space defined between four wheels of the tractor.

[0012] The first arm and the second arm may be configured such that when the first arm and the second arm are folded, the first and second hydraulic cylinders are respectively inserted into the first arm and the second arm.

[0013] The rotating shaft may be provided with a sprocket, and a chain may be coupled to the sprocket, the chain being connected to first ends of operating rods of a pair of third hydraulic cylinders, so that the rotating shaft is rotated by extension and contraction of the third hydraulic cylinders.

[0014] The sprocket and the chain coupled to the sprocket may form at least a double sprocket-chain structure.

[0015] Each of the third hydraulic cylinder may include a damping bushing provided on a second end of the operating rod, and a damping chamber formed in an end of the third hydraulic cylinder, the damping chamber forming a space into which the damping bushing is inserted, wherein the space has a size at which a fine gap is formed when the damping bushing is inserted into the damping chamber.

[0016] The rotating shaft may be disposed adjacent to a rear end of a side surface of the driver cab, so that the rotating boom can rotate around the rotating shaft within an angular range of 270°.

[0017] The rotating shaft may be fastened to the body frame or a rear axle.

Advantageous Effects

[0018] In a tractor with a rotatable articulated arm according to the present invention, a rotating shaft is installed around a driver cab of the tractor, and the articulated arm is coupled to the rotating shaft so that the articulated arm can rotate around the rotating shaft within as large an angular range as possible (within an angular range of about 270° in the case where the driver cab is disposed on a rear end of a side portion of the tractor body). Thereby, an operating radius and working efficiency of an operating implement mounted to an end of the articulated arm can be markedly improved.

[0019] Furthermore, in the present invention, the rotating shaft is disposed around a rear end of a side surface of the driver cab. Therefore, the articulated arm installation structure of the present invention can reduce the whole length of the tractor.

[0020] Moreover, the articulated arm according to the present invention includes an arc-shaped curved rotating boom and two arms (a first arm and a second arm), thus making it possible for the tractor to conduct work even in a small place. Hence, the tractor of the present invention can be used in a variety of work environments.

Description of Drawings

[0021]

Fig. 1 is a perspective view illustrating a tractor with a rotatable articulated arm, according to the present invention;

Fig. 2 is a bottom view illustrating the tractor with the rotatable articulated arm according to the present invention;

Fig. 3 is a view showing in detail the construction of a rotating shaft according to the present invention;

Fig. 4 is a side view of the tractor when the articulated arm is oriented forwards according to the present invention;

Fig. 5 is a side view of the tractor when the articulated arm is oriented rearwards according to the present invention;

Fig. 6 is a side view of the tractor to illustrate an operating radius of the articulated arm when it is oriented rearwards according to the present invention; and

Fig. 7 is a side view of the tractor to illustrate that it is possible for the tractor to carry out work even when it is in a small space after the articulated arm has been oriented rearwards.

<Description of the Reference Numerals in the Drawings>

[0022]

10: driver cab 21: front wheel
22: rear wheel 30: articulated arm
31: rotating boom 32: first arm
33: second arm 32a, 33a: hydraulic cylinder
40: rotating shaft 41: sprocket
42: chain 50: hydraulic cylinder
51: operating rod 52: damping bushing
53: damping chamber 54: fluid passage
60: frame box 61: bearing box
62, 63: bearing 70: hydraulic cylinder
80: bucket

Best Mode

[0023] Hereinafter, a tractor with a rotatable articulated arm according to the present invention will be described in detail with reference to the attached drawings.

[0024] As shown in Figs. 1 and 2, in the tractor with the rotatable articulated arm according to the present invention, a driver cab 10 having a driver seat therein is located on a left side portion of a body of the tractor, and the rotatable articulated arm 30 is disposed on a portion of the tractor body where the driver cab 10 is not located, so as to keep the balance of the tractor body.

[0025] In detail, the driver cab 10 is disposed between front wheels 21 and rear wheels 22 of the tractor and located on the left side portion of the tractor body such that space is formed beside the driver cab 10. When the articulated arm 30 is not in use, the articulated arm 30 is maintained in a folded state in this space.

[0026] A rotating shaft 40 is rotatably provided beside a rear end of a side surface of the driver cab 10, in other words, at a position adjacent to one corner of the driver cab 10. The articulated arm 30 is provided on the rotating shaft 40 so that the articulated arm 30 can be rotated around the rotating shaft 40 by rotation of the rotating shaft 40. The location of the rotating shaft 40 is not limited to the vicinity of the rear end of the side surface of the driver cab 10, and it can be disposed at any position, so long as it is adjacent to the driver cab 10. The articulated arm 30 includes a rotating boom 31 which is coupled to the rotating shaft 40, a first arm 32 which is hinged to the rotating boom 31 and is vertically folded or unfolded by a hydraulic cylinder 32a, and a second arm 33 which is hinged to the first arm 32 and is vertically folded or unfolded by a hydraulic cylinder 33a. An attachment is provided on an end of the second arm 33.

[0027] The first arm 32 and the second arm 33 respectively have spaces therein so that, when the first arm 32 and the second arm 33 are folded, the hydraulic cylinder 32a and the hydraulic cylinder 33a which operate the first and second arms 32 and 33 are respectively inserted into the spaces of the first and second arms 32 and 33.

Thanks to this structure, interference with the hydraulic cylinder 32a or 33a can be minimized, whereby the first arm 32 and the second arm 33 can be folded to the greatest extent.

[0028] As shown in Fig. 4, when the first arm 32 and the second arm 33 are folded, they, along with the rotating boom 31, form a Z shape. Because the articulated arm 30 which includes the rotating boom 31, the first arm 32 and the second arm 33 has the Z-shaped structure, when the articulated arm 30 is not in operation, it can be stably maintained in the folded state in the space formed beside the driver cab 10. Therefore, when the tractor moves, it can move smoothly and without instability.

[0029] Furthermore, the tractor is configured such that, when the first arm 32 and the second arm 33 are folded to the greatest extent, the first and second arms 32 and 33 are in space defined between the front and rear wheels of the tractor. Thereby, when the tractor travels, the first and second arms 32 and 33 can be maintained in a more stable state.

[0030] The rotating boom 31 which is coupled to the rotating shaft 40 is configured to be curved in an arc shape. Hence, after the articulated arm has been rotated rearwards, that is, towards the rear wheels 22, by rotation of the rotating shaft 40, it becomes possible to conduct work using the articulated arm, even in a small space, without interference with the rear wheels 22.

[0031] Furthermore, when the articulated arm 30 is being rotated by the rotation of the rotating shaft 40, except for the driver cab 10 which is disposed on the left portion of the tractor body, nothing impedes the rotation of the articulated arm 30. Therefore, the articulated arm 30 can easily rotate around the rotating shaft 40 within an angular range other than an angular range within which it would interfere with the driver cab 10. In the case where the driver cab 10 is disposed in a rear end of the left side portion of the tractor, if the angular range within which the driver cab 10 impedes the rotation of the articulated arm 30 is excluded, the articulated arm 30 can rotate within an angular range of about 270° (from a range of about 260° to a range of about 290°).

[0032] Below, the structure for rotating the rotating shaft 40 will be described with reference to Figs. 2 and 3.

[0033] As shown in Figs. 2 and 3, although it is preferable that the rotating shaft 40 is installed in a frame box 60 provided in a rear end of a body frame, it may be installed on a rear axle. A plurality of bearings 62 and 63 are provided around the rotating shaft 40 so that it can smoothly rotate. A bearing box 61 which houses the bearing 62 therein is installed in the frame box 60.

[0034] Furthermore, a sprocket 41 is provided around a circumferential outer surface of the rotating shaft 40. A chain 42 is wrapped around the sprocket 41. Opposite ends of the chain 42 are respectively coupled to outer ends of operating rods 51 of two hydraulic cylinders 50. Thus, the rotating shaft 40 can be rotated by extension and contraction of the hydraulic cylinders 50.

[0035] In Fig. 3, a triple sprocket-chain structure having

three sprockets 41 and three chains 42 is illustrated as being used to increase rotating force of the articulated arm 30 coupled to the rotating shaft 40. Preferably, a double sprocket-chain structure comprising at least two sprockets and two chains is used.

[0036] Each hydraulic cylinder 50 includes a damping structure to prevent the rotating shaft 40 from excessively rapidly rotating.

[0037] The damping structure of the hydraulic cylinder 50 includes a damping bushing 52 which is provided on an inner end of the operating rod 51, and a damping chamber 53 which is formed in an end of the hydraulic cylinder and forms a space into which the damping bushing 52 is inserted. The damping structure is configured such that, when the operating rod 51 is completely extended and the damping bushing 52 is thus inserted into the damping chamber 53, a narrow gap is formed and operating oil of the hydraulic cylinder 50 comes out towards a fluid passage 54 through the narrow gap. At this time, the expansion or contraction speed of the hydraulic cylinder 50 is reduced. In this way, the damping function can be conducted.

[0038] Hereinafter, a working process of the tractor with the rotatable articulated arm according to the present invention will be explained with reference to Figs. 4 through 7.

[0039] The attachment is provided on the end of the articulated arm 30 so that an operating implement such as a bucket, a bale clamp, a fork lift, a hook, etc. can be easily and removably mounted to the articulated arm 30. In an embodiment of Figs. 4 through 7, a small bucket 80 is provided on the end of the articulated arm 30.

[0040] When the tractor moves forwards or rearwards, the articulated arm 30 assumes the position of Fig. 4. To conduct work in front of the tractor using the operating implement (for example, a bucket) provided on the end of the articulated arm 30, from the state of Fig. 4, the bucket 80 is moved forwards by folding or unfolding the first and second arms 32 and 33 of the articulated arm 30, and the orientation of the bucket 80 is adjusted by controlling the hydraulic cylinder 70 provided in the second arm 33.

[0041] When it is required to conduct work in an area to the side of the tractor that corresponds to the right side of the driver cab 10, the rotating shaft 40 is rotated such that the articulated arm 30 is oriented in the lateral direction of the tractor.

[0042] Furthermore, to conduct work backing an area to the rear of the tractor, as shown in Fig. 5, the rotating shaft 40 is rotated such that the articulated arm 30 is oriented rearwards. Here, the driver seat (not shown) provided in the driver cab 10 has a rotatable structure. Therefore, after the driver seat has been rotated rearwards, the driver in the seat can easily operate the articulated arm 30 without turning his/her head.

[0043] Meanwhile, because the articulated arm 30 includes the rotating boom 31 coupled to the rotating shaft 40, and the first and second arms 32 and 33 which are

hinged to the rotating boom 31 and are respectively operated by the hydraulic cylinders 32a and 33a, the operating radius of the articulated arm 30 can be increased, as shown in Fig. 6, showing the case where the first arm 32 and the second arm 33 are extended.

[0044] Furthermore, since the rotating boom 31 of the articulated arm 30 has the arc-shaped curved structure, as shown in Fig. 7, it can conduct work even in a small space without being impeded by the rear wheels 22.

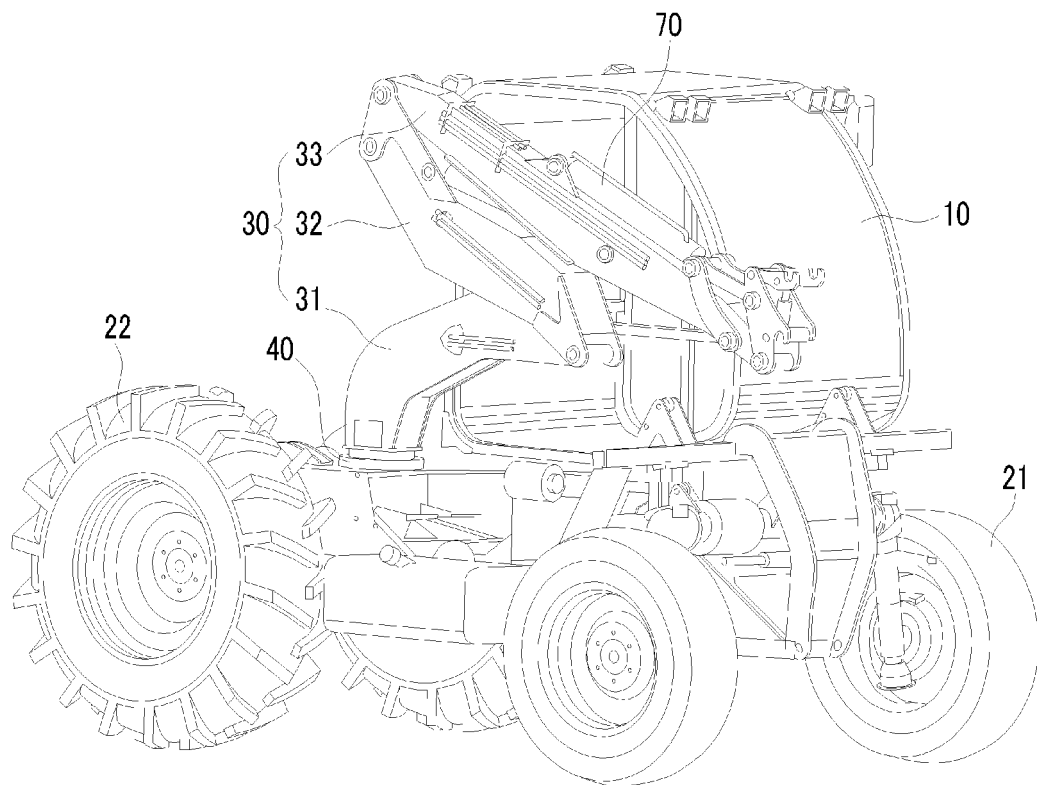
[0045] In the present invention having the above-mentioned construction, the articulated arm 30 can rotate within an angular range of about 270°. The operating radius of the operating implement mounted to the end of the articulated arm 30 can be further increased. Thereby, operation efficiency of the tractor can be markedly enhanced.

[0046] Although the preferred embodiment of the present invention has been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

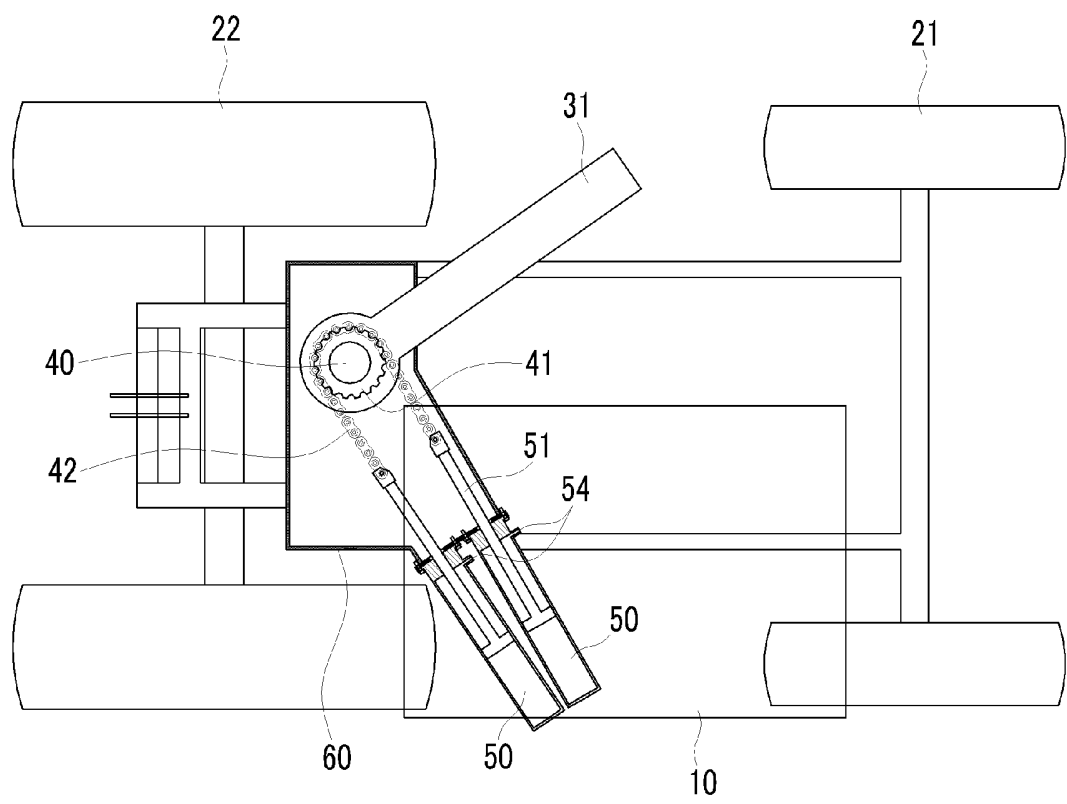
Claims

1. A tractor with a rotatable articulated arm, wherein a driver cab is provided with a driver seat and disposed on a body frame at a position displaced to one side from a central portion of the body frame, a rotating shaft is installed around the driver cab, and the articulated arm is installed on the rotating shaft so that the articulated arm can rotate around the rotating shaft.
2. The tractor with the rotatable articulated arm of claim 1, wherein the articulated arm comprises: a rotating boom coupled to the rotating shaft; a first arm hinged to the rotating boom and vertically bent by a first hydraulic cylinder; a second arm hinged to the first arm and vertically bent by a second hydraulic cylinder, with an attachment provided on an end of the second arm.
3. A tractor with a rotatable articulated arm, wherein a rotating shaft is installed around a driver cab, and the articulated arm is coupled to the rotating shaft so that the articulated arm can rotate around the rotating shaft, the articulated arm comprising: a rotating boom coupled to the rotating shaft; a first arm hinged to the rotating boom and vertically bent by a first hydraulic cylinder; a second arm hinged to the first arm and vertically bent by a second hydraulic cylinder, wherein the first arm and the second arm are folded, the first arm and the second arm form a Z shape along with the rotating boom.
4. The tractor with the rotatable articulated arm of claim
- 2 or 3, wherein a bucket is mounted to the end of the second arm.
5. The tractor with the rotatable articulated arm of claim 2 or 3, wherein the rotating boom is curved in an arc shape.
6. The tractor with the rotatable articulated arm of claim 2 or 3, wherein when the first arm and the second arm are completely folded, the first arm and the second arm are in space defined between four wheels of the tractor.
7. The tractor with the rotatable articulated arm of claim 2 or 3, wherein the first arm and the second arm are configured such that when the first arm and the second arm are folded, the first and second hydraulic cylinders are respectively inserted into the first arm and the second arm.
8. The tractor with the rotatable articulated arm of claim 2 or 3, wherein the rotating shaft is provided with a sprocket, and a chain is coupled to the sprocket, the chain being connected to first ends of operating rods of a pair of third hydraulic cylinders, so that the rotating shaft is rotated by extension and contraction of the third hydraulic cylinders.
9. The tractor with the rotatable articulated arm of claim 8, wherein the sprocket and the chain coupled to the sprocket form at least a double sprocket-chain structure.
10. The tractor with the rotatable articulated arm of claim 8, wherein each of the third hydraulic cylinder includes a damping bushing provided on a second end of the operating rod, and a damping chamber formed in an end of the third hydraulic cylinder, the damping chamber forming a space into which the damping bushing is inserted, wherein the space has a size at which a fine gap is formed when the damping bushing is inserted into the damping chamber.
11. The tractor with the rotatable articulated arm of claim 2 or 3, wherein the rotating shaft is disposed adjacent to a rear end of a side surface of the driver cab, so that the rotating boom can rotate around the rotating shaft within an angular range of 270°.
12. The tractor with the rotatable articulated arm of claim 2 or 3, wherein the rotating shaft is fastened to the body frame or a rear axle.

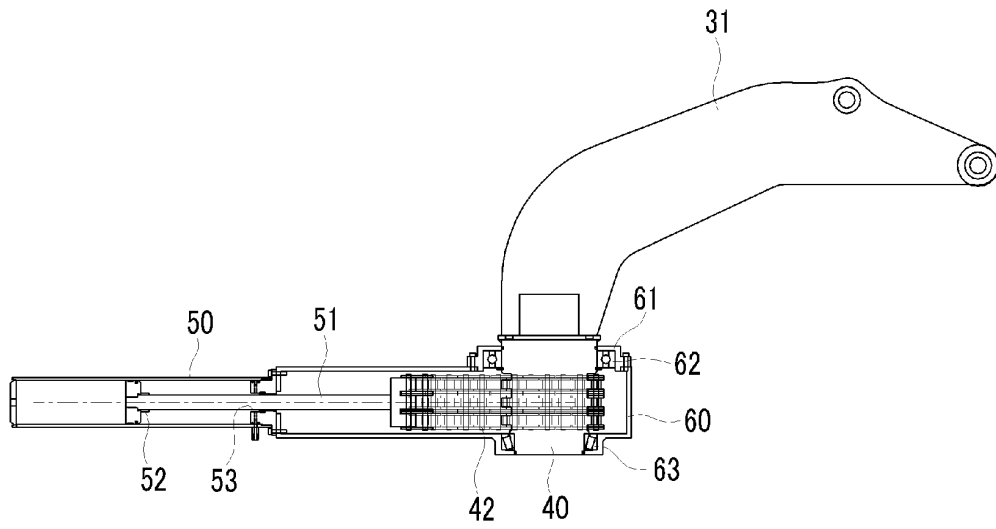
[FIG 1]



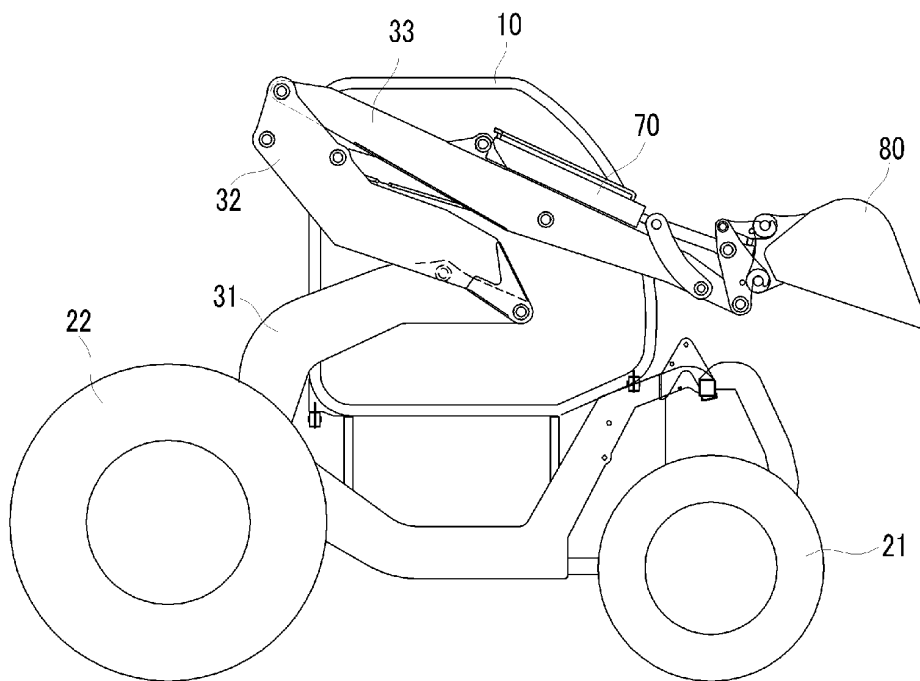
[FIG 2]



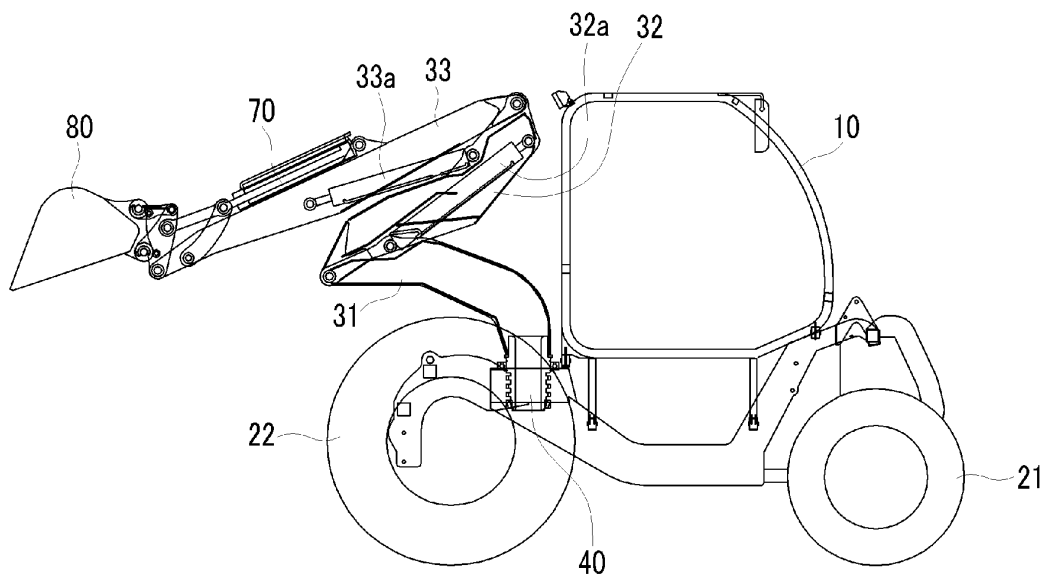
[FIG 3]



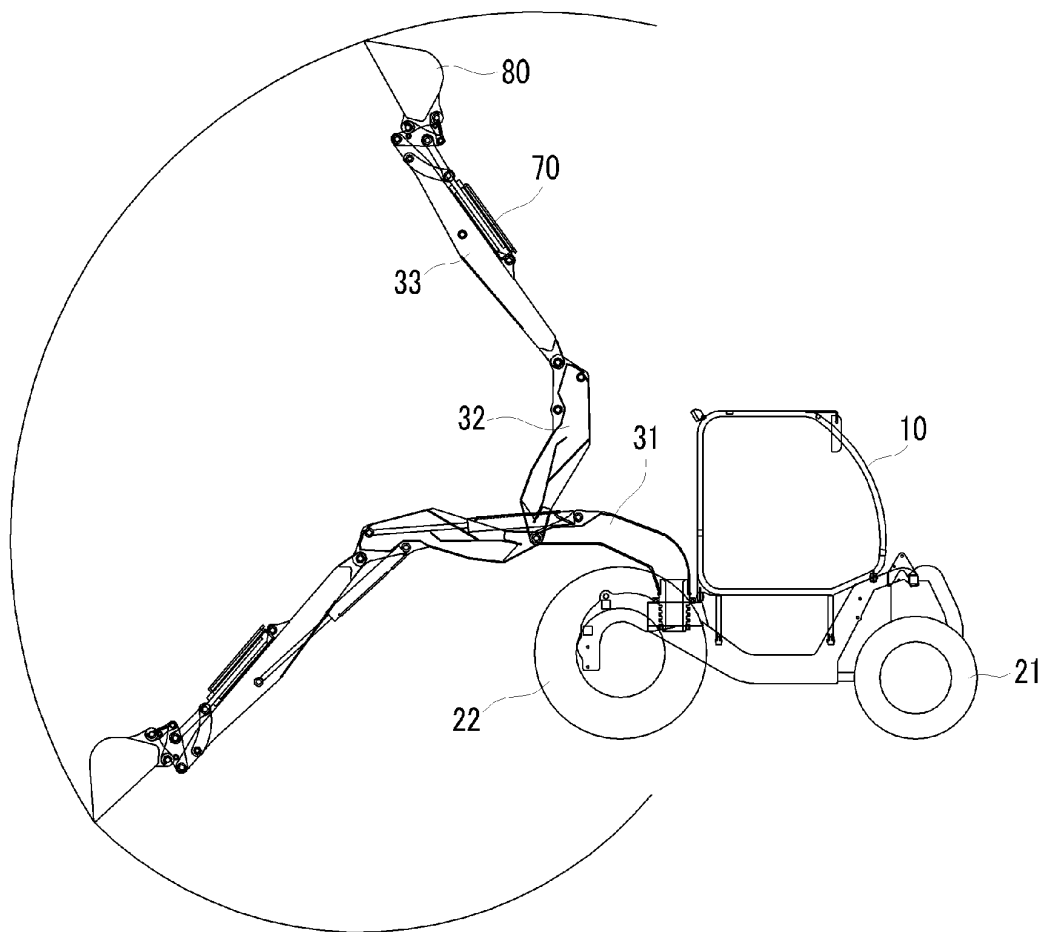
[FIG 4]



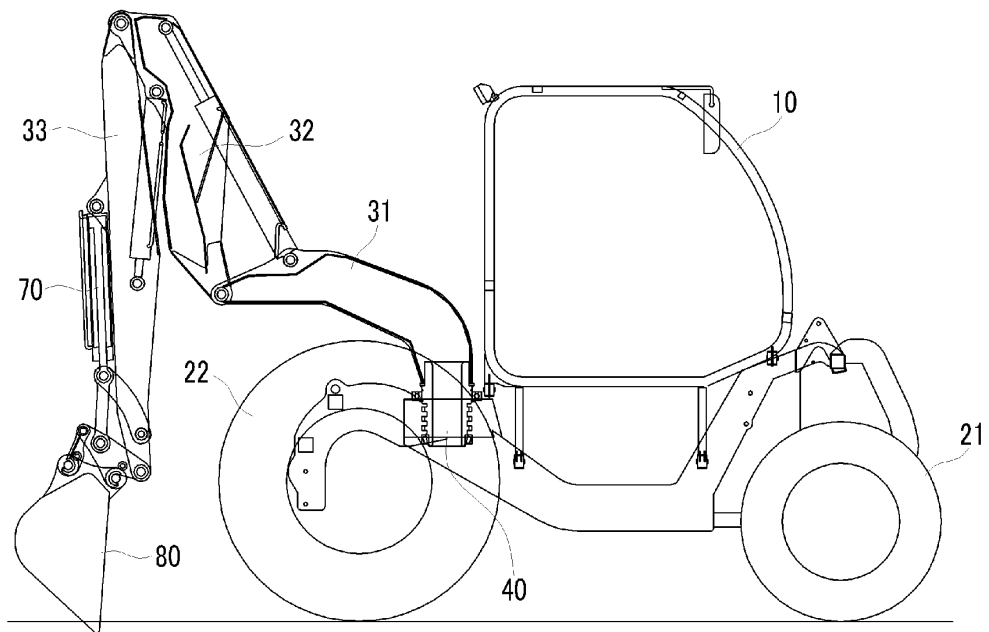
[FIG 5]



[FIG 6]



[FIG 7]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2011/003779**A. CLASSIFICATION OF SUBJECT MATTER*****E02F 3/42(2006.01)i, B66C 23/68(2006.01)i, A01B 63/102(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 3/42; A01B 49/00; E02F 7/04; B60P 1/04; A01B 63/00

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: refraction arm, tractor, frame, rotatable shaft, rotatable boom, hinge, attachment, hydraulic cylinder, bucket.**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 57-012463 U (YANO SANYU) 22 January 1982 Claim 1 and figures 1-2.	1,2,4-5,11-12 1-12
Y A	KR 20-0227627 Y1 (CHO, DONG HYEON) 15 June 2001 Claim 1 and figures 2-4.	1,2,4-5,11-12 1-12
Y A	KR 10-0232366 B1 (KWON, TAE KUN) 01 December 1999 Claims 1-2 and figures 1-2.	2,4-5,11-12 1-12

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

* Special categories of cited documents:

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Date of the actual completion of the international search

30 JANUARY 2012 (30.01.2012)

Date of mailing of the international search report

06 FEBRUARY 2012 (06.02.2012)

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2011/003779

Patent document cited in search report	Publication date	Patent family member	Publication date
JP 57-012463 U	22.01.1982	NONE	
KR 20-0227627 Y1	15.06.2001	NONE	
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Form PCT/ISA/210 (patent family annex) (July 2009)