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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/961,868	10/07/2022	Brad Thomas	31681-641	8378

76656 7590 09/24/2024

Patent Docket Department
Armstrong Teasdale LLP
7700 Forsyth Boulevard
Suite 1800
St. Louis, MO 63105

EXAMINER	
KRAMER, DEAN J	

ART UNIT	PAPER NUMBER
3651	

NOTIFICATION DATE	DELIVERY MODE
09/24/2024	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USpatents@atllp.com

APPLICATION NO.	ISSUE DATE	PATENT NO.
17/961,868	24-Sep-2024	12098063

Patent Docket Department
Armstrong Teasdale LLP
7700 Forsyth Boulevard
St. Louis, MO 63105

EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at https://patentcenter.uspto.gov

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit https://www.uspto.gov/electronicgrants

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/961,868	09/24/2024	12098063	31681-641	8378

76656 7590 09/04/2024

Patent Docket Department
Armstrong Teasdale LLP
7700 Forsyth Boulevard
Suite 1800
St. Louis, MO 63105

ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at https://patentcenter.uspto.gov/. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

The USPTO is implementing electronic patent issuance with a transition period, during which period the USPTO will mail a ceremonial paper copy of the electronic patent grant to the correspondence address of record. Additional copies of the patent (i.e., certified and presentation copies) may be ordered for a fee from the USPTO's Certified Copy Center at https://certifiedcopycenter.uspto.gov/index.html. The Certified Copy Center may be reached at (800)972-6382.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Center (https://patentcenter.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional inventors):

Brad Thomas, Pleasant Hill, IA;
Louis Hartke, Pella, IA;
Greg Langenfeld, Bettendorf, IA;
Matt Hutchinson, Pella, IA;

APPLICANT(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional applicants):

Vermeer Manufacturing Company, Pella, IA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/961,868	**08/15/2024 02:04:20 PM Z ET**	**31681-641**

Title of Invention

COMPACT TOOL CARRIER AND MAINFRAMES FOR A SELF-PROPELLED MACHINE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8378	FILED BY	Teddi Weber
PATENT CENTER #	66798543	FILING DATE	10/07/2022
CUSTOMER #	76656	FIRST NAMED INVENTOR	Brad Thomas
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Michael Vander Molen

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
3084USC5 Issue Fee Transmittal 15AUG2024.pdf	1	Issue Fee Payment (PTO-85B)	155 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
3084USC5 Issue Fee Transmittal 15AUG2024.pdf	0F2C8D53CB73E532000A4F39AC710BAA33CA6042B1C11AB0C9381684CF3A18F462024B62306B19EAF626B481D594AFB0DFFDA2FFADCC8F331E3C26B96ECF5A6D

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

76656 7590 08/15/2024

Patent Docket Department
Armstrong Teasdale LLP
7700 Forsyth Boulevard
Suite 1800
St. Louis, MO 63105

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/961,868	10/07/2022	Brad Thomas	31681-641	8378

TITLE OF INVENTION: COMPACT TOOL CARRIER AND MAINFRAMES FOR A SELF-PROPELLED MACHINE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	11/15/2024

EXAMINER	ART UNIT	CLASS-SUBCLASS
KRAMER, DEAN J	3651	414-722000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Armstrong Teasdale LLP
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Vermeer Manufacturing Company

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Pella, IA

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 012384

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

☐ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

☐ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Michael J. Vander Molen/ Date 08/15/2024

Typed or printed name Michael J. Vander Molen Registration No. 57274

UNITED STATES
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Alexandria, VA 22313 - 1450
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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/961,868	**08/15/2024 02:04:20 PM Z ET**	**31681-641**

Title of Invention

COMPACT TOOL CARRIER AND MAINFRAMES FOR A SELF-PROPELLED MACHINE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8378	FILED BY	Teddi Weber
PATENT CENTER #	66798543	AUTHORIZED BY	Michael Vander Molen
CUSTOMER #	76656	FILING DATE	10/07/2022
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Brad Thomas

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
DA / 012384	**E20248EE05459689**	**Teddi Weber**

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
1501	UTILITY ISSUE FEE	1200.00	1	1200.00
			TOTAL AMOUNT:	**$1,200.00**

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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NOTICE OF ALLOWANCE AND FEE(S) DUE

76656 7590 08/15/2024

Patent Docket Department
Armstrong Teasdale LLP
7700 Forsyth Boulevard
Suite 1800
St. Louis, MO 63105

EXAMINER	
KRAMER, DEAN J	
ART UNIT	**PAPER NUMBER**
3651	

DATE MAILED: 08/15/2024

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/961,868	10/07/2022	Brad Thomas	31681-641	8378

TITLE OF INVENTION: COMPACT TOOL CARRIER AND MAINFRAMES FOR A SELF-PROPELLED MACHINE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	11/15/2024

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

76656 7590 08/15/2024

Patent Docket Department
Armstrong Teasdale LLP
7700 Forsyth Boulevard
Suite 1800
St. Louis, MO 63105

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/961,868	10/07/2022	Brad Thomas	31681-641	8378

TITLE OF INVENTION: COMPACT TOOL CARRIER AND MAINFRAMES FOR A SELF-PROPELLED MACHINE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	11/15/2024

EXAMINER	ART UNIT	CLASS-SUBCLASS
KRAMER, DEAN J	3651	414-722000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via the USPTO patent electronic filing system ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/961,868	10/07/2022	Brad Thomas	31681-641	8378

76656 7590 08/15/2024

Patent Docket Department
Armstrong Teasdale LLP
7700 Forsyth Boulevard
Suite 1800
St. Louis, MO 63105

EXAMINER	
KRAMER, DEAN J	

ART UNIT	PAPER NUMBER
3651	

DATE MAILED: 08/15/2024

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/ owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).
https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf

Routine uses of the information in this record may include disclosure to:

1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
2) a federal, state, local, or international agency, in response to its request;
3) a contractor of the USPTO having need for the information in order to perform a contract;
4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
8) another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c));
9) the Office of Personnel Management (OPM) for personnel research purposes; and
10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 17/961,868	Applicant(s) Thomas et al.	
	Examiner DEAN J KRAMER	Art Unit 3651	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to the amendment filed 8/1/2024.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-14 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/DEAN J KRAMER/
Primary Examiner, Art Unit 3651

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	Art Unit
	DEAN J KRAMER	3651

CPC - Searched*		
Symbol	Date	Examiner
B62D 21/16; 21/186; 51/007; 51/02; 51/04	03/15/2023	djk
B66F 9/065; 9/075; 9/07513; 9/07518; 9/07527; 9/07572; 9/07577	03/15/2023	djk
B60P 1/483	03/15/2023	djk
E02F 9/08; 9/0816; 9/0825	03/15/2023	djk

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
inventor and assignee search	03/15/2023	djk
updated search	10/03/2023	djk
updated search	01/04/2024	djk
updated search	07/16/2024	djk
updated search	08/07/2024	djk

EX1002 / Page 15 of 527
Kubota North America Corporation et al

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	Art Unit
	DEAN J KRAMER	3651

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
PGPubs text search	see search history	08/07/2024	djk

EX1002 / Page 16 of 527
Kubota North America Corporation et al

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	**Art Unit**
	DEAN J KRAMER	3651

CPC						
Symbol					**Type**	**Version**
B66F	/	9	/	065	F	2013-01-01
B66F	/	9	/	06	I	2013-01-01
B66F	/	9	/	07577	I	2013-01-01
E02F	/	3	/	3414	I	2013-01-01
E02F	/	3	/	3405	I	2013-01-01
E02F	/	3	/	96	I	2013-01-01
E02F	/	9	/	08	I	2013-01-01
E02F	/	9	/	205	I	2013-01-01
B60P	/	1	/	483	I	2013-01-01
B66F	/	9	/	07572	I	2013-01-01
B66F	/	9	/	0759	I	2013-01-01
B66F	/	9	/	22	I	2013-01-01

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	14	
/DEAN J KRAMER/ Primary Examiner, Art Unit 3651	07 August 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

U.S. Patent and Trademark Office — Part of Paper No.: 20240807

EX1002 / Page 17 of 527
Kubota North America Corporation et al

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	**Art Unit**
	DEAN J KRAMER	3651

INTERNATIONAL CLASSIFICATION				
CLAIMED				
B66F	/	9	/	06
B66F	/	9	/	065
B66F	/	9	/	075
B66F	/	9	/	22
B60P	/	1	/	48
E02F	/	3	/	34
E02F	/	3	/	96
E02F	/	9	/	08
E02F	/	9	/	20

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE (Assistant Examiner) (Date)	**Total Claims Allowed:** 14	
/DEAN J KRAMER/ Primary Examiner, Art Unit 3651 (Primary Examiner) 07 August 2024 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 3

U.S. Patent and Trademark Office Part of Paper No.: 20240807

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	Art Unit
	DEAN J KRAMER	3651

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	10	10												
2	2	11	11												
3	3	12	12												
4	4	13	13												
5	5	14	14												
6	6														
7	7														
8	8														
9	9														

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	14	
/DEAN J KRAMER/ Primary Examiner, Art Unit 3651	07 August 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

U.S. Patent and Trademark Office

Part of Paper No.: 20240807

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	Art Unit
	DEAN J KRAMER	3651

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/16/2023	10/04/2023	01/04/2024	07/16/2024	08/07/2024				
1	1	✓	=	=	=	=				
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3	3	✓	=	=	=	=				
4	4		✓	✓	=	=				
5	5		✓	✓	=	=				
6	6		✓	✓	=	=				
7	7		✓	✓	=	=				
8	8		✓	✓	=	=				
9	9		✓	✓	=	=				
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14	14		✓	✓	=	=				
	15		✓	✓	✓	-				
	16		✓	✓	✓	-				
	17		✓	✓	✓	-				
	18		✓	✓	✓	-				
	19		✓	✓	✓	-				
	20		✓	✓	✓	-				

Bibliographic Data

Application No: 17/961,868

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /DEAN J KRAMER/ Examiner's Signature | Initials

Title: COMPACT TOOL CARRIER AND MAINFRAMES FOR A SELF-PROPELLED MACHINE

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/07/2022	414	3651	31681-641
RULE			

APPLICANTS

Vermeer Manufacturing Company,

INVENTORS

Brad Thomas, Pleasant Hill, IA, UNITED STATES

Louis Hartke, Pella, IA, UNITED STATES

Greg Langenfeld, Bettendorf, IA, UNITED STATES

Matt Hutchinson, Pella, IA, UNITED STATES

CONTINUING DATA

This application is a CON of 17397200 08/09/2021 PAT 11465891

17397200 is a CON of 16270070 02/07/2019ABN

16270070 is a CON of 15704685 09/14/2017 PAT 10202266

15704685 is a CON of 15062801 03/07/2016 PAT 9975750

15062801 is a CON of 14691649 04/21/2015 PAT 9321386

14691649 has PRO of 62118860 02/20/2015

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

10/21/2022

STATE OR COUNTRY

UNITED STATES

ADDRESS

Patent Docket Department

Armstrong Teasdale LLP

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Suite 1800

St. Louis, MO 63105
UNITED STATES

FILING FEE RECEIVED

$1,820

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	66	("10202266" OR "1808735" OR "20030095857" OR "20040026153" OR "20040228715" OR "20050036876" OR "20070017713" OR "20070128012" OR "20070132204" OR "20080197588" OR "20090116943" OR "20100106344" OR "20100183412" OR "20110137491" OR "20120291319" OR "20120305025" OR "20140271078" OR "2298450" OR "2345620" OR "2455474" OR "2558928" OR "2563277" OR "2774496" OR "2849132" OR "2953264" OR "2980271" OR "3074572" OR "3586195" OR "3908778" OR "4087101" OR "4117610" OR "4186812" OR "4239444" OR "5169278" OR "5423654" OR "5470190" OR "5520500" OR "5542814" OR "5551523" OR "5609464" OR "5894908" OR "6182778" OR "6205665" OR "6325589" OR "6474933" OR "6575262" OR "6616398" OR "6695568" OR "6866466" OR "7214026" OR "7264435" OR "7428943" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/15 10:06 AM

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L2	76	(((("THOMAS") near3 ("Brad")) OR ((("HARTKE") near3 ("Louis")) OR ((("LANGENFELD") near3 ("Greg")) OR ((("HUTCHINSON") near3 ("Matt"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2023/03/15 10:27 AM
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L5	22	("1789238" | "2535301" | "2725223" | "2822056" | "3437163" | "3880445").pn. OR ("4087101").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 10:29 AM
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L7	1453	b62d21/16.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 10:42 AM
L8	3470	b62d21/186.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP,	OR	ON	ON	2023/03/15 11:06 AM

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L12	663	9 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2023/03/15 12:34 PM

			EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
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L14	3547	13 NOT (12 OR 7)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 12:49 PM
L15	0	b66f9/17518.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:02 PM
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L18	887	e02f9/0816.cpc. OR e02f9/0825.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:05 PM
L19	703	e02f9/08.cpc. AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA,	OR	ON	ON	2023/03/15 01:13 PM

			VN); FPRS; EPO; JPO; IBM_TDB)				
L20	652	19 NOT 18	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:13 PM
L21	2186	b60p1/483.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:34 PM
L22	206	21 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:34 PM
L23	5406	(b62d51/007.cpc. OR b62d51/02.cpc. OR b62d51/04.cpc.) OR 280/797.ccls.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO,	OR	ON	ON	2023/03/15 03:10 PM

			MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L24	489	23 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 03:10 PM
L25	468	24 NOT (12 OR 7 OR 20 OR 17)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 03:11 PM
L26	4	((US-8821104-B2 OR US-6205665-B1 OR US-5551523-A OR US-4087101-A).did. AND USPT.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/10/03 11:05 AM
L27	30	("5547244" | "6065276" | "6098739" | "6205665" | "6283220" | "6684537" | "8303026" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 11:42 AM

		"20040028514").pn. OR ("8821104").urpn. AND (PGPB | USPT | USOC).dbnm.					
L28	14	("3452887" | "3667620" | "3912092" | "4119222" | "6085811" | "6470606" | "6648578").pn. OR ("7695236").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 12:51 PM
L29	77	("1808735" | "2298450" | "2345620" | "2455474" | "2558928" | "2563277" | "2774496" | "2849132" | "2953264" | "2980271" | "3074572" | "3586195" | "3908778" | "4087101" | "4117610" | "4186812" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5520500" | "5542814" | "5551523" | "5609464" | "5894908" | "D431574" | "6182778" | "6205665" | "6325589" | "6474933" | "6575262" | "6616398" | "6695568" | "6866466" | "7214026" | "7264435" | "7428943" | "7695236" | "7805864" | "7866700" | "D631898" | "7980569" | "8016065" | "8109356" | "8152433" | "8821104" | "9045882" | "9321386" | "9975750" | "10202266" | "20030095857" | "20040026153" | "20040228715" | "20050036876" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100106344" | "20100183412" | "20110137491" | "20120291319" | "20120305025" | "20140271078").pn. OR ("11465891").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 01:03 PM
L30	15	("2007/0128012").urpn. AND (PGPB | USPT |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 01:07 PM

		USOC).dbnm.					
L31	1470	b62d21/16.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L32	3517	b62d21/186.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L33	3744	(B66F9/065.cpc. OR b66f9/075$.cpc.) AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L34	888	e02f9/0816.cpc. OR e02f9/0825.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO,	OR	ON	ON	2023/10/03 02:19 PM

			NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L35	9296	31 OR 32 OR 33 OR 34	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L36	15	("4345524" | "5253777" | "5269585" | "5352011" | "5501504" | "5577746" | "6041880" | "7275785" | "7422241" | "8973982" | "9200344" | "20100206439" | "20150099139" | "20150360725").pn. OR ("10822034").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 02:25 PM
L37	18	("2701728" | "3032352" | "3595410" | "3700256" | "3822073" | "4087101" | "4232883" | "4403671" | "4664404" | "4690183" | "4736633" | "D436969" | "6880854" | "8662460" | "20130026789" | "20180186207").pn. OR ("10518810").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 02:31 PM
L38	5	((US-8821104-B2 OR US-6205665-B1 OR US-5551523-A OR US-4087101-A OR US-3074572-A).did. AND USPT.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK,	OR	ON	ON	2024/01/04 10:43 AM

			TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L39	11	("3074572").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 10:44 AM
L40	56	("2345620" | "2455474" | "2558928" | "2774496" | "2849132" | "2953264" | "2980271" | "3074572" | "3586195" | "4117610" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5542814" | "5609464" | "D431574" | "6325589" | "6474933" | "6616398" | "6695568" | "7214026" | "7264435" | "7695236" | "7805864" | "7980569" | "8152433" | "8821104" | "20040026153" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100183412" | "20120291319" | "20120305025" | "20140271078").pn. OR ("9975750").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 10:45 AM
L41	14	("3452887" | "3667620" | "3912092" | "4119222" | "6085811" | "6470606" | "6648578").pn. OR ("7695236").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 11:00 AM
L42	41	("2984373" | "3412819" | "3540220" | "3833261" | "4547119" | "4676713" | "4691806" | "5027940" | "5040428" | "5083895").pn. OR ("5423654").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 11:03 AM
L43	11	("2774496").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 11:09 AM
L44	1484	b62d21/16.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP,	OR	ON	ON	2024/01/04 11:12 AM

			AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L45	3818	(B66F9/065.cpc. OR b66f9/075$.cpc.) AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/04 11:12 AM
L46	897	e02f9/0816.cpc. OR e02f9/0825.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/04 11:12 AM
L47	6177	44 OR 45 OR 46	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO;	OR	ON	ON	2024/01/04 11:12 AM

			JPO; IBM_TDB)				
L48	5	((US-8821104-B2 OR US-6205665-B1 OR US-5551523-A OR US-4087101-A OR US-3074572-A).did. AND USPT.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/07/16 07:23 AM
L49	1	("9975750").pn.	(USPAT)	OR	ON	ON	2024/07/16 07:24 AM
L50	58	("2345620" | "2455474" | "2558928" | "2774496" | "2849132" | "2953264" | "2980271" | "3074572" | "3586195" | "4117610" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5542814" | "5609464" | "D431574" | "6325589" | "6474933" | "6616398" | "6695568" | "7214026" | "7264435" | "7695236" | "7805864" | "7980569" | "8152433" | "8821104" | "20040026153" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100183412" | "20120291319" | "20120305025" | "20140271078").pn. OR ("9975750").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 07:24 AM
L51	228	48 OR 50	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO,	OR	ON	ON	2024/07/16 07:25 AM

			MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L52	77	("1808735" | "2298450" | "2345620" | "2455474" | "2558928" | "2563277" | "2774496" | "2849132" | "2953264" | "2980271" | "3074572" | "3586195" | "3908778" | "4087101" | "4117610" | "4186812" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5520500" | "5542814" | "5551523" | "5609464" | "5894908" | "D431574" | "6182778" | "6205665" | "6325589" | "6474933" | "6575262" | "6616398" | "6695568" | "6866466" | "7214026" | "7264435" | "7428943" | "7695236" | "7805864" | "7866700" | "D631898" | "7980569" | "8016065" | "8109356" | "8152433" | "8821104" | "9045882" | "9321386" | "9975750" | "10202266" | "20030095857" | "20040026153" | "20040228715" | "20050036876" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100106344" | "20100183412" | "20110137491" | "20120291319" | "20120305025" | "20140271078").pn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 08:17 AM
L53	8	((US-8821104-B2 OR US-6205665-B1 OR US-5551523-A OR US-4087101-A OR US-3074572-A OR US-10202266-B2 OR US-9975750-B2 OR US-9321386-B1).did. AND	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2024/07/16 08:23 AM

		USPT.dbnm.)	MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L54	5	53 AND (direct$).clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/07/16 08:24 AM
L55	75	("1404419" | "1948802" | "2910888" | "3485314" | "4509769" | "4584735" | "4735392" | "4878339" | "5004251" | "5106256" | "5117944" | "5575140" | "5577744" | "5653466" | "5685554" | "5697623" | "5809756" | "5816614" | "5909887" | "6151811" | "6415532" | "6443252" | "6485036" | "6488291" | "6709223" | "6935092" | "7004272" | "7063341" | "7114736" | "7300061" | "7458588" | "7624996" | "20040093840" | "20040145134" | "20060103093" | "20060290080" | "20070200307" | "20090072504").pn. OR ("7980569").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 08:41 AM
L56	25	("2794382" | "2926796" | "3002638" | "3226857" | "3393759" | "3630544" | "3869022" | "4077141" | "4236643" | "4360311" | "4626163" | "4961371").pn. OR ("5106256").urpn. AND (PGPB | USPT |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 08:48 AM

		USOC).dbnm.					
L57	14	("3452887" | "3667620" | "3912092" | "4119222" | "6085811" | "6470606" | "6648578").pn. OR ("7695236").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 08:54 AM
L58	52	("D201126" | "D205485" | "D217661" | "D240757" | "D272825" | "D294032" | "D322792" | "3850473" | "4705449" | "5171124").pn. OR ("D359497").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 09:03 AM
L59	53	("D191506" | "D195254" | "D205485" | "D231482" | "D259631" | "D271397" | "D272825").pn. OR ("D294032").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 09:10 AM
L60	11	("3074572").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 09:24 AM
L61	32	("0701887" | "2763385" | "2980271" | "3074572" | "3184086" | "3209930" | "3215292").pn. OR ("3586195").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 09:50 AM
L62	13	((US-8821104-B2 OR US-6205665-B1 OR US-5551523-A OR US-4087101-A OR US-3074572-A OR US-10202266-B2 OR US-9975750-B2 OR US-9321386-B1 OR US-9970176-B2 OR US-7264435-B2 OR US-5609464-A OR US-3586195-A).did. AND USPT.dbnm.) OR ((US-20070128012-A1).did. AND PGPB.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/08/07 09:02 AM
L63	63	("2345620" | "2455474" | "2558928" | "2774496" | "2849132" | "2953264"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/08/07 09:08 AM

		| "2980271" | "3074572" | "3586195" | "4117610" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5542814" | "5609464" | "D431574" | "6325589" | "6474933" | "6616398" | "6695568" | "6866466" | "7214026" | "7264435" | "7695236" | "7805864" | "D631898" | "7980569" | "8152433" | "8821104" | "9045882" | "9321386" | "20030095857" | "20040026153" | "20050036876" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100106344" | "20100183412" | "20120291319" | "20120305025" | "20140271078").pn. OR ("10202266").urpn. AND (PGPB | USPT | USOC).dbnm.					
L64	1524	b62d21/16.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/08/07 09:18 AM
L65	3587	b62d21/186.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK,	OR	ON	ON	2024/08/07 09:18 AM

			TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L66	4026	(B66F9/065.cpc. OR b66f9/075$.cpc.) AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/08/07 09:18 AM
L67	913	e02f9/0816.cpc. OR e02f9/0825.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/08/07 09:18 AM
L68	228	21 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/08/07 09:18 AM
L69	537	23 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2024/08/07 09:18 AM

			MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; IBM_TDB)				
L70	10450	64 OR 65 OR 66 OR 67 OR 68 OR 69	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/08/07 09:19 AM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	57	((mainframe frame$ chassis) AND (vehicle machine loader) AND side$ AND bracket AND (pocket groove$ channel$) AND (opening hole aperture bore) AND (pivot$ rotat$) AND (hydraulic$ liquid fluid) AND (reservoir housing)).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2024/08/07 09:27 AM
N2	554	((loader loading) AND arm AND (mainframe frame$ chassis) AND (link$ lever) AND (pivot$ rotat$) AND direct$ AND (actuat$ piston)).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2024/08/07 09:30 AM
N3	306	2 AND (compact rear$ back behind).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2024/08/07 09:30 AM
N4	306	3 NOT 1	(US-PGPUB; USPAT)	OR	ON	ON	2024/08/07 09:31 AM

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Brad Thomas Art Unit: 1714
Application No.: 17/961,868
Filed On: October 7, 2022
Confirmation No.: 8378
Art Unit: 3651
For: COMPACT TOOL CARRIERS AND MAINFRAMES FOR A SELF-PROPELLED MACHINE
Examiner: Dean J. Kramer

August 1, 2024

AMENDMENT D

TO THE COMMISSIONER FOR PATENTS,

SIR:

Please enter the following amendments and consider the following remarks:

Amendments to the Claims are reflected in the Listing of Claims which begins on page 2;

Amendments to the Specification begin on page 7; and

Remarks begin on page 8.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/961,868	**08/01/2024 02:33:53 PM Z ET**	**31681-641**

Title of Invention

LOW PROFILE COMPACT TOOL CARRIERS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8378	FILED BY	Teddi Weber
PATENT CENTER #	66608601	FILING DATE	10/07/2022
CUSTOMER #	76656	FIRST NAMED INVENTOR	Brad Thomas
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Michael Vander Molen

Documents

TOTAL DOCUMENTS: 4

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
3084USC5 Amendment D 01AUG2024-65083340.pdf		9	-	94 KB
3084USC5 Amendment D 01AUG2024-65083340-A.NE.pdf	(1-1)	1	Response After Final Action	81 KB
3084USC5 Amendment D 01AUG2024-65083340-CLM.pdf	(2-6)	5	Claims	87 KB
3084USC5 Amendment D 01AUG2024-65083340-SPEC.pdf	(7-7)	1	Specification	81 KB

3084USC5 Amendment D 01AUG2024-65083340-REM.pdf	(8-9)	2	Applicant Arguments/Remarks Made in an Amendment	82 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
3084USC5 Amendment D 01AUG2024-65083340.pdf	B4E0F4F23A35FA2A2F236E3D7B18D1BECF7E2F8028026 5B4E7FA323A67B9BBE9BE4F6EF18D79DE1E793C1FDED35046E98975C778081AE022A5F5B0507EA004B0
3084USC5 Amendment D 01AUG2024-65083340-A.NE.pdf	56D3418606EBC5C9CE1B3B96783F6F0BB443C12E30190F8D67A449F6FCBEE3DA8C1C3F82DAD980CCF88AAA01AFF4CDED9AF9175D4504A586A92E90D91C27E72B
3084USC5 Amendment D 01AUG2024-65083340-CLM.pdf	E4B564BE77F154AD3AD0BF11FC92F3C12421283D28C9EDFCBE864DD1B71E5E429895BDD9A8CC22627656013B1E1EE67ADCCA97B8DB0C986BDE439D041B053B18
3084USC5 Amendment D 01AUG2024-65083340-SPEC.pdf	A3EF089C20215C3D8191372154EB9D762684E7450F8747D1206D52C056E87E75BA4503134000B0A926678656AD54140BFF65F851A84CF17E1AAEC07A945407DF
3084USC5 Amendment D 01AUG2024-65083340-REM.pdf	82AC7171D2B42911EFF39DA73BB60D60E7188D14956275 19C359201404D335F280082F7D3699CD1DC4D12E14602D9464219D405AD0E3F5AE63A98E09A80F2B2E

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Brad Thomas Art Unit: 1714
Application No.: 17/961,868
Filed On: October 7, 2022
Confirmation No.: 8378
Art Unit: 3651
For: COMPACT TOOL CARRIERS AND MAINFRAMES FOR A SELF-PROPELLED MACHINE
Examiner: Dean J. Kramer

August 1, 2024

AMENDMENT D

TO THE COMMISSIONER FOR PATENTS,

SIR:

Please enter the following amendments and consider the following remarks:

Amendments to the Claims are reflected in the Listing of Claims which begins on page 2;

Amendments to the Specification begin on page 7; and

Remarks begin on page 8.

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

1. (Previously Presented) A mainframe for a self-propelled machine, the mainframe having a front end, a rear end and a longitudinal axis and comprising:

a first side comprising:

a first bracket portion for supporting a load, the first bracket portion forming an upward-facing first pocket that extends from the front end to the rear end of the mainframe, the first side defining a first drive opening for receiving a first hub of a drive mechanism; and

a plurality of first pivot points for attachment of a loader including a first front pivot point proximate the front end, a first rear pivot point proximate the rear end, and a first central pivot point located between the first front pivot point and the first rear pivot point along the longitudinal axis;

a second side comprising:

a second bracket portion for supporting a load, the second bracket portion forming an upward-facing second pocket that extends from the front end to the rear end of the mainframe, the second side defining a second drive

opening for receiving a second hub of a drive mechanism; and

a plurality of second pivot points for attachment of a loader including a second front pivot point proximate the front end, a second rear pivot point proximate the rear end, and a second central pivot point located between the second front pivot point and the second rear pivot point along the longitudinal axis; and

a hydraulic reservoir housing configured to store hydraulic fluid, the hydraulic reservoir housing being connected to the first side of the mainframe and connected to the second side of the mainframe, the hydraulic reservoir housing being disposed between the front end of the mainframe and the first and second drive openings.

2. (Previously Presented) The mainframe as set forth in claim 1 further comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being disposed between the rear end and the first and second drive openings.

3. (Original) The mainframe as set forth in claim 1 wherein the mainframe is a single weldment.

4. (Previously presented) A compact tool carrier having a longitudinal axis and comprising:

a loader having a loader arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis;

a first linkage pivotally attached to the first side of the mainframe and directly pivotally attached to the loader arm;

a second linkage pivotally attached to the first side of the mainframe and directly pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe and directly pivotally attached to the loader arm; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear end of the compact tool carrier.

5. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the mainframe comprises an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe.

6. (Previously Presented) The compact tool carrier as set forth in claim 5 comprising an engine to propel a drive mechanism, the engine being attached to the engine bracket.

7. (Previously Presented) The compact tool carrier as set for in claim 4, wherein the mainframe incorporates a single weldment.

8. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the loader arm is a first loader arm, the loader comprising a second loader arm and the compact tool carrier comprising a third linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm and a fourth linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

9. (Previously Presented) The compact tool carrier as set forth in claim 8, wherein the actuator is a first actuator, the compact tool carrier comprising a second actuator, the second actuator being pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

10. (Previously Presented) The compact tool carrier as set forth in claim 4 comprising a drive mechanism comprising tracks or wheels, the drive mechanism being attached to the mainframe.

11. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the actuator is a hydraulic cylinder.

12. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the loader arm incorporates a single weldment.

13. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the mainframe defines a pocket toward a rear of the mainframe to partially surround an operator.

14. (Previously Presented) The compact tool carrier as set forth in claim 13 further comprising an operator platform at least partially within the pocket.

15-20. (Cancelled)

AMENDMENTS TO THE SPECIFICATION

Please replace the title of the application with the following rewritten title:

COMPACT TOOL CARRIER AND MAINFRAMES FOR A SELF-PROPELLED MACHINE

REMARKS

The final Office action of July 19, 2024 has been carefully reviewed and the following remarks are made in response. Applicant respectfully requests reconsideration and allowance of all pending claims. Applicant does not concede the propriety of the rejections but amends only to expedite prosecution. Applicant reserves the right to file one or more continuing applications.

Status of the Claims

Applicant has cancelled claims 15-20. Claims 1-14 are pending.

Allowed Subject Matter

Claims 1-14 are in condition for allowance as stated on page 6 of the Office action. Applicant does not concede the propriety of the rejection of claimd 15-20 under 35 U.S.C. §103 and reserves the right to contest the rejection in one or more continuing applications.

Conclusion

Applicant respectfully requests reconsideration and allowance of all pending claims. The undersigned requests a phone call from the Examiner if this might expedite prosecution.

Applicant authorizes the Commissioner to charge any fees which may be due in connection with this Amendment D to Deposit Account No. 012384 in the name of Armstrong Teasdale LLP.

Respectfully submitted,

/Michael J. Vander Molen/

Michael J. Vander Molen
Reg. No. 57,274
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MJV/tkw

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/961,868	Filing Date 10/07/2022	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $480 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	08/01/2024	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 14	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	Program Support Assistant
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/VENESSA JONES/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/961,868	10/07/2022	Brad Thomas	31681-641	8378

76656 7590 07/19/2024

Patent Docket Department
Armstrong Teasdale LLP
7700 Forsyth Boulevard
Suite 1800
St. Louis, MO 63105

EXAMINER	
KRAMER, DEAN J	

ART UNIT	PAPER NUMBER
3651	

NOTIFICATION DATE	DELIVERY MODE
07/19/2024	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USpatents@atllp.com

Office Action Summary	Application No. 17/961,868	Applicant(s) Thomas et al.	
	Examiner DEAN J KRAMER	Art Unit 3651	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 09 July 2024.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☑ This action is **FINAL.** 2b) ☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-20 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☑ Claim(s) 1-14 is/are allowed.

7) ☑ Claim(s) 15-20 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

The amendment filed July 9, 2024 and the remarks presented therewith have been carefully considered. However, they are not deemed to be fully persuasive. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 15-20 are rejected under 35 U.S.C. 103 as being unpatentable over Ulinski (US-3,074,572) in view of Shimazaki et al. (US-4,087,101).

Ulinski shows a compact tool carrier comprising a loader (15) made up of several loader arms (17, 19, 24) wherein the loader (15) is adapted to carry a tool (16), a mainframe (10, 14), a first linkage (27) pivotally attached between a first side (14) of the mainframe and directly to an arm (24) of the loader, a second linkage (32) pivotally attached between a first side of the mainframe and directly to an arm (19) of the loader, a hydraulic actuator (36) pivotally attached between a first side of the mainframe and directly to an arm (24) of the loader, and a control station (54) at the rear of the carrier. While the Ulinski patent includes an engine assembly (42, 44) mounted on its mainframe (10), there is no disclosure of an engine bracket extending from one side of the mainframe towards the other side of the mainframe as called for in the above claims of the instant application.

However, the patent to Shimazaki et al. shows it old and well known to a mount a bracket (27) for supporting an engine that extends from a first side (21) to a second side (21) of a vehicle mainframe (13).

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to a provide a bracket spanning the sidewalls (14, 14) of the Ulinski mainframe (10), as taught by Shimazaki et al., so that the engine of the carrier could be securely and safely supported on the mainframe through the resulting bracket.

In regard to claim 16, the linkages and actuator are at least indirectly pivotally attached to all of the arms (17, 19, 24) that make up the loader as broadly as recited in the claim.

Regarding claims 17 and 18, the linkages and actuators are duplicated on each side of the mainframe (see col. 1, lines 61-65 of the Ulinski patent).

Regarding claims 19 and 20, a pocket for surrounding a user is shown in dashed lines in Figure 1 of the Ulinski patent above a platform on which the user stands while operating the controls.

Allowable Subject Matter

3. Claims 1-14 are allowed.

Response to Arguments

Independent claim 15 now recites the first and second linkages being directly attached to "the loader". As pointed out in the above rejection, the "loader" of the Ulinski patent can be interpreted to include a set of interconnected arms (17, 19, 24). Each of the linkages (27, 32) and the actuator (36) of Ulinski are *directly* attached to at least one of the arms that make up "the loader" of it compact tool carrier.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DEANJ KRAMER whose telephone number is (571)272-6926. The examiner can normally be reached Monday-Friday 7:30-4:00.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gene Crawford can be reached on 571-272-6911. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and

https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DEAN J KRAMER/
Primary Examiner, Art Unit 3651

DEAN J. KRAMER
Primary Examiner
Art Unit 3651

Djk

7/16/2024

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	Art Unit
	DEAN J KRAMER	3651

CPC - Searched*		
Symbol	Date	Examiner
B62D 21/16; 21/186; 51/007; 51/02; 51/04	03/15/2023	djk
B66F 9/065; 9/075; 9/07513; 9/07518; 9/07527; 9/07572; 9/07577	03/15/2023	djk
B60P 1/483	03/15/2023	djk
E02F 9/08; 9/0816; 9/0825	03/15/2023	djk

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
inventor and assignee search	03/15/2023	djk
updated search	10/03/2023	djk
updated search	01/04/2024	djk
updated search	07/16/2024	djk

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Kubota North America Corporation et al

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	Art Unit
	DEAN J KRAMER	3651

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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Kubota North America Corporation et al

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	Art Unit
	DEAN J KRAMER	3651

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/16/2023	10/04/2023	01/04/2024	07/16/2024					
	1	✓	=	=	=					
	2	✓	=	=	=					
	3	✓	=	=	=					
	4		✓	✓	=					
	5		✓	✓	=					
	6		✓	✓	=					
	7		✓	✓	=					
	8		✓	✓	=					
	9		✓	✓	=					
	10		✓	✓	=					
	11		✓	✓	=					
	12		✓	✓	=					
	13		✓	✓	=					
	14		✓	✓	=					
	15		✓	✓	✓					
	16		✓	✓	✓					
	17		✓	✓	✓					
	18		✓	✓	✓					
	19		✓	✓	✓					
	20		✓	✓	✓					

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	66	("10202266" OR "1808735" OR "20030095857" OR "20040026153" OR "20040228715" OR "20050036876" OR "20070017713" OR "20070128012" OR "20070132204" OR "20080197588" OR "20090116943" OR "20100106344" OR "20100183412" OR "20110137491" OR "20120291319" OR "20120305025" OR "20140271078" OR "2298450" OR "2345620" OR "2455474" OR "2558928" OR "2563277" OR "2774496" OR "2849132" OR "2953264" OR "2980271" OR "3074572" OR "3586195" OR "3908778" OR "4087101" OR "4117610" OR "4186812" OR "4239444" OR "5169278" OR "5423654" OR "5470190" OR "5520500" OR "5542814" OR "5551523" OR "5609464" OR "5894908" OR "6182778" OR "6205665" OR "6325589" OR "6474933" OR "6575262" OR "6616398" OR "6695568" OR "6866466" OR "7214026" OR "7264435" OR "7428943" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/15 10:06 AM

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L2	76	((("THOMAS") near3 ("Brad")) OR (("HARTKE") near3 ("Louis")) OR (("LANGENFELD") near3 ("Greg")) OR (("HUTCHINSON") near3 ("Matt"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2023/03/15 10:27 AM
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L5	22	("1789238" | "2535301" | "2725223" | "2822056" | "3437163" | "3880445").pn. OR ("4087101").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 10:29 AM
L6	12	("1198885" | "3880445" | "4087101" | "6398236" | "6668957" | "7243949" | "7503586" | "20050062251").pn. OR ("8146948").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 10:31 AM
L7	1453	b62d21/16.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 10:42 AM
L8	3470	b62d21/186.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP,	OR	ON	ON	2023/03/15 11:06 AM

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L9	3371	8 NOT 7	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 11:07 AM
L10	26	("3838952" | "3842927" | "3850473" | "3870172" | "3895728" | "4055262" | "4060261" | "4074782" | "4131225" | "4374600" | "4405280" | "4449606" | "4514007" | "4535868" | "4955455" | "4962825" | "5161638").pn. OR ("6167980").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 11:11 AM
L11	13	("3895728" | "4055262" | "4449606" | "4815550" | "6108907" | "6138786" | "6167980" | "7735594" | "7866700" | "8821104" | "8919486" | "20080078917" | "20130220720").pn. OR ("9586466").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 11:29 AM
L12	663	9 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2023/03/15 12:34 PM

			EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L13	3585	(B66F9/065.cpc. OR b66f9/075$.cpc.) AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 12:49 PM
L14	3547	13 NOT (12 OR 7)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 12:49 PM
L15	0	b66f9/17518.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:02 PM
L16	661	b66f9/07518.cpc.	(US-PGPUB; USPAT;	OR	ON	ON	2023/03/15

			USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				01:02 PM
L17	376	16 NOT 14	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:03 PM
L18	887	e02f9/0816.cpc. OR e02f9/0825.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:05 PM
L19	703	e02f9/08.cpc. AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA,	OR	ON	ON	2023/03/15 01:13 PM

			VN); FPRS; EPO; JPO; IBM_TDB)				
L20	652	19 NOT 18	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:13 PM
L21	2186	b60p1/483.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:34 PM
L22	206	21 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:34 PM
L23	5406	(b62d51/007.cpc. OR b62d51/02.cpc. OR b62d51/04.cpc.) OR 280/797.ccls.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO,	OR	ON	ON	2023/03/15 03:10 PM

			MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
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L25	468	24 NOT (12 OR 7 OR 20 OR 17)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 03:11 PM
L26	4	((US-8821104-B2 OR US-6205665-B1 OR US-5551523-A OR US-4087101-A).did. AND USPT.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/10/03 11:05 AM
L27	30	("5547244" | "6065276" | "6098739" | "6205665" | "6283220" | "6684537" | "8303026" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 11:42 AM

		"20040028514").pn. OR ("8821104").urpn. AND (PGPB | USPT | USOC).dbnm.					
L28	14	("3452887" | "3667620" | "3912092" | "4119222" | "6085811" | "6470606" | "6648578").pn. OR ("7695236").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 12:51 PM
L29	77	("1808735" | "2298450" | "2345620" | "2455474" | "2558928" | "2563277" | "2774496" | "2849132" | "2953264" | "2980271" | "3074572" | "3586195" | "3908778" | "4087101" | "4117610" | "4186812" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5520500" | "5542814" | "5551523" | "5609464" | "5894908" | "D431574" | "6182778" | "6205665" | "6325589" | "6474933" | "6575262" | "6616398" | "6695568" | "6866466" | "7214026" | "7264435" | "7428943" | "7695236" | "7805864" | "7866700" | "D631898" | "7980569" | "8016065" | "8109356" | "8152433" | "8821104" | "9045882" | "9321386" | "9975750" | "10202266" | "20030095857" | "20040026153" | "20040228715" | "20050036876" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100106344" | "20100183412" | "20110137491" | "20120291319" | "20120305025" | "20140271078").pn. OR ("11465891").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 01:03 PM
L30	15	("2007/0128012").urpn. AND (PGPB | USPT |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 01:07 PM

		USOC).dbnm.					
L31	1470	b62d21/16.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L32	3517	b62d21/186.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L33	3744	(B66F9/065.cpc. OR b66f9/075$.cpc.) AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L34	888	e02f9/0816.cpc. OR e02f9/0825.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO,	OR	ON	ON	2023/10/03 02:19 PM

			NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L35	9296	31 OR 32 OR 33 OR 34	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L36	15	("4345524" | "5253777" | "5269585" | "5352011" | "5501504" | "5577746" | "6041880" | "7275785" | "7422241" | "8973982" | "9200344" | "20100206439" | "20150099139" | "20150360725").pn. OR ("10822034").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 02:25 PM
L37	18	("2701728" | "3032352" | "3595410" | "3700256" | "3822073" | "4087101" | "4232883" | "4403671" | "4664404" | "4690183" | "4736633" | "D436969" | "6880854" | "8662460" | "20130026789" | "20180186207").pn. OR ("10518810").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 02:31 PM
L38	5	((US-8821104-B2 OR US-6205665-B1 OR US-5551523-A OR US-4087101-A OR US-3074572-A).did. AND USPT.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK,	OR	ON	ON	2024/01/04 10:43 AM

			TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L39	11	("3074572").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 10:44 AM
L40	56	("2345620" | "2455474" | "2558928" | "2774496" | "2849132" | "2953264" | "2980271" | "3074572" | "3586195" | "4117610" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5542814" | "5609464" | "D431574" | "6325589" | "6474933" | "6616398" | "6695568" | "7214026" | "7264435" | "7695236" | "7805864" | "7980569" | "8152433" | "8821104" | "20040026153" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100183412" | "20120291319" | "20120305025" | "20140271078").pn. OR ("9975750").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 10:45 AM
L41	14	("3452887" | "3667620" | "3912092" | "4119222" | "6085811" | "6470606" | "6648578").pn. OR ("7695236").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 11:00 AM
L42	41	("2984373" | "3412819" | "3540220" | "3833261" | "4547119" | "4676713" | "4691806" | "5027940" | "5040428" | "5083895").pn. OR ("5423654").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 11:03 AM
L43	11	("2774496").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 11:09 AM
L44	1484	b62d21/16.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP,	OR	ON	ON	2024/01/04 11:12 AM

			AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L45	3818	(B66F9/065.cpc. OR b66f9/075$.cpc.) AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/04 11:12 AM
L46	897	e02f9/0816.cpc. OR e02f9/0825.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/04 11:12 AM
L47	6177	44 OR 45 OR 46	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO;	OR	ON	ON	2024/01/04 11:12 AM

			JPO; IBM_TDB)				
L48	5	((US-8821104-B2 OR US-6205665-B1 OR US-5551523-A OR US-4087101-A OR US-3074572-A).did. AND USPT.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/07/16 07:23 AM
L49	1	("9975750").pn.	(USPAT)	OR	ON	ON	2024/07/16 07:24 AM
L50	58	("2345620" | "2455474" | "2558928" | "2774496" | "2849132" | "2953264" | "2980271" | "3074572" | "3586195" | "4117610" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5542814" | "5609464" | "D431574" | "6325589" | "6474933" | "6616398" | "6695568" | "7214026" | "7264435" | "7695236" | "7805864" | "7980569" | "8152433" | "8821104" | "20040026153" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100183412" | "20120291319" | "20120305025" | "20140271078").pn. OR ("9975750").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 07:24 AM
L51	228	48 OR 50	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO,	OR	ON	ON	2024/07/16 07:25 AM

			MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L52	77	("1808735" | "2298450" | "2345620" | "2455474" | "2558928" | "2563277" | "2774496" | "2849132" | "2953264" | "2980271" | "3074572" | "3586195" | "3908778" | "4087101" | "4117610" | "4186812" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5520500" | "5542814" | "5551523" | "5609464" | "5894908" | "D431574" | "6182778" | "6205665" | "6325589" | "6474933" | "6575262" | "6616398" | "6695568" | "6866466" | "7214026" | "7264435" | "7428943" | "7695236" | "7805864" | "7866700" | "D631898" | "7980569" | "8016065" | "8109356" | "8152433" | "8821104" | "9045882" | "9321386" | "9975750" | "10202266" | "20030095857" | "20040026153" | "20040228715" | "20050036876" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100106344" | "20100183412" | "20110137491" | "20120291319" | "20120305025" | "20140271078").pn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 08:17 AM
L53	8	((US-8821104-B2 OR US-6205665-B1 OR US-5551523-A OR US-4087101-A OR US-3074572-A OR US-10202266-B2 OR US-9975750-B2 OR US-9321386-B1).did. AND	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2024/07/16 08:23 AM

		USPT.dbnm.)	MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L54	5	53 AND (direct$).clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/07/16 08:24 AM
L55	75	("1404419" | "1948802" | "2910888" | "3485314" | "4509769" | "4584735" | "4735392" | "4878339" | "5004251" | "5106256" | "5117944" | "5575140" | "5577744" | "5653466" | "5685554" | "5697623" | "5809756" | "5816614" | "5909887" | "6151811" | "6415532" | "6443252" | "6485036" | "6488291" | "6709223" | "6935092" | "7004272" | "7063341" | "7114736" | "7300061" | "7458588" | "7624996" | "20040093840" | "20040145134" | "20060103093" | "20060290080" | "20070200307" | "20090072504").pn. OR ("7980569").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 08:41 AM
L56	25	("2794382" | "2926796" | "3002638" | "3226857" | "3393759" | "3630544" | "3869022" | "4077141" | "4236643" | "4360311" | "4626163" | "4961371").pn. OR ("5106256").urpn. AND (PGPB | USPT |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 08:48 AM

		USOC).dbnm.					
L57	14	("3452887" | "3667620" | "3912092" | "4119222" | "6085811" | "6470606" | "6648578").pn. OR ("7695236").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 08:54 AM
L58	52	("D201126" | "D205485" | "D217661" | "D240757" | "D272825" | "D294032" | "D322792" | "3850473" | "4705449" | "5171124").pn. OR ("D359497").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 09:03 AM
L59	53	("D191506" | "D195254" | "D205485" | "D231482" | "D259631" | "D271397" | "D272825").pn. OR ("D294032").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 09:10 AM
L60	11	("3074572").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 09:24 AM
L61	32	("0701887" | "2763385" | "2980271" | "3074572" | "3184086" | "3209930" | "3215292").pn. OR ("3586195").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/07/16 09:50 AM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/961,868	**07/09/2024 02:17:11 PM Z ET**	**31681-641**

Title of Invention

LOW PROFILE COMPACT TOOL CARRIERS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8378	FILED BY	Connie Lager
PATENT CENTER #	66285909	FILING DATE	10/07/2022
CUSTOMER #	76656	FIRST NAMED INVENTOR	Brad Thomas
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Michael Vander Molen

Documents

TOTAL DOCUMENTS: 3

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
2024-07-09 Office Action Response 3084USC5 31681-641-64838759.pdf		14	-	1369 KB
2024-07-09 Office Action Response 3084USC5 31681-641-64838759-A....pdf	(1-1)	1	Amendment/Request for Reconsideration-After Non-Final Rejection	118 KB
2024-07-09 Office Action Response 3084USC5 31681-641-64838759-CLM.pdf	(2-8)	7	Claims	126 KB
2024-07-09 Office Action	(9-14)	6	Applicant Arguments/Remarks	1354 KB

Response 3084USC5 31681-641-64838759-REM.pdf	Made in an Amendment

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
2024-07-09 Office Action Response 3084USC5 31681-641-64838759.pdf	30ECD7D32622EEB18792C240411EF2A5194DC818E7D89CBA203F4EFB84D398D00B0598784961602936 6A4074B281B92C0653554653D17721B02E05D994D3B10A
2024-07-09 Office Action Response 3084USC5 31681-641-64838759-A....pdf	02A94CC678798494A70E66C2F9A554395ED4A3CC80A7C3B3E28158F0F8E83580C940C3B2E771419018244D4A5D7C7E66814C1B913D753FBB037CF5B8B448D83C
2024-07-09 Office Action Response 3084USC5 31681-641-64838759-CLM.pdf	6FA0CAAB1F0E52AC4841BAB94DA55ADD2A4138DC70F62B4D2BA507394F3B4FAF2BCA7BA6C8FF05C25CF0618A51FDCF6440381296808FE4B55C70843BB86B996D
2024-07-09 Office Action Response 3084USC5 31681-641-64838759-REM.pdf	887808468D631AE40A473631000EB7238BAF94A0184A00C7CF9F1C46896688B59CAC4C51FECDB74ED4F3B6AD5CF9B8016645BD2D8E16E54421A8E1B025E9A7FD

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES
PATENT AND TRADEMARK OFFICE

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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/961,868	07/09/2024 02:17:11 PM Z ET	31681-641

Title of Invention

LOW PROFILE COMPACT TOOL CARRIERS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8378	FILED BY	Connie Lager
PATENT CENTER #	66285909	AUTHORIZED BY	Michael Vander Molen
CUSTOMER #	76656	FILING DATE	10/07/2022
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Brad Thomas

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
DA / 012384	E202479E18527000	Connie Lager

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
1253	EXTENSION FOR RESPONSE WITHIN THIRD MONTH	1480.00	1	1480.00
			TOTAL AMOUNT:	$1,480.00

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Brad Thomas Art Unit: 1714
Application No.: 17/961,868
Filed On: October 7, 2022
Confirmation No.: 8378
Art Unit: 3651
For: MAINFRAMES FOR A SELF-PROPELLED MACHINE
Examiner: Dean J. Kramer

July 9, 2024

AMENDMENT C

TO THE COMMISSIONER FOR PATENTS,

SIR:

Please enter the following amendments and consider the following remarks:

Amendments to the Claims are reflected in the Listing of Claims which begins on page 2; and

Remarks begin on page 9.

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

1. (Previously Presented) A mainframe for a self-propelled machine, the mainframe having a front end, a rear end and a longitudinal axis and comprising:

a first side comprising:

a first bracket portion for supporting a load, the first bracket portion forming an upward-facing first pocket that extends from the front end to the rear end of the mainframe, the first side defining a first drive opening for receiving a first hub of a drive mechanism; and

a plurality of first pivot points for attachment of a loader including a first front pivot point proximate the front end, a first rear pivot point proximate the rear end, and a first central pivot point located between the first front pivot point and the first rear pivot point along the longitudinal axis;

a second side comprising:

a second bracket portion for supporting a load, the second bracket portion forming an upward-facing second pocket that extends from the front end to the rear end of the mainframe, the second side defining a second drive

opening for receiving a second hub of a drive mechanism; and

a plurality of second pivot points for attachment of a loader including a second front pivot point proximate the front end, a second rear pivot point proximate the rear end, and a second central pivot point located between the second front pivot point and the second rear pivot point along the longitudinal axis; and

a hydraulic reservoir housing configured to store hydraulic fluid, the hydraulic reservoir housing being connected to the first side of the mainframe and connected to the second side of the mainframe, the hydraulic reservoir housing being disposed between the front end of the mainframe and the first and second drive openings.

2. (Previously Presented) The mainframe as set forth in claim 1 further comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being disposed between the rear end and the first and second drive openings.

3. (Original) The mainframe as set forth in claim 1 wherein the mainframe is a single weldment.

4. (Currently Amended) A compact tool carrier having a longitudinal axis and comprising:

a loader having a loader arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis;

a first linkage pivotally attached to the first side of the mainframe and **directly** pivotally attached to the loader arm;

a second linkage pivotally attached to the first side of the mainframe and **directly** pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe and directly pivotally attached to the loader arm; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear end of the compact tool carrier.

5. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the mainframe comprises an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe.

6. (Previously Presented) The compact tool carrier as set forth in claim 5 comprising an engine to propel a drive mechanism, the engine being attached to the engine bracket.

7. (Previously Presented) The compact tool carrier as set for in claim 4, wherein the mainframe incorporates a single weldment.

8. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the loader arm is a first loader arm, the loader comprising a second loader arm and the compact tool carrier comprising a third linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm and a fourth linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

9. (Previously Presented) The compact tool carrier as set forth in claim 8, wherein the actuator is a first actuator, the compact tool carrier comprising a second actuator, the second actuator being pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

10. (Previously Presented) The compact tool carrier as set forth in claim 4 comprising a drive mechanism comprising tracks or wheels, the drive mechanism being attached to the mainframe.

11. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the actuator is a hydraulic cylinder.

12. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the loader arm incorporates a single weldment.

13. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the mainframe defines a pocket toward a rear of the mainframe to partially surround an operator.

14. (Previously Presented) The compact tool carrier as set forth in claim 13 further comprising an operator platform at least partially within the pocket.

15. (Currently Amended) A compact tool carrier having a longitudinal axis and comprising:

a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe;

a first linkage pivotally attached to the mainframe at a first pivot point and **directly** pivotally attached to the loader at a second pivot point;

an actuator pivotally attached to the mainframe at a third pivot point and directly pivotally attached to the loader at a fourth pivot point;

a second linkage pivotally attached to the mainframe at a fifth pivot point and **directly** pivotally attached to the loader at a sixth pivot point; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering

the loader, the control station being mounted toward the rear end of the compact tool carrier,

wherein the second, fourth and sixth pivot points move relative to the mainframe as the loader moves between the down position and the vertically raised position.

16. (Previously Presented) The compact tool carrier as set forth in claim 15, wherein the loader includes a first loader arm, wherein the first linkage is pivotally attached to the first loader arm of the loader and the second linkage is pivotally attached to the first loader arm of the loader.

17. (Previously Presented) The compact tool carrier as set forth in claim 16, the loader comprising a second loader arm and the compact tool carrier comprising a third linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm and a fourth linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

18. (Previously Presented) The compact tool carrier as set forth in claim 17, wherein the actuator is a first actuator, the compact tool carrier comprising a second actuator, the second actuator being pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

19. (Previously Presented) The compact tool carrier as set forth in claim 15, wherein the mainframe defines a pocket toward a rear of the mainframe to partially surround an operator.

20. (Previously Presented) The compact tool carrier as set forth in claim 19 further comprising an operator platform at least partially within the pocket.

REMARKS

The final Office action of January 9, 2024 has been carefully reviewed and the following remarks are made in response. Applicant respectfully requests reconsideration and allowance of all pending claims. Applicant does not concede the propriety of the rejections but amends only to expedite prosecution. Applicant reserves the right to file one or more continuing applications.

Status of the Claims

Applicant has amended claims 4 and 15. Claims 1-20 are pending.

Allowed Subject Matter

Applicant thanks the Office for the indication that claims 1-3 are allowable.

Non-statutory Obviousness-Type Double Patenting Rejection

The Office has rejected claims 4-7, 10, and 11 on the ground of non-statutory obviousness-type double patenting over claims 1, 2, 5, and 8, respectively, of U.S. Patent No. 9,975,750. Applicant will consider filing a terminal disclaimer to obviate the rejection when it is the last remaining rejection in the application and the presently pending claims have been indicated as allowable, but for the rejection.

Rejections under 35 U.S.C. §102

The Office has rejected claims 4, 8-11, and 13-14 under 35 U.S.C. §102 for being anticipated by U.S. Patent No. 3,074,572 to Ulinski ("Ulinski"). The pending claims are novel over Ulinski for the reasons set forth below.

In Applicant's "Response to Office Action" dated December 11, 2023, Applicant amended claim 4 to recite that the actuator is "directly" pivotally attached to the loader arm and noted that the "second ram 36" of Ulinski is not directly attached to the loader arm. In response, the Office states that Ulinski discloses a "series of interconnected arms (24, 19, 17) *each of which* can be considered a 'loader arm'":

> ***Response to Arguments***
>
> The loader (15) shown in the Ulinski patent (US-3,074,572) is made up of series of interconnected arms (24, 19, 17) each of which can be considered a "loader arm" as broadly as recited in claims 4 and 15. The first linkage (27) and the hydraulic actuator (36) are in direct pivotal attachment to the loader arm (24) as now called for in independent claims 4 and 15.

Page 6 of the Office action.

Claim 4 does not recite a "series of interconnected arms" to which the actuator and linkages are attached. Claim 4 recites that the first and second linkages and the actuator are pivotally attached to the *same* loader arm:

4. A compact tool carrier having a longitudinal axis and comprising:

a loader having a loader arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis;

a first linkage pivotally attached to the first side of the mainframe and directly pivotally attached to the loader arm;

a second linkage pivotally attached to the first side of the mainframe and directly pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe and directly pivotally attached to the loader arm; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear end of the compact tool carrier.

The first and second linkages and actuator are attached to the *same* loader arm

Claim 1 has also been amended to recite that the first linkage is *directly* attached to the loader arm and that the second linkage is *directly* attached to the loader arm.

As shown in FIG. 4 of Ulinski, the extending arm 27 and bell-crank 32, which the Office considers to be equivalent of the first and second linkages of claim 4, are not connected to the same loader arm:

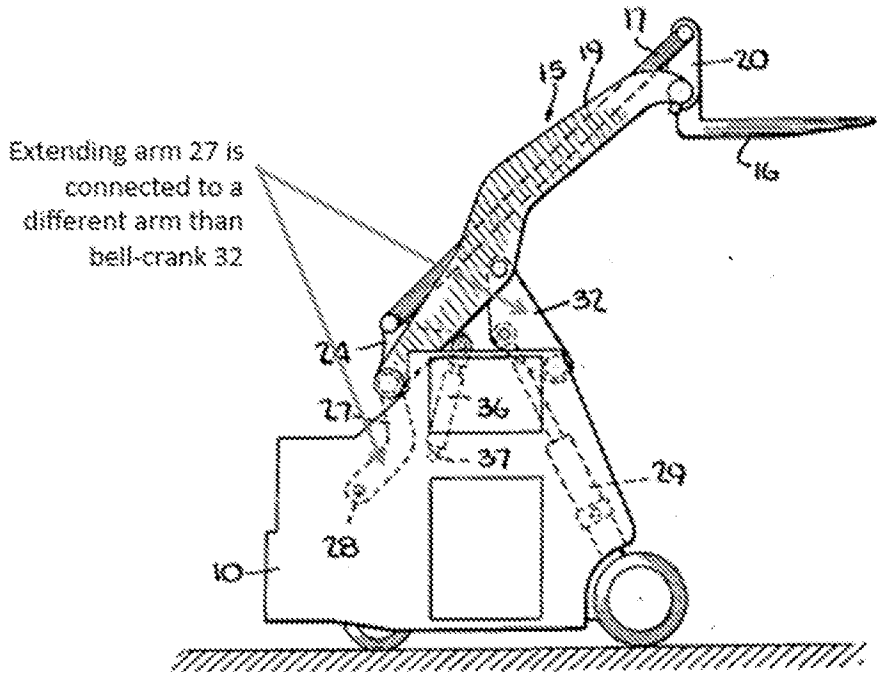


FIG. 4 of Ulinski

Applicant respectfully submits that the anticipation rejection must be withdrawn. The MPEP and the case law make clear that to anticipate a claim, a single reference must contain all of the elements of the claim. MPEP §2131. Because Ulinski does not include first and second linkages and an actuator that are connected to the same loader arm, Ulinski does not anticipate independent claim 4 or its dependent claims.

Rejections under 35 U.S.C. §103

The Office has rejected claims 5-7, 12 and 15-20 under 35 U.S.C. §103 for being obvious over Ulinski in view of U.S. Patent No. 4,087,101 to Shimazaki ("Shimazaki"). The pending claims are patentable over the cited references for the reasons set forth below.

Claims 5-7 and 12

Claims 5-7 and 12 depend directly or indirectly from claim 1 and incorporate the recitations set forth therein. Shimazaki does not cure the deficiency of Ulinski to disclose first and second linkages and an actuator that are connected to the same loader arm. Shimazaki describes a frame assembly for a tractor shovel including a front frame and a rear frame (abstract). Shimazaki is cited by the Office to show a bracket for supporting an engine (page 5 of the Office action). Shimazaki does not describe an actuator and linkages directly and pivotally attached to a loader arm as recited in claim 4 from which claims 5-7 and 12 depend. For at least this reason claims 5-7 and 12 are patentable over Ulinski in view of Shimazaki.

Claims 15-20

Inasmuch as independent claim 15 recites that the first and second linkages and first actuator are directly pivotally attached to the same loader, independent claim 15 and its dependent claims are patentable over the cited references for the reasons set forth above relating to claim 1.

Conclusion

Applicant respectfully requests reconsideration and allowance of all pending claims. The undersigned requests a phone call from the Examiner if this might expedite prosecution.

Applicant authorizes the Commissioner to charge any fees which may be due in connection with this Amendment C to Deposit Account No. 012384 in the name of Armstrong Teasdale LLP.

Respectfully submitted,

/Michael J. Vander Molen/

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MJV/tkw

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/961,868	10/07/2022	Brad Thomas	31681-641	8378

76656 7590 01/09/2024

Patent Docket Department
Armstrong Teasdale LLP
7700 Forsyth Boulevard
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St. Louis, MO 63105

EXAMINER	
KRAMER, DEAN J	

ART UNIT	PAPER NUMBER
3651	

NOTIFICATION DATE	DELIVERY MODE
01/09/2024	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USpatents@armstrongteasdale.com

Office Action Summary	Application No. 17/961,868	Applicant(s) Thomas et al.	
	Examiner DEAN J KRAMER	Art Unit 3651	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 28 December 2023.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-20 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☑ Claim(s) 1-3 is/are allowed.

7) ☑ Claim(s) 4-20 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/11/2023 has been entered.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The filing of a terminal disclaimer by itself is not a complete reply to a nonstatutory double patenting (NSDP) rejection. A complete reply requires that the terminal disclaimer be accompanied by a reply requesting reconsideration of the prior Office action. Even where the NSDP rejection is provisional the reply must be complete. See MPEP § 804, subsection I.B.1. For a reply to a non-final Office action, see 37 CFR 1.111(a). For a reply to final Office action, see 37 CFR 1.113(c). A request for reconsideration while not provided for in 37 CFR 1.113(c) may be filed after final for consideration. See MPEP §§ 706.07(e) and 714.13.

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The actual filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/apply/applying-online/eterminal-disclaimer.

4. Claims 4, 7, 10, and 12 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1, 2, 5, and 8, respectively, of U.S. Patent No. 9,975,750. Although the claims at issue are not identical, they are not patentably distinct from each other because claims 4, 7, 10, and 12 are generic to all that is recited in claims 1, 2, 5, and 8, respectively, of U.S. Pat. 9,975,750. In other words, claims 1, 2, 5, and 8 of the ('750) patent fully encompass the subject matter of claims 4, 7, 10, and 12 of the instant application. .

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention.

6. Claim(s) 4, 8-11, 13, and 14 is/are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Ulinski (US-3,074,572).

Ulinski shows a compact tool carrier comprising a loader (15) having a loader arm (24) wherein the loader (15) is adapted to carry a tool (16), a mainframe (10, 14), a first linkage (27) pivotally attached directly between a first side (14) of the mainframe and the loader arm (24), a second linkage (32) pivotally attached between a first side of the mainframe and the loader arm (24) through an additional arm (19) of the loader, a hydraulic actuator (36) pivotally attached directly between a first side of the mainframe and the loader arm (24), and a control station (54) at the rear of the carrier.

Regarding claims 8 and 9, the linkages and actuators are duplicated on each side of the mainframe (see col. 1, lines 61-65).

In regard to claim 10, a motor (44) for driving traction wheels (12) is attached to the mainframe.

Regarding claims 13 and 14, a pocket for surrounding a user is shown in dashed lines in Figure 1 above a platform on which the user stands while operating the controls.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim(s) 5-7, 12, and 15-20 is/are rejected under 35 U.S.C. 103 as being unpatentable over Ulinski (US-3,074,572) in view of Shimazaki et al. (US-4,087,101).

While the Ulinski patent includes an engine assembly (42, 44) mounted on its mainframe (10), there is no disclosure of an engine bracket extending from one side of the mainframe towards the other side of the mainframe as called for in the above claims of the instant application.

However, the patent to Shimazaki et al. shows it old and well known to a mount a bracket (27) for supporting an engine that extends from a first side (21) to a second side (21) of a vehicle mainframe (13).

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to a provide a bracket spanning the sidewalls (14, 14) of the Ulinski mainframe (10), as taught by Shimazaki et al., so that the engine of the carrier could be securely and safely supported on the mainframe through the resulting bracket.

Regarding claims 7 and 12, it would have been an obvious choice of mechanical design to integrally form the mainframe or loader arm of the Ulinski carrier as a single weldment in order to facilitate the construction thereof and create a durable structure. *In re Larson*, 340 F.2d 965, 968, 144

USPQ 347, 349 (CCPA 1965) (A claim to a fluid transporting vehicle was rejected as obvious over a prior art reference which differed from the prior art in claiming a brake drum integral with a clamping means, whereas the brake disc and clamp of the prior art comprise several parts rigidly secured together as a single unit. The court affirmed the rejection holding, among other reasons, "that the use of a one piece construction instead of the structure disclosed in [the prior art] would be merely a matter of obvious engineering choice."

In regard to claim 15, pivot points (26, 40, 35) represent the second, fourth, and sixth pivot points, respectively, and are movable relative to the mainframe as the loader moves between a down and a raised position (see Figs. 3-5).

Response to Arguments

The loader (15) shown in the Ulinski patent (US-3,074,572) is made up of series of interconnected arms (24, 19, 17) each of which can be considered a “loader arm” as broadly as recited in claims 4 and 15. The first linkage (27) and the hydraulic actuator (36) are in direct pivotal attachment to the loader arm (24) as now called for in independent claims 4 and 15.

Allowable Subject Matter

9. Claims 1-3 are allowed.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DEANJ KRAMER whose telephone number is (571)272-6926. The examiner can normally be reached Monday-Friday 7:30-4:00.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gene Crawford can be reached on 571-272-6911. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DEAN J KRAMER/
Primary Examiner, Art Unit 3651

DEAN J. KRAMER
Primary Examiner
Art Unit 3651

Djk

1/4/2024

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	Art Unit
	DEAN J KRAMER	3651

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/16/2023	10/04/2023	01/04/2024						
	1	✓	=	=						
	2	✓	=	=						
	3	✓	=	=						
	4		✓	✓						
	5		✓	✓						
	6		✓	✓						
	7		✓	✓						
	8		✓	✓						
	9		✓	✓						
	10		✓	✓						
	11		✓	✓						
	12		✓	✓						
	13		✓	✓						
	14		✓	✓						
	15		✓	✓						
	16		✓	✓						
	17		✓	✓						
	18		✓	✓						
	19		✓	✓						
	20		✓	✓						

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	Art Unit
	DEAN J KRAMER	3651

CPC - Searched*		
Symbol	Date	Examiner
B62D 21/16; 21/186; 51/007; 51/02; 51/04	03/15/2023	djk
B66F 9/065; 9/075; 9/07513; 9/07518; 9/07527; 9/07572; 9/07577	03/15/2023	djk
B60P 1/483	03/15/2023	djk
E02F 9/08; 9/0816; 9/0825	03/15/2023	djk

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
inventor and assignee search	03/15/2023	djk
updated search	10/03/2023	djk
updated search	01/04/2024	djk

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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Kubota North America Corporation et al

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	66	("10202266" OR "1808735" OR "20030095857" OR "20040026153" OR "20040228715" OR "20050036876" OR "20070017713" OR "20070128012" OR "20070132204" OR "20080197588" OR "20090116943" OR "20100106344" OR "20100183412" OR "20110137491" OR "20120291319" OR "20120305025" OR "20140271078" OR "2298450" OR "2345620" OR "2455474" OR "2558928" OR "2563277" OR "2774496" OR "2849132" OR "2953264" OR "2980271" OR "3074572" OR "3586195" OR "3908778" OR "4087101" OR "4117610" OR "4186812" OR "4239444" OR "5169278" OR "5423654" OR "5470190" OR "5520500" OR "5542814" OR "5551523" OR "5609464" OR "5894908" OR "6182778" OR "6205665" OR "6325589" OR "6474933" OR "6575262" OR "6616398" OR "6695568" OR "6866466" OR "7214026" OR "7264435" OR "7428943" OR "7695236" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/15 10:06 AM

		"7805864" OR "7866700" OR "7980569" OR "8016065" OR "8109356" OR "8152433" OR "8821104" OR "9045882" OR "9321386" OR "9975750" OR "D359497" OR "D431574" OR "D631898").pn.					
L2	76	((("THOMAS") near3 ("Brad")) OR (("HARTKE") near3 ("Louis")) OR (("LANGENFELD") near3 ("Greg")) OR (("HUTCHINSON") near3 ("Matt"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2023/03/15 10:27 AM
L3	77	("1808735" | "2298450" | "2345620" | "2455474" | "2558928" | "2563277" | "2774496" | "2849132" | "2953264" | "2980271" | "3074572" | "3586195" | "3908778" | "4087101" | "4117610" | "4186812" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5520500" | "5542814" | "5551523" | "5609464" | "5894908" | "D431574" | "6182778" | "6205665" | "6325589" | "6474933" | "6575262" | "6616398" | "6695568" | "6866466" | "7214026" | "7264435" | "7428943" | "7695236" | "7805864" | "7866700" | "D631898" | "7980569" | "8016065" | "8109356" | "8152433" | "8821104" | "9045882" | "9321386" | "9975750" | "10202266" | "20030095857" | "20040026153" | "20040228715" | "20050036876" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100106344" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 10:28 AM

		"20100183412" | "20110137491" | "20120291319" | "20120305025" | "20140271078").pn. OR ("11465891").urpn. AND (PGPB | USPT | USOC).dbnm.					
L4	0	3 NOT 1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 10:28 AM
L5	22	("1789238" | "2535301" | "2725223" | "2822056" | "3437163" | "3880445").pn. OR ("4087101").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 10:29 AM
L6	12	("1198885" | "3880445" | "4087101" | "6398236" | "6668957" | "7243949" | "7503586" | "20050062251").pn. OR ("8146948").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 10:31 AM
L7	1453	b62d21/16.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 10:42 AM
L8	3470	b62d21/186.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY,	OR	ON	ON	2023/03/15 11:06 AM

			CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L9	3371	8 NOT 7	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 11:07 AM
L10	26	("3838952" | "3842927" | "3850473" | "3870172" | "3895728" | "4055262" | "4060261" | "4074782" | "4131225" | "4374600" | "4405280" | "4449606" | "4514007" | "4535868" | "4955455" | "4962825" | "5161638").pn. OR ("6167980").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 11:11 AM
L11	13	("3895728" | "4055262" | "4449606" | "4815550" | "6108907" | "6138786" | "6167980" | "7735594" | "7866700" | "8821104" | "8919486" | "20080078917" | "20130220720").pn. OR ("9586466").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 11:29 AM
L12	663	9 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS,	OR	ON	ON	2023/03/15 12:34 PM

			IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L13	3585	(B66F9/065.cpc. OR b66f9/075$.cpc.) AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 12:49 PM
L14	3547	13 NOT (12 OR 7)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 12:49 PM
L15	0	b66f9/17518.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:02 PM
L16	661	b66f9/07518.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2023/03/15 01:02 PM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L17	376	16 NOT 14	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:03 PM
L18	887	e02f9/0816.cpc. OR e02f9/0825.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:05 PM
L19	703	e02f9/08.cpc. AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:13 PM
L20	652	19 NOT 18	(US-PGPUB; USPAT;	OR	ON	ON	2023/03/15

			USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				01:13 PM
L21	2186	b60p1/483.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:34 PM
L22	206	21 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:34 PM
L23	5406	(b62d51/007.cpc. OR b62d51/02.cpc. OR b62d51/04.cpc.) OR 280/797.ccls.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA,	OR	ON	ON	2023/03/15 03:10 PM

			VN); FPRS; EPO; JPO; IBM_TDB)				
L24	489	23 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 03:10 PM
L25	468	24 NOT (12 OR 7 OR 20 OR 17)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 03:11 PM
L26	4	((US-8821104-B2 OR US-6205665-B1 OR US-5551523-A OR US-4087101-A).did. AND USPT.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/10/03 11:05 AM
L27	30	("5547244" | "6065276" | "6098739" | "6205665" | "6283220" | "6684537" | "8303026" | "20040028514").pn. OR ("8821104").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 11:42 AM

L28	14	("3452887" | "3667620" | "3912092" | "4119222" | "6085811" | "6470606" | "6648578").pn. OR ("7695236").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 12:51 PM
L29	77	("1808735" | "2298450" | "2345620" | "2455474" | "2558928" | "2563277" | "2774496" | "2849132" | "2953264" | "2980271" | "3074572" | "3586195" | "3908778" | "4087101" | "4117610" | "4186812" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5520500" | "5542814" | "5551523" | "5609464" | "5894908" | "D431574" | "6182778" | "6205665" | "6325589" | "6474933" | "6575262" | "6616398" | "6695568" | "6866466" | "7214026" | "7264435" | "7428943" | "7695236" | "7805864" | "7866700" | "D631898" | "7980569" | "8016065" | "8109356" | "8152433" | "8821104" | "9045882" | "9321386" | "9975750" | "10202266" | "20030095857" | "20040026153" | "20040228715" | "20050036876" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100106344" | "20100183412" | "20110137491" | "20120291319" | "20120305025" | "20140271078").pn. OR ("11465891").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 01:03 PM
L30	15	("2007/0128012").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 01:07 PM
L31	1470	b62d21/16.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY,	OR	ON	ON	2023/10/03 02:19 PM

			CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L32	3517	b62d21/186.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L33	3744	(B66F9/065.cpc. OR b66f9/075$.cpc.) AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L34	888	e02f9/0816.cpc. OR e02f9/0825.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM

L35	9296	31 OR 32 OR 33 OR 34	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L36	15	("4345524" | "5253777" | "5269585" | "5352011" | "5501504" | "5577746" | "6041880" | "7275785" | "7422241" | "8973982" | "9200344" | "20100206439" | "20150099139" | "20150360725").pn. OR ("10822034").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 02:25 PM
L37	18	("2701728" | "3032352" | "3595410" | "3700256" | "3822073" | "4087101" | "4232883" | "4403671" | "4664404" | "4690183" | "4736633" | "D436969" | "6880854" | "8662460" | "20130026789" | "20180186207").pn. OR ("10518810").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 02:31 PM
L38	5	((US-8821104-B2 OR US-6205665-B1 OR US-5551523-A OR US-4087101-A OR US-3074572-A).did. AND USPT.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/04 10:43 AM
L39	11	("3074572").urpn. AND (PGPB | USPT |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 10:44 AM

		USOC).dbnm.					
L40	56	("2345620" | "2455474" | "2558928" | "2774496" | "2849132" | "2953264" | "2980271" | "3074572" | "3586195" | "4117610" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5542814" | "5609464" | "D431574" | "6325589" | "6474933" | "6616398" | "6695568" | "7214026" | "7264435" | "7695236" | "7805864" | "7980569" | "8152433" | "8821104" | "20040026153" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100183412" | "20120291319" | "20120305025" | "20140271078").pn. OR ("9975750").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 10:45 AM
L41	14	("3452887" | "3667620" | "3912092" | "4119222" | "6085811" | "6470606" | "6648578").pn. OR ("7695236").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 11:00 AM
L42	41	("2984373" | "3412819" | "3540220" | "3833261" | "4547119" | "4676713" | "4691806" | "5027940" | "5040428" | "5083895").pn. OR ("5423654").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 11:03 AM
L43	11	("2774496").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2024/01/04 11:09 AM
L44	1484	b62d21/16.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2024/01/04 11:12 AM

			MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L45	3818	(B66F9/065.cpc. OR b66f9/075$.cpc.) AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/04 11:12 AM
L46	897	e02f9/0816.cpc. OR e02f9/0825.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/04 11:12 AM
L47	6177	44 OR 45 OR 46	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/04 11:12 AM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

UNITED STATES
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Alexandria, VA 22313 - 1450
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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/961,868	12/28/2023 11:24:27 AM Z ET	31681-641

Title of Invention

LOW PROFILE COMPACT TOOL CARRIERS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8378	FILED BY	Teddi Weber
PATENT CENTER #	63772291	AUTHORIZED BY	Michael Gnibus
CUSTOMER #	76656	FILING DATE	10/07/2022
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Brad Thomas

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
DA / 012384	E2023BRB24457357	Teddi Weber

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
1801	REQUEST FOR CONTINUED EXAMINATION (RCE) - 1ST REQUEST (SEE 37 CFR 1.114)	1360.00	1	1360.00
			TOTAL AMOUNT:	$1,360.00

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/30EFS (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	17961868	Filing Date	2022-10-07	Docket Number (if applicable)	31681-641 (3084USC5)	Art Unit	3651
First Named Inventor	Brad Thomas			Examiner Name	Dean J. Kramer		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☒ Other Amendment filed December 11, 2023

☐ Enclosed

☐ Amendment/Reply

☐ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 012384

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

PTO/SB/30EFS (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/Michael M. Gnibus/	Date (YYYY-MM-DD)	2023-12-28
Name	Michael M. Gnibus	Registration Number	38,162

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/961,868	**12/28/2023 11:24:27 AM Z ET**	**31681-641**

Title of Invention

LOW PROFILE COMPACT TOOL CARRIERS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8378	FILED BY	Teddi Weber
PATENT CENTER #	63772291	FILING DATE	10/07/2022
CUSTOMER #	76656	FIRST NAMED INVENTOR	Brad Thomas
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Michael Gnibus

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
3084USC5 RCE Transmittal 28DEC2023-61912503.pdf	3	Request for Continued Examination (RCE)	1678 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
3084USC5 RCE Transmittal 28DEC2023-61912503.pdf	FA2E52721AEE5DFEBFF361F02BE1633016FD1067A3AF345FA C27FA6D3CB9FF8A002D7361482348EE87F9D662E6642395796 C9A320C2C6B9222F0BD013051EC65

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized

by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/961,868	Filing Date 10/07/2022	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $480 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	12/28/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/VIOLA D ROGERS/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/961,868	10/07/2022	Brad Thomas	31681-641	8378

76656 7590 12/22/2023

Patent Docket Department
Armstrong Teasdale LLP
7700 Forsyth Boulevard
Suite 1800
St. Louis, MO 63105

EXAMINER	
KRAMER, DEAN J	

ART UNIT	PAPER NUMBER
3651	

NOTIFICATION DATE	DELIVERY MODE
12/22/2023	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USpatents@armstrongteasdale.com

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 17/961,868	**Applicant(s)** Thomas et al.	
	Examiner DEAN J KRAMER	**Art Unit** 3651	**AIA (FITF) Status** Yes

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 11 December 2023 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☑ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:
   a) ☐ The period for reply expires ____ months from the mailing date of the final rejection.
   b) ☑ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection.The current period for reply expires ____ months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.
   Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANTS FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37CFR 41.37(a).

AMENDMENTS

3. ☑ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☑ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.
   NOTE: See Continuation Sheet (See 37 CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☐ For purposes of appeal, the proposed amendment(s):(a)☐ will not be entered, or (b)☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____
9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.
13. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____
14. ☐ Other: _____.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:
    Claim(s) allowed:1-3.
    Claim(s) objected to:_____.
    Claim(s) rejected:4-20.
    Claim(s) withdrawn from consideration:_____.

/DEAN J KRAMER/ Primary Examiner, Art Unit 3651	

Continuation of 3. NOTE: The proposed amendment to claims 4 and 15 further defining the actuator as being "directly" pivotally attached to the loader arm raises new issues that would require a further consideration of the prior art.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Brad Thomas	:	
	:	Art Unit: 3651
Serial No.: 17/961,868	:	
	:	Examiner: Kramer, Dean J
Filed: October 7, 2022	:	
	:	Conf. No.: 8378
For: MAINFRAMES FOR A SELF-PROPELLED MACHINE	:	

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT

In response to the Office Action dated October 13, 2023, please amend the above-identified patent application as follows and consider the following remarks.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/961,868	**12/11/2023 04:09:20 PM Z ET**	**31681-641**

Title of Invention

LOW PROFILE COMPACT TOOL CARRIERS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8378	FILED BY	Teddi Weber
PATENT CENTER #	63566450	FILING DATE	10/07/2022
CUSTOMER #	76656	FIRST NAMED INVENTOR	Brad Thomas
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Michael Gnibus

Documents

TOTAL DOCUMENTS: 3

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
3084USC5 Response to Final OA 11DEC2023.pdf		12	-	175 KB
3084USC5 Response to Final OA 11DEC2023-A.NE.pdf	(1-1)	1	Response After Final Action	104 KB
3084USC5 Response to Final OA 11DEC2023-CLM.pdf	(2-6)	5	Claims	113 KB
3084USC5 Response to Final OA 11DEC2023-REM.pdf	(7-12)	6	Applicant Arguments/Remarks Made in an Amendment	158 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
3084USC5 Response to Final OA 11DEC2023.pdf	553006B54DEB61390F4E5509567C45F0983E5A10A03D9B03A904FA19D2F012D6D76EB61F22CA3FA6AA0B5F9D51F02471FE8081C2CBDFDB040B164F91A00B2C77
3084USC5 Response to Final OA 11DEC2023-A.NE.pdf	A584715086F65D62D2C8F250AB8E7DE6E197CA72BDF01FAC03767D97299293B70EFB6F35B08EB768B79CE2E10CCF2C75AC6A0816619FEF4AEF4C5673284C5AB3
3084USC5 Response to Final OA 11DEC2023-CLM.pdf	42E3AEAFC10C910EAAA868E658BFD0F6142EE25283C918E5C2B65827DE2C9DF132A14EC1E7CE843352CF95BCDF81D48846154B32A550F1F6F1D958210871E141
3084USC5 Response to Final OA 11DEC2023-REM.pdf	8817FEE73D13D29DAFA36F1F1BC9079D7F7E5BDA81A88ABE19C15F929AD8D17E7527E304547983179OF8FC5E4D37AAF9DB34AB0AD9496DE36C8C69EB1E378E32

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Brad Thomas	:	
	:	Art Unit: 3651
Serial No.: 17/961,868	:	
	:	Examiner: Kramer, Dean J
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Mail Stop Amendment
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P.O. Box 1450
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AMENDMENT

In response to the Office Action dated October 13, 2023, please amend the above-identified patent application as follows and consider the following remarks.

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. (Previously Presented) A mainframe for a self-propelled machine, the mainframe having a front end, a rear end and a longitudinal axis and comprising:

a first side comprising:

a first bracket portion for supporting a load, the first bracket portion forming an upward-facing first pocket that extends from the front end to the rear end of the mainframe, the first side defining a first drive opening for receiving a first hub of a drive mechanism; and

a plurality of first pivot points for attachment of a loader including a first front pivot point proximate the front end, a first rear pivot point proximate the rear end, and a first central pivot point located between the first front pivot point and the first rear pivot point along the longitudinal axis;

a second side comprising:

a second bracket portion for supporting a load, the second bracket portion forming an upward-facing second pocket that extends from the front end to the rear end of the mainframe, the second side defining a second drive opening for receiving a second hub of a drive mechanism; and

a plurality of second pivot points for attachment of a loader including a second front pivot point proximate the front end, a second rear pivot point

proximate the rear end, and a second central pivot point located between the second front pivot point and the second rear pivot point along the longitudinal axis; and

a hydraulic reservoir housing configured to store hydraulic fluid, the hydraulic reservoir housing being connected to the first side of the mainframe and connected to the second side of the mainframe, the hydraulic reservoir housing being disposed between the front end of the mainframe and the first and second drive openings.

2. (Previously Presented) The mainframe as set forth in claim 1 further comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being disposed between the rear end and the first and second drive openings.

3. (Original) The mainframe as set forth in claim 1 wherein the mainframe is a single weldment.

4. (Currently Amended) A compact tool carrier having a longitudinal axis and comprising:

a loader having a loader arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis;

a first linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;

a second linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe and directly pivotally attached to the loader arm; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear end of the compact tool carrier.

5. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the mainframe comprises an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe.

6. (Previously Presented) The compact tool carrier as set forth in claim 5 comprising an engine to propel a drive mechanism, the engine being attached to the engine bracket.

7. (Previously Presented) The compact tool carrier as set for in claim 4, wherein the mainframe incorporates a single weldment.

8. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the loader arm is a first loader arm, the loader comprising a second loader arm and the compact tool carrier comprising a third linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm and a fourth linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

9. (Previously Presented) The compact tool carrier as set forth in claim 8, wherein the actuator is a first actuator, the compact tool carrier comprising a second actuator, the second actuator being pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

10. (Previously Presented) The compact tool carrier as set forth in claim 4 comprising a drive mechanism comprising tracks or wheels, the drive mechanism being attached to the mainframe.

11. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the actuator is a hydraulic cylinder.

12. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the loader arm incorporates a single weldment.

13. (Previously Presented) The compact tool carrier as set forth in claim 4, wherein the mainframe defines a pocket toward a rear of the mainframe to partially surround an operator.

14. (Previously Presented) The compact tool carrier as set forth in claim 13 further comprising an operator platform at least partially within the pocket.

15. (Currently Amended) A compact tool carrier having a longitudinal axis and comprising:

a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe;

a first linkage pivotally attached to the mainframe at a first pivot point and pivotally attached to the loader at a second pivot point;

an actuator pivotally attached to the mainframe at a third pivot point and directly pivotally attached to the loader at a fourth pivot point;

a second linkage pivotally attached to the mainframe at a fifth pivot point and pivotally attached to the loader at a sixth pivot point; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear end of the compact tool carrier,

wherein the second, fourth and sixth pivot points move relative to the mainframe as the loader moves between the down position and the vertically raised position.

16. (Previously Presented) The compact tool carrier as set forth in claim 15, wherein the loader includes a first loader arm, wherein the first linkage is pivotally attached to the first loader arm of the loader and the second linkage is pivotally attached to the first loader arm of the loader.

17. (Previously Presented) The compact tool carrier as set forth in claim 16, the loader comprising a second loader arm and the compact tool carrier comprising a third linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm and a fourth linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

18. (Previously Presented) The compact tool carrier as set forth in claim 17, wherein the actuator is a first actuator, the compact tool carrier comprising a second actuator, the second actuator being pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

19. (Previously Presented) The compact tool carrier as set forth in claim 15, wherein the mainframe defines a pocket toward a rear of the mainframe to partially surround an operator.

20. (Previously Presented) The compact tool carrier as set forth in claim 19 further comprising an operator platform at least partially within the pocket.

REMARKS

The Office Action dated October 13, 2023, has been carefully reviewed and the following remarks are made in response. Applicant respectfully requests reconsideration and allowance of all pending claims. Applicant does not concede the propriety of the rejections but amends only to expedite prosecution.

Status of the Claims

Claims 1-20 are pending. Claims 1-3 are indicated as allowable. Claims 4-20 are rejected. Applicant has amended claims 4 and 15. Support for the amendments may be found at, for example, Figures 2-3 of the application. No new matter is added.

Double Patenting

The Office has rejected claims 4-7, 10, and 11 on the ground of nonstatutory obviousness-type double patenting over claims 45, 6, 49, 57, and 7, respectively, of U.S. Patent No. 9,321,386C2. Claims 4, 7, 10, and 12 are rejected on the ground of nonstatutory obviousness-type double patenting over claims 1, 2, 5, and 8, respectively, of U.S. Patent No. 9,975,750C1. Applicant will consider filing a terminal disclaimer to obviate the rejection when it is the last remaining rejection in the application and the presently pending claims have been indicated as allowable, but for the rejection.

Claim Rejections - 35 U.S.C. § 102

The Office has rejected claims 4, 8-11, 13, and 14 under 35 U.S.C. §102 as being anticipated by U.S. Patent No. 3,074,572 to Ulinski ("Ulinski"). The claims are novel over Ulinski for the reasons set forth below.

Claim 4 is directed to a compact tool carrier. As amended, the compact tool carrier includes:

a loader having a loader arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis;

a first linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;

a second linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe and **directly** pivotally attached to the loader arm; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear end of the compact tool carrier.

Ulinski describes an industrial truck employing leverage systems for elevating and lowering a load carriage (col. 1, lines 11-13). FIG. 3 of Ulinski is reproduced below for reference.

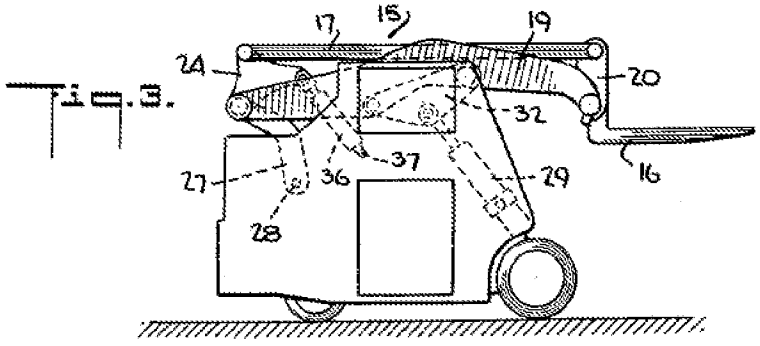


FIG. 3 of Ulinski

The industrial truck includes a main frame 10 (FIG. 1) and a leverage system 15 for "lifting and lowering of a load carriage" (col. 1, lines 55-65). A hydraulic ram 29 is pivotally connected to a vertical plate of the main frame 10 and to a bell crank 32 for raising and lowering the leverage system 15 (col. 2, lines 7-16 and col. 3, lines 9-29). A second ram 36 is connected to a crank arm 24 to pivot the forks 16 of the truck (col. 2, lines 17-34).

The Office considers the second ram 36 to be the equivalent of the actuator recited in claim 1 (page 4 of the Office action). Ulinski teaches that the second ram 36 is supported by a pivot 37...extending upwardly...to a forwardly extending portion of the crank arm 24 (col. 2, lines 17-22). Ulinski does not teach an actuator ***directly*** and pivotally attached to the loader arm. In contrast, ***the second ram 36 is attached to the crank arm 24***, and the crank arm 24 is pivotally attached to the lever 19 and the first linkage 27. Ulinkski does not teach an actuator pivotally attached to the first side of the mainframe and directly pivotally attached to the loader arm as recited in claim 4.

For at least these reasons, claim 4 is novel over Ulinski. Claims 8-11, 13, and 14 depend directly or indirectly from claim 4 and are novel over Ulinski for at least the same reasons.

Accordingly, Applicant respectfully requests the rejections of Claims 4, 8-11, 13, and 14 under § 102 be withdrawn.

Claim Rejections - 35 U.S.C. § 103

The Office has rejected claims 5-7, 12, and 15-20 under 35 U.S.C. §103 as being obvious over Ulinski in view of U.S. Patent No. 4,087,101 to Shimazaki et al. ("Shimazaki"). The claims are patentable over the cited references for at least the reasons set forth below.

Claims 5-7 and 12

To establish a prima facie case of obviousness, the Office Action must show that the cited prior art includes each element claimed, although not necessarily in a single prior art reference. MPEP § 2143 (emphasis added).

Ulinski is described above. Shimazaki describes a frame assembly for a tractor shovel including a front frame and a rear frame (Abstract).

Shimazaki is cited by the Office to show a bracket for supporting an engine (page 5 of the Office action). Shimazaki does not cure the deficiencies of Ulinski to describe an actuator directly and pivotally attached to a loader arm as recited in claim 4 from which claims 5-7 and 12

depend. For at least these reasons Claims 5-7 and 12 are patentable over Ulinski in view of Shimazaki.

Claims 15-20

Claim 15 is directed to a compact tool carrier. As amended, the compact tool carrier includes:

> a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position;
>
> a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe;
>
> a first linkage pivotally attached to the mainframe at a first pivot point and pivotally attached to the loader at a second pivot point;
>
> an actuator pivotally attached to the mainframe at a third pivot point and **directly** pivotally attached to the loader at a fourth pivot point, the actuator disposed between the first linkage and the second linkage;
>
> a second linkage pivotally attached to the mainframe at a fifth pivot point and pivotally attached to the loader at a sixth pivot point; and
>
> a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader in a substantially vertical travel path, the control station being mounted toward the rear end of the compact tool carrier,
>
> wherein the second, fourth and sixth pivot points move relative to the mainframe as the loader moves between the down position and the vertically raised position.

The combination of Ulinski and Shimazaki does not teach or suggest an actuator pivotally attached to the first side of the mainframe and directly pivotally attached to the loader as recited in independent claim 15. For at least these reasons Claim 15 and its dependent claims are patentable over the cited references.

Claims 16-20, which depend from Claim 15, are also submitted to be patentable over cited references for at least the same reasons.

Accordingly, Applicant respectfully requests the rejections of Claims 5-7, 12, and 15-20 under § 103 be withdrawn.

Conclusion

Applicant's failure (if at all) to expressly address above any particular statement or argument by the Examiner should not be construed as an admission or acquiescence that such statement or argument is accurate or proper.

In view of the foregoing amendment and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action are respectfully solicited.

Should the Examiner have any issues concerning this reply or any other outstanding issues remaining in this application, the favor of a telephone call to the undersigned is respectfully requested in order to expedite prosecution.

Respectfully submitted,

/Michael M. Gnibus/
Michael M. Gnibus
Registration No. 38,162
ARMSTRONG TEASDALE LLP
7700 Forsyth Blvd., Suite 1800
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PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/961,868	Filing Date 10/07/2022	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $480 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	12/11/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/VENICE M WILLIAMS/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Brad Thomas	:	
	:	Art Unit: 3651
Serial No.: 17/961,868	:	
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Mail Stop Amendment
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AMENDMENT

In response to the Office Action dated October 13, 2023, please amend the above-identified patent application as follows and consider the following remarks.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/961,868	10/07/2022	Brad Thomas	31681-641	8378

76656 7590 10/13/2023

Patent Docket Department
Armstrong Teasdale LLP
7700 Forsyth Boulevard
Suite 1800
St. Louis, MO 63105

EXAMINER	
KRAMER, DEAN J	

ART UNIT	PAPER NUMBER
3651	

NOTIFICATION DATE	DELIVERY MODE
10/13/2023	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USpatents@armstrongteasdale.com

Office Action Summary	Application No. 17/961,868	Applicant(s) Thomas et al.	
	Examiner DEAN J KRAMER	Art Unit 3651	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 21 September 2023.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☑ This action is **FINAL.** 2b) ☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-20 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☑ Claim(s) 1-3 is/are allowed.

7) ☑ Claim(s) 4-20 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

The amendment filed 9/21/2023 and the remarks presented therewith have been carefully considered. However, they are not deemed to be fully persuasive. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Double Patenting

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject

to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The filing of a terminal disclaimer by itself is not a complete reply to a nonstatutory double patenting (NSDP) rejection. A complete reply requires that the terminal disclaimer be accompanied by a reply requesting reconsideration of the prior Office action. Even where the NSDP rejection is provisional the reply must be complete. See MPEP § 804, subsection I.B.1. For a reply to a non-final Office action, see 37 CFR 1.111(a). For a reply to final Office action, see 37 CFR 1.113(c). A request for reconsideration while not provided for in 37 CFR 1.113(c) may be filed after final for consideration. See MPEP §§ 706.07(e) and 714.13.

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The actual filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/apply/applying-online/eterminal-disclaimer.

2. Claims 4-7, 10, and 11 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 45, 6, 49, 57, and 7, respectively, of U.S. Patent No. 9,321,386. Although the claims at issue are not identical, they are not patentably distinct from each other because claims 4-7, 10, and 11 are generic to all that is recited in claims 45, 6, 49, 57, and 7, respectively, of U.S. Pat. 9,321,386.

In other words, claims 45, 6, 49, 57, and 7 of the ('386) patent fully encompass the subject matter of claims 4-7, 10, and 11 of the instant application.

3. Claims 4, 7, 10, and 12 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1, 2, 5, and 8, respectively, of U.S. Patent No. 9,975,750. Although the claims at issue are not identical, they are not patentably distinct from each other because claims 4, 7, 10, and 12 are generic to all that is recited in claims 1, 2, 5, and 8, respectively, of U.S. Pat. 9,975,750. In other words, claims 1, 2, 5, and 8 of the ('750) patent fully encompass the subject matter of claims 4, 7, 10, and 12 of the instant application. .

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention.

5. Claim(s) 4, 8-11, 13, and 14 is/are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Ulinski (US-3,074,572).

Ulinski shows a compact tool carrier comprising a loader (15) having a loader arm (19) adapted to carry a tool (16), a mainframe (10, 14), a first linkage (27) pivotally attached between a first side (14) of the mainframe and the loader arm, a second linkage (32) pivotally attached between a first side of the mainframe and the loader arm, a hydraulic actuator (36) pivotally attached between a first side of the mainframe and the loader arm through crank (24), and a control station (54) at the rear of the carrier.

Regarding claims 8 and 9, the linkages and actuators are duplicated on each side of the mainframe (see col. 1, lines 61-65).

In regard to claim 10, a motor (44) for driving traction wheels (12) is attached to the mainframe.

Regarding claims 13 and 14, a pocket for surrounding a user is shown in dashed lines in Figure 1 above a platform on which the user stands while operating the controls.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim(s) 5-7, 12, and 15-20 is/are rejected under 35 U.S.C. 103 as being unpatentable over Ulinski (US-3,074,572) in view of Shimazaki et al. (US-4,087,101).

While the Ulinski patent includes an engine assembly (42, 44) mounted on its mainframe (10), there is no disclosure of an engine bracket extending from one side of the mainframe towards the other side of the mainframe as called for in the above claims of the instant application.

However, the patent to Shimazaki et al. shows it old and well known to a mount a bracket (27) for supporting an engine that extends from a first side (21) to a second side (21) of a vehicle mainframe (13).

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to a provide a bracket spanning the sidewalls (14, 14) of the Ulinski mainframe (10), as taught by Shimazaki et al., so that the engine of the carrier could be securely and safely supported on the mainframe through the resulting bracket.

Regarding claims 7 and 12, it would have been an obvious choice of mechanical design to integrally form the mainframe or loader arm of the Ulinski carrier as a single weldment in order to facilitate the construction thereof and create a durable structure. *In re Larson,* 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965) (A claim to a fluid transporting vehicle was rejected as obvious over a prior art reference which differed from the prior art in claiming a brake drum integral with a clamping means, whereas the brake disc and clamp of the prior art comprise several parts rigidly secured together as a single unit. The court affirmed the rejection holding, among other reasons, "that the use of a one piece construction instead of the structure disclosed in [the prior art] would be merely a matter of obvious engineering choice."

In regard to claim 15, pivot points (26, 40, 35) represent the second, fourth, and sixth pivot points, respectively, and are movable relative to the mainframe as the loader moves between a down and a raised position (see Figs. 3-5).

Allowable Subject Matter

8. Claims 1-3 are allowed.

Response to Arguments

9. Applicant's arguments with respect to newly added claims 4-20 have been considered but are moot because the new ground of rejection does not rely on any reference applied in the prior rejection of record for any teaching or matter specifically challenged in the argument.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DEANJ KRAMER whose telephone number is (571)272-6926. The examiner can normally be reached Monday-Friday 7:30-4:00.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gene Crawford can be reached on 571-272-6911. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit

https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DEAN J KRAMER/
Primary Examiner, Art Unit 3651

DEAN J. KRAMER
Primary Examiner
Art Unit 3651

Djk

10/4/2023

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	Art Unit
	DEAN J KRAMER	3651

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant				☐ CPA		☐ T.D.		☐ R.1.47		
CLAIM		DATE								
Final	Original	03/16/2023	10/04/2023							
	1	✓	=							
	2	✓	=							
	3	✓	=							
	4		✓							
	5		✓							
	6		✓							
	7		✓							
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	14		✓							
	15		✓							
	16		✓							
	17		✓							
	18		✓							
	19		✓							
	20		✓							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	Art Unit
	DEAN J KRAMER	3651

CPC - Searched*		
Symbol	Date	Examiner
B62D 21/16; 21/186; 51/007; 51/02; 51/04	03/15/2023	djk
B66F 9/065; 9/075; 9/07513; 9/07518; 9/07527; 9/07572; 9/07577	03/15/2023	djk
B60P 1/483	03/15/2023	djk
E02F 9/08; 9/0816; 9/0825	03/15/2023	djk

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
inventor and assignee search	03/15/2023	djk
updated search	10/03/2023	djk

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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Kubota North America Corporation et al

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	66	("10202266" OR "1808735" OR "20030095857" OR "20040026153" OR "20040228715" OR "20050036876" OR "20070017713" OR "20070128012" OR "20070132204" OR "20080197588" OR "20090116943" OR "20100106344" OR "20100183412" OR "20110137491" OR "20120291319" OR "20120305025" OR "20140271078" OR "2298450" OR "2345620" OR "2455474" OR "2558928" OR "2563277" OR "2774496" OR "2849132" OR "2953264" OR "2980271" OR "3074572" OR "3586195" OR "3908778" OR "4087101" OR "4117610" OR "4186812" OR "4239444" OR "5169278" OR "5423654" OR "5470190" OR "5520500" OR "5542814" OR "5551523" OR "5609464" OR "5894908" OR "6182778" OR "6205665" OR "6325589" OR "6474933" OR "6575262" OR "6616398" OR "6695568" OR "6866466" OR "7214026" OR "7264435" OR "7428943" OR "7695236" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/15 10:06 AM

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L2	76	((("THOMAS") near3 ("Brad")) OR (("HARTKE") near3 ("Louis")) OR (("LANGENFELD") near3 ("Greg")) OR (("HUTCHINSON") near3 ("Matt"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2023/03/15 10:27 AM
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L5	22	("1789238" | "2535301" | "2725223" | "2822056" | "3437163" | "3880445").pn. OR ("4087101").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 10:29 AM
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L8	3470	b62d21/186.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY,	OR	ON	ON	2023/03/15 11:06 AM

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			IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
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L15	0	b66f9/17518.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:02 PM
L16	661	b66f9/07518.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2023/03/15 01:02 PM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
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L18	887	e02f9/0816.cpc. OR e02f9/0825.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:05 PM
L19	703	e02f9/08.cpc. AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:13 PM
L20	652	19 NOT 18	(US-PGPUB; USPAT;	OR	ON	ON	2023/03/15

			USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				01:13 PM
L21	2186	b60p1/483.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:34 PM
L22	206	21 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:34 PM
L23	5406	(b62d51/007.cpc. OR b62d51/02.cpc. OR b62d51/04.cpc.) OR 280/797.ccls.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA,	OR	ON	ON	2023/03/15 03:10 PM

			VN); FPRS; EPO; JPO; IBM_TDB)				
L24	489	23 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 03:10 PM
L25	468	24 NOT (12 OR 7 OR 20 OR 17)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 03:11 PM
L26	4	((US-8821104-B2 OR US-6205665-B1 OR US-5551523-A OR US-4087101-A).did. AND USPT.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/10/03 11:05 AM
L27	30	("5547244" | "6065276" | "6098739" | "6205665" | "6283220" | "6684537" | "8303026" | "20040028514").pn. OR ("8821104").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 11:42 AM

L28	14	("3452887" | "3667620" | "3912092" | "4119222" | "6085811" | "6470606" | "6648578").pn. OR ("7695236").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 12:51 PM
L29	77	("1808735" | "2298450" | "2345620" | "2455474" | "2558928" | "2563277" | "2774496" | "2849132" | "2953264" | "2980271" | "3074572" | "3586195" | "3908778" | "4087101" | "4117610" | "4186812" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5520500" | "5542814" | "5551523" | "5609464" | "5894908" | "D431574" | "6182778" | "6205665" | "6325589" | "6474933" | "6575262" | "6616398" | "6695568" | "6866466" | "7214026" | "7264435" | "7428943" | "7695236" | "7805864" | "7866700" | "D631898" | "7980569" | "8016065" | "8109356" | "8152433" | "8821104" | "9045882" | "9321386" | "9975750" | "10202266" | "20030095857" | "20040026153" | "20040228715" | "20050036876" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100106344" | "20100183412" | "20110137491" | "20120291319" | "20120305025" | "20140271078").pn. OR ("11465891").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 01:03 PM
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			CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L32	3517	b62d21/186.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L33	3744	(B66F9/065.cpc. OR b66f9/075$.cpc.) AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L34	888	e02f9/0816.cpc. OR e02f9/0825.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM

L35	9296	31 OR 32 OR 33 OR 34	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/10/03 02:19 PM
L36	15	("4345524" | "5253777" | "5269585" | "5352011" | "5501504" | "5577746" | "6041880" | "7275785" | "7422241" | "8973982" | "9200344" | "20100206439" | "20150099139" | "20150360725").pn. OR ("10822034").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 02:25 PM
L37	18	("2701728" | "3032352" | "3595410" | "3700256" | "3822073" | "4087101" | "4232883" | "4403671" | "4664404" | "4690183" | "4736633" | "D436969" | "6880854" | "8662460" | "20130026789" | "20180186207").pn. OR ("10518810").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/10/03 02:31 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/961,868	**09/21/2023 09:36:03 AM ET**	**31681-641**

Title of Invention

LOW PROFILE COMPACT TOOL CARRIERS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8378	FILED BY	Teddi Weber
PATENT CENTER #	62831219	AUTHORIZED BY	Michael Gnibus
CUSTOMER #	76656	FILING DATE	10/07/2022
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Brad Thomas

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
DA / 012384	**E20239K037557823**	**Teddi Weber**

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
1253	EXTENSION FOR RESPONSE WITHIN THIRD MONTH	1480.00	1	1480.00
			TOTAL AMOUNT:	**$1,480.00**

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Brad Thomas	
	Art Unit: 3651
Serial No.: 17/961,868	
	Examiner: Kramer, Dean J
Filed: October 7, 2022	
	Conf. No.: 8378
For: MAINFRAMES FOR A SELF-PROPELLED MACHINE	

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT

In response to the Office Action dated March 21, 2023, please amend the above-identified patent application as follows and consider the following remarks.

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. (Currently Amended) A mainframe for a self-propelled machine, the mainframe having a front end, a rear end and a longitudinal axis and comprising:

a first side comprising: ~~having~~

a first bracket portion for supporting a load, the first bracket portion forming an upward-facing first pocket that extends from the front end to the rear end of the mainframe, the first side defining a first drive opening for receiving a first hub of a drive mechanism; and

a plurality of first pivot points for attachment of a loader including a first front pivot point proximate the front end, a first rear pivot point proximate the rear end, and a first central pivot point located between the first front pivot point and the first rear pivot point along the longitudinal axis;

a second side comprising: ~~having~~

a second bracket portion for supporting a load, the second bracket portion forming an upward-facing second pocket that extends from the front end to the rear end of the mainframe, the second side defining a second drive opening for receiving a second hub of a drive mechanism; and

a plurality of second pivot points for attachment of a loader including a second front pivot point proximate the front end, a second rear pivot point

proximate the rear end, and a second central pivot point located between the second front pivot point and the second rear pivot point along the longitudinal axis; and

a hydraulic reservoir housing configured to store hydraulic fluid, the hydraulic reservoir housing being connected to the first side of the mainframe and connected to the second side of the mainframe, the hydraulic reservoir housing being disposed between the front end of the mainframe and the first and second drive openings.

2. (Currently amended) The mainframe as set forth in claim 1 further comprising an [[d]] engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being disposed between the rear end and the first and second drive openings.

3. (Original) The mainframe as set forth in claim 1 wherein the mainframe is a single weldment.

4. (New) A compact tool carrier having a longitudinal axis and comprising:

a loader having a loader arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis;

a first linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;

a second linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;

an actuator pivotally attached to the first side of the mainframe and pivotally attached to the loader arm; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear end of the compact tool carrier.

5. (New) The compact tool carrier as set forth in claim 4, wherein the mainframe comprises an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe.

6. (New) The compact tool carrier as set forth in claim 5 comprising an engine to propel a drive mechanism, the engine being attached to the engine bracket.

7. (New) The compact tool carrier as set for in claim 4, wherein the mainframe incorporates a single weldment.

8. (New) The compact tool carrier as set forth in claim 4, wherein the loader arm is a first loader arm, the loader comprising a second loader arm and the compact tool carrier comprising a third linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm and a fourth linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

9. (New) The compact tool carrier as set forth in claim 8, wherein the actuator is a first actuator, the compact tool carrier comprising a second actuator, the second actuator being pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

10. (New) The compact tool carrier as set forth in claim 4 comprising a drive mechanism comprising tracks or wheels, the drive mechanism being attached to the mainframe.

11. (New) The compact tool carrier as set forth in claim 4, wherein the actuator is a hydraulic cylinder.

12. (New) The compact tool carrier as set forth in claim 4, wherein the loader arm incorporates a single weldment.

13. (New) The compact tool carrier as set forth in claim 4, wherein the mainframe defines a pocket toward a rear of the mainframe to partially surround an operator.

14. (New) The compact tool carrier as set forth in claim 13 further comprising an operator platform at least partially within the pocket.

15. (New) A compact tool carrier having a longitudinal axis and comprising:

a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position;

a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis, the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe;

a first linkage pivotally attached to the mainframe at a first pivot point and pivotally attached to the loader at a second pivot point;

an actuator pivotally attached to the mainframe at a third pivot point and pivotally attached to the loader at a fourth pivot point;

a second linkage pivotally attached to the mainframe at a fifth pivot point and pivotally attached to the loader at a sixth pivot point; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear end of the compact tool carrier,

wherein the second, fourth and sixth pivot points move relative to the mainframe as the loader moves between the down position and the vertically raised position.

16. (New) The compact tool carrier as set forth in claim 15, wherein the loader includes a first loader arm, wherein the first linkage is pivotally attached to the first loader arm of the loader and the second linkage is pivotally attached to the first loader arm of the loader.

17. (New) The compact tool carrier as set forth in claim 16, the loader comprising a second loader arm and the compact tool carrier comprising a third linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm and a fourth linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

18. (New) The compact tool carrier as set forth in claim 17, wherein the actuator is a first actuator, the compact tool carrier comprising a second actuator, the second actuator being pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

19. (New) The compact tool carrier as set forth in claim 15, wherein the mainframe defines a pocket toward a rear of the mainframe to partially surround an operator.

20. (New) The compact tool carrier as set forth in claim 19 further comprising an operator platform at least partially within the pocket.

REMARKS

The Office Action dated March 21, 2023, has been carefully reviewed and the following remarks are made in response. Applicant respectfully requests reconsideration and allowance of all pending claims. Applicant does not concede the propriety of the rejections but amends only to expedite prosecution.

Status of the Claims

Claims 1-3 are pending. Claims 1-2 are amended. Claims 4-20 are newly added. Support for the amendments may be found at least at paragraphs [0026]-[0030] and Figure 5, for example, of the originally filed application. No new matter is added.

Claim Rejections - 35 U.S.C. § 103

Claims 1 and 3 are rejected under 35 U.S.C. § 103 as being obvious over U.S. Patent No. 5,551,523 ("Berg") in view of U.S. Patent No. 8,821,104 ("Yasuda") and U.S. Patent No. 6,205,665 ("Anderson"). Claim 2 is rejected under 35 U.S.C. § 103 as being obvious over Berg in view of Yasuda and Anderson and in further view of U.S. Patent No. 7,866,700 ("Weibling"). Applicant traverses these rejections.

To establish a prima facie case of obviousness, the Office Action must show that the cited prior art includes each element claimed, although not necessarily in a single prior art reference. MPEP § 2143 (emphasis added).

Berg describes a traction lock for a vehicle, such as a skid steer loader. Berg describes a main transmission case 14 including side walls 22 and frame supports 28. FIG. 1 of Berg is reproduced below.

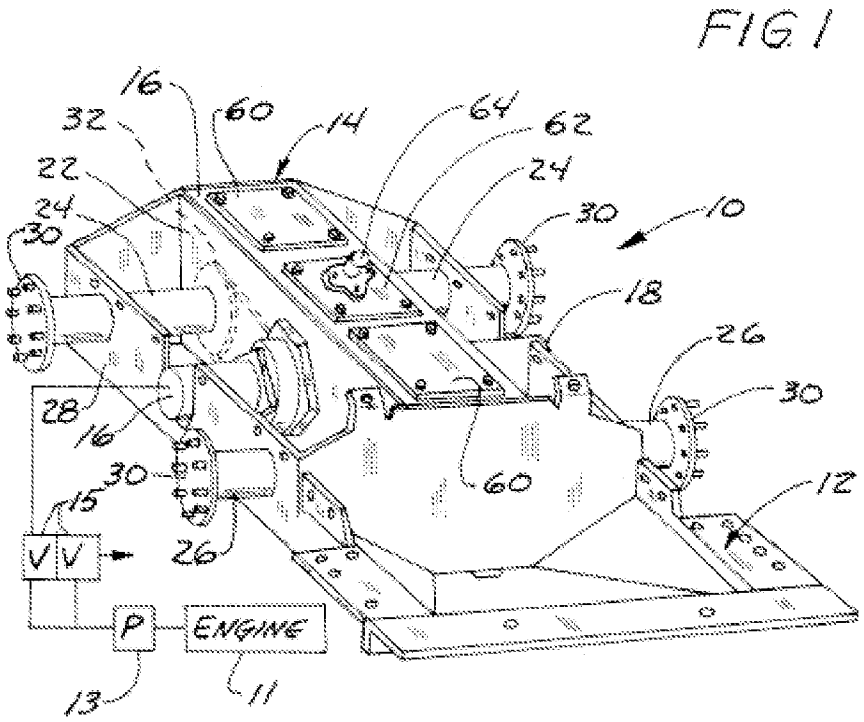


FIG. 1 of Berg

Yasuda describes a loader work machine including a body frame 1 including left/right sidewalls 7. The frame 1 is shown by FIG. 3 of Yasuda, which is reproduced below.

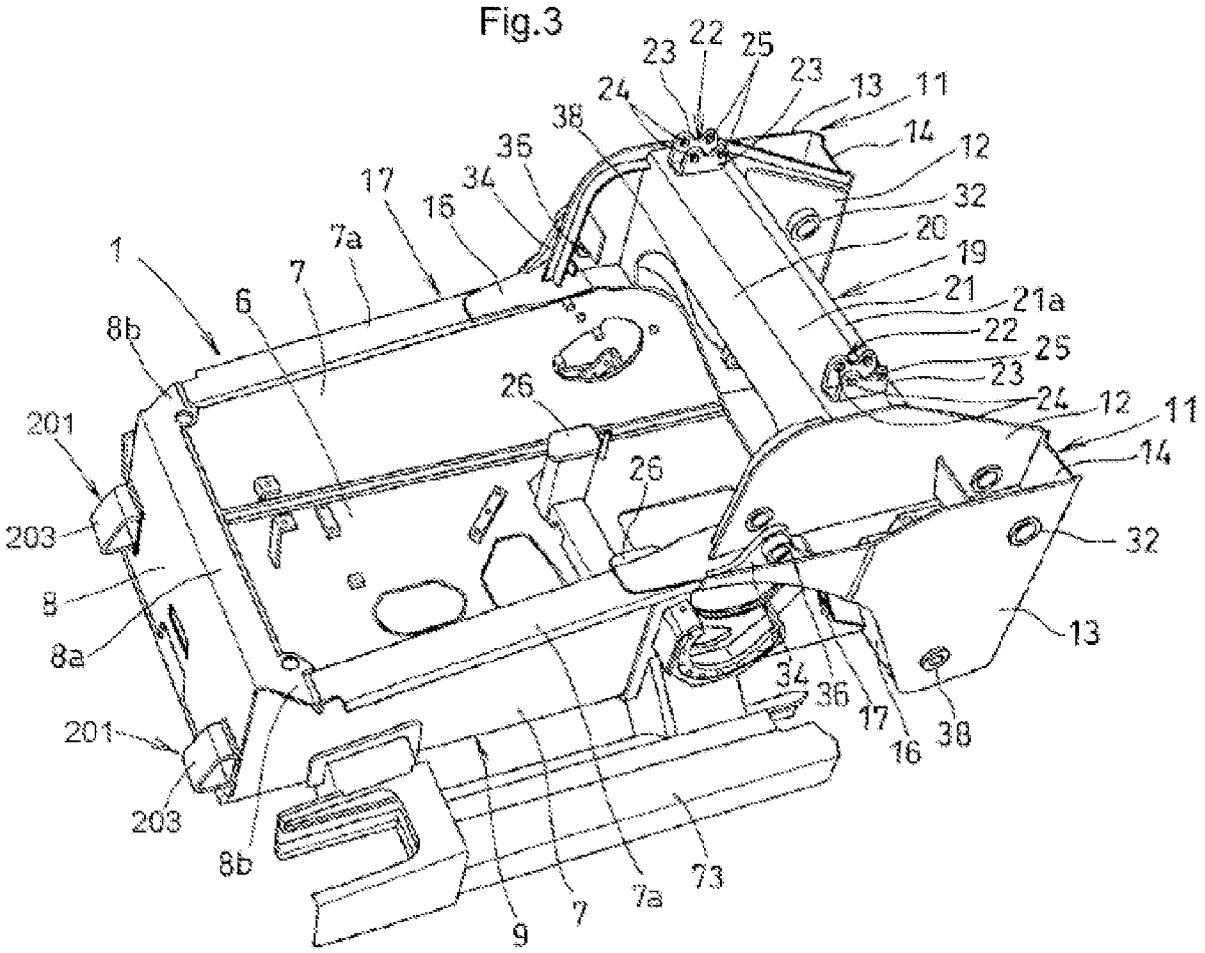


FIG. 3 of Yasuda

The frame 1 includes a first mounting boss 32 having a mounting hole, a second mounting boss 36 having a mounting hole, and a third mounting boss 38 having a mounting hole. Notably, the mounting bosses described by Yasuda are proximate the rear of the frame 1.

Anderson describes a lower frame assembly 26 with a pair of spaced side rails 56, 60. FIG. 1 of Anderson is reproduced below.

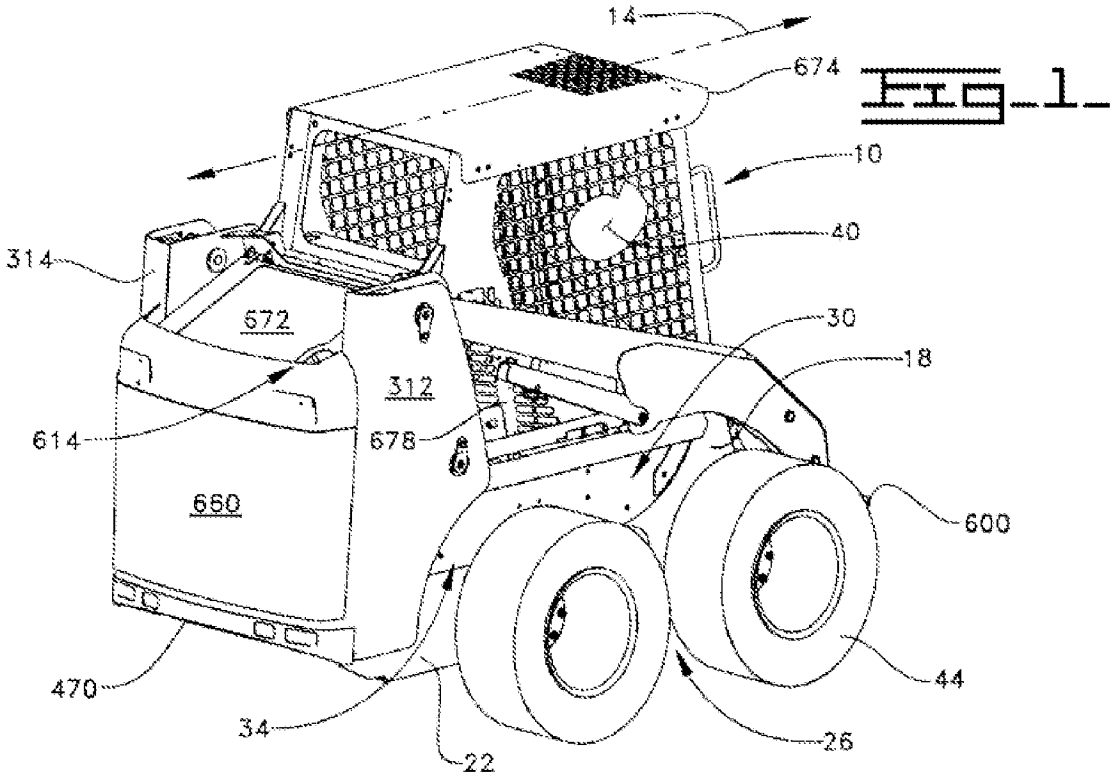


Fig. 1

FIG. 1 of Anderson

Claim 1, as amended, recites a mainframe for a self-propelled machine, the mainframe having "a front end, a rear end and a longitudinal axis and including a first side having a plurality of first pivot points for attachment of a loader including a first front pivot point proximate the front end, a first rear pivot point proximate the rear end, and a first central pivot point located between the first front pivot point and the first rear pivot point along the longitudinal axis; a second side having a plurality of second pivot points for attachment of a loader including a second front pivot point proximate the front end, a second rear pivot point proximate the rear end, and a second central pivot point located between the second front pivot point and the second rear pivot point along the longitudinal axis" (emphasis added).

Notably, no combination of Berg, Yasuda, and Anderson teach or suggest a first front pivot point proximate the first end and a second front pivot point proximate the first end, as recited in amended Claim 1.

For at least the reasons set forth above, Claim 1 and its dependent claims are patentable over Berg, Yasuda, and Anderson. Weibling which is cited to reject dependent claim 2 does not cure the deficiencies of Berg, Yasuda, and Anderson noted above.

New Claims

Support for new claims 4-20 may be found at least at paragraphs [0026]-[0027] and [0030] and Figure 5, for example, of the originally filed application. Claims 4-20 are patentable over cited references because the combination of references does not disclose or suggest the combination of features recited therein.

Conclusion

Applicant's failure (if at all) to expressly address above any particular statement or argument by the Examiner should not be construed as an admission or acquiescence that such statement or argument is accurate or proper.

In view of the foregoing amendment and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action are respectfully solicited.

Should the Examiner have any issues concerning this reply or any other outstanding issues remaining in this application, the favor of a telephone call to the undersigned is respectfully requested in order to expedite prosecution.

Respectfully submitted,

/Michael M. Gnibus/
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UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/961,868	**09/21/2023 09:36:03 AM ET**	**31681-641**

Title of Invention

LOW PROFILE COMPACT TOOL CARRIERS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8378	FILED BY	Teddi Weber
PATENT CENTER #	62831219	FILING DATE	10/07/2022
CUSTOMER #	76656	FIRST NAMED INVENTOR	Brad Thomas
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Michael Gnibus

Documents

TOTAL DOCUMENTS: 3

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
3084USC5 Response to NonFinal OA 20SEP2023-60640605.pdf		12	-	228 KB
3084USC5 Response to NonFinal OA 20SEP2023-60640605-A....pdf	(1-1)	1	Amendment/Request for Reconsideration-After Non-Final Rejection	103 KB
3084USC5 Response to NonFinal OA 20SEP2023-60640605-CLM.pdf	(2-6)	5	Claims	113 KB
3084USC5 Response to NonFinal OA 20SEP2023-60640605-REM.pdf	(7-12)	6	Applicant Arguments/Remarks Made in an Amendment	211 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
3084USC5 Response to NonFinal OA 20SEP2023-60640605.pdf	5ED4D1C1018463B3F61E200B6D44B43357EA433E336C75FDAE02028F258BF5E96EFD844199C607C38B92D99BC9ADDDC068FEF59B6141D60C8009515A14FC78F2
3084USC5 Response to NonFinal OA 20SEP2023-60640605-A....pdf	217E8B7F8EB4EAC2E882B3DDFD038480A8A0AD4486FCEA5A86E17FAF7447441AC9AA5DBE2007F97D2CFFA1CF1FAD9CE21D451136D5E856DA229055D34C54B45D
3084USC5 Response to NonFinal OA 20SEP2023-60640605-CLM.pdf	51AA90EE049495886AAF5B6F8698C107A35892AD08B8198234A708BCDDF9AB3EA8B72B125E84F3256D9A94C8B8C18CDD60504351004229E7587FCFAC9DE01B95
3084USC5 Response to NonFinal OA 20SEP2023-60640605-REM.pdf	35D7CD33F26D5FA1487016278CFA9BE5357683992F55DD90B8CBA143312A9258FB26CCE8296EF8BEAA1E881BA36FD99BD1A811FE1DEBBEF0E7A82A6977B35BC7

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/961,868	Filing Date 10/07/2022	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $480 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	09/21/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	SLIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/SHANDA E ROSS/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/961,868	10/07/2022	Brad Thomas	31681-641	8378

76656 7590 03/21/2023

Patent Docket Department
Armstrong Teasdale LLP
7700 Forsyth Boulevard
Suite 1800
St. Louis, MO 63105

EXAMINER	
KRAMER, DEAN J	

ART UNIT	PAPER NUMBER
3651	

NOTIFICATION DATE	DELIVERY MODE
03/21/2023	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USpatents@armstrongteasdale.com

Office Action Summary	Application No. 17/961,868	Applicant(s) Thomas et al.	
	Examiner DEAN J KRAMER	Art Unit 3651	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-3 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-3 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 and 3 is/are rejected under 35 U.S.C. 103 as being unpatentable over Berg et al. (5,551,523) in view of Yasuda et al. (8,821,104) and Anderson et al. (6,205,665).

The patent to Berg et al. shows a mainframe (14) for a skid steer loader comprising upwardly-facing open pockets on each side of the mainframe that are defined between walls (22) and (28) as best shown in Figure 1. The mainframe (14) also includes centrally arranged drive openings for accommodating motors (16) and (18) on each side of the mainframe. The Berg et al. patent fails to disclose a hydraulic reservoir housing connected to each side on the front end of the mainframe.

However, the Yasuda et al. patent shows a mainframe (1) for a self-propelled vehicle comprising a pair of sidewalls (7) with aligned openings for accommodating the hub (71) of a drive mechanism. Fluid reservoirs (102,103) are located in the mainframe between the front end of the mainframe and the drive openings (see Fig. 23).

Further, the patent to Anderson et al. shows a mainframe having a fluid reservoir housing (150) integrally formed between the sidewalls of the mainframe and a pair of walls (154,156) extending across the mainframe.

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to a provide a fluid reservoir housing between the sidewalls of the Berg et al. mainframe (14) near the front end thereof, as taught by Yasuda et al., in order to create an easily accessible space for such equipment. The resulting reservoir housing could be formed between the mainframe sidewalls and a pair of laterally extending walls, similar to the reservoir (150) shown in the Anderson et al. patent, in order to create a durable, large capacity reservoir.

Regarding claim 3, it would have been an obvious choice of mechanical design to manufacture the resulting mainframe as a one-piece integral unit. See *In re Larson*, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965) (A claim to a fluid transporting vehicle was rejected as obvious over a prior art reference which differed from the prior art in claiming a brake drum integral with a clamping means, whereas the brake disc and clamp of the prior art comprise several parts rigidly secured together as a single unit. The court affirmed the rejection holding, among other reasons, "that the use of a one piece construction instead of the structure disclosed in [the prior art] would be merely a matter of obvious engineering choice.")

4. Claim 2 is/are rejected under 35 U.S.C. 103 as being unpatentable over Berg et al. in view of Yasuda et al. and Anderson et al. as applied to claims 1 and 3 above, and further in view of Weibling et al. (7,866,700).

There is no specific disclosure of an engine supporting bracket extending between the sides of the Berg et al. mainframe near the rear end of the mainframe.

However, the Weibling et al. patent shows an engine supporting bracket (149) extending between the sidewalls (130,132) of its mainframe (see Fig. 2).

It would have been obvious to a person having ordinary skill in the art to provide an engine support between the sides of the modified Berg et al. mainframe, similar to that shown at (149) in Figure 2 of the Weibling et al. patent, in order to rigidly secure the engine on the rear end of the mainframe.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ulinski (US-3,021,150) and Morrison (US-4,645,264) both show fluid reservoirs rigidly attached to the sides of a mainframe.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DEAN J KRAMER whose telephone number is (571)272-6926. The examiner can normally be reached Monday-Friday 7:30-4:00.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gene Crawford can be reached on 571-272-6911. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and

https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DEAN J KRAMER/
Primary Examiner, Art Unit 3651

DEAN J. KRAMER
Primary Examiner
Art Unit 3652

Djk

3/16/2023

Notice of References Cited	Application/Control No. 17/961,868	Applicant(s)/Patent Under Reexamination Thomas et al.	
	Examiner DEAN J KRAMER	Art Unit 3651	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-3021150-A	02-1962	ULINSKI BRONISLAUS I	B62D7/00	280/124.113
*	B	US-4645264-A	02-1987	Morrison; Donald R.	B62D51/005	165/41
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	Art Unit
	DEAN J KRAMER	3651

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	03/16/2023								
	1	✓								
	2	✓								
	3	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/961,868	Thomas et al.
	Examiner	Art Unit
	DEAN J KRAMER	3651

CPC - Searched*		
Symbol	Date	Examiner
B62D 21/16; 21/186; 51/007; 51/02; 51/04	03/15/2023	djk
B66F 9/065; 9/075; 9/07513; 9/07518; 9/07527; 9/07572; 9/07577	03/15/2023	djk
B60P 1/483	03/15/2023	djk
E02F 9/08; 9/0816; 9/0825	03/15/2023	djk

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
inventor and assignee search	03/15/2023	djk

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

EX1002 / Page 199 of 527
Kubota North America Corporation et al

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	66	("10202266" OR "1808735" OR "20030095857" OR "20040026153" OR "20040228715" OR "20050036876" OR "20070017713" OR "20070128012" OR "20070132204" OR "20080197588" OR "20090116943" OR "20100106344" OR "20100183412" OR "20110137491" OR "20120291319" OR "20120305025" OR "20140271078" OR "2298450" OR "2345620" OR "2455474" OR "2558928" OR "2563277" OR "2774496" OR "2849132" OR "2953264" OR "2980271" OR "3074572" OR "3586195" OR "3908778" OR "4087101" OR "4117610" OR "4186812" OR "4239444" OR "5169278" OR "5423654" OR "5470190" OR "5520500" OR "5542814" OR "5551523" OR "5609464" OR "5894908" OR "6182778" OR "6205665" OR "6325589" OR "6474933" OR "6575262" OR "6616398" OR "6695568" OR "6866466" OR "7214026" OR "7264435" OR "7428943" OR "7695236" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/15 10:06 AM

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L2	76	((("THOMAS") near3 ("Brad")) OR (("HARTKE") near3 ("Louis")) OR (("LANGENFELD") near3 ("Greg")) OR (("HUTCHINSON") near3 ("Matt"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2023/03/15 10:27 AM
L3	77	("1808735" | "2298450" | "2345620" | "2455474" | "2558928" | "2563277" | "2774496" | "2849132" | "2953264" | "2980271" | "3074572" | "3586195" | "3908778" | "4087101" | "4117610" | "4186812" | "4239444" | "5169278" | "D359497" | "5423654" | "5470190" | "5520500" | "5542814" | "5551523" | "5609464" | "5894908" | "D431574" | "6182778" | "6205665" | "6325589" | "6474933" | "6575262" | "6616398" | "6695568" | "6866466" | "7214026" | "7264435" | "7428943" | "7695236" | "7805864" | "7866700" | "D631898" | "7980569" | "8016065" | "8109356" | "8152433" | "8821104" | "9045882" | "9321386" | "9975750" | "10202266" | "20030095857" | "20040026153" | "20040228715" | "20050036876" | "20070017713" | "20070128012" | "20070132204" | "20080197588" | "20090116943" | "20100106344" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 10:28 AM

		"20100183412" | "20110137491" | "20120291319" | "20120305025" | "20140271078").pn. OR ("11465891").urpn. AND (PGPB | USPT | USOC).dbnm.					
L4	0	3 NOT 1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 10:28 AM
L5	22	("1789238" | "2535301" | "2725223" | "2822056" | "3437163" | "3880445").pn. OR ("4087101").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 10:29 AM
L6	12	("1198885" | "3880445" | "4087101" | "6398236" | "6668957" | "7243949" | "7503586" | "20050062251").pn. OR ("8146948").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 10:31 AM
L7	1453	b62d21/16.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 10:42 AM
L8	3470	b62d21/186.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY,	OR	ON	ON	2023/03/15 11:06 AM

			CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L9	3371	8 NOT 7	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 11:07 AM
L10	26	("3838952" | "3842927" | "3850473" | "3870172" | "3895728" | "4055262" | "4060261" | "4074782" | "4131225" | "4374600" | "4405280" | "4449606" | "4514007" | "4535868" | "4955455" | "4962825" | "5161638").pn. OR ("6167980").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 11:11 AM
L11	13	("3895728" | "4055262" | "4449606" | "4815550" | "6108907" | "6138786" | "6167980" | "7735594" | "7866700" | "8821104" | "8919486" | "20080078917" | "20130220720").pn. OR ("9586466").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/15 11:29 AM
L12	663	9 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS,	OR	ON	ON	2023/03/15 12:34 PM

			IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L13	3585	(B66F9/065.cpc. OR b66f9/075$.cpc.) AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 12:49 PM
L14	3547	13 NOT (12 OR 7)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 12:49 PM
L15	0	b66f9/17518.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:02 PM
L16	661	b66f9/07518.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2023/03/15 01:02 PM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				
L17	376	16 NOT 14	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:03 PM
L18	887	e02f9/0816.cpc. OR e02f9/0825.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:05 PM
L19	703	e02f9/08.cpc. AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:13 PM
L20	652	19 NOT 18	(US-PGPUB; USPAT;	OR	ON	ON	2023/03/15

			USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)				01:13 PM
L21	2186	b60p1/483.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:34 PM
L22	206	21 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 01:34 PM
L23	5406	(b62d51/007.cpc. OR b62d51/02.cpc. OR b62d51/04.cpc.) OR 280/797.ccls.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA,	OR	ON	ON	2023/03/15 03:10 PM

			VN); FPRS; EPO; JPO; IBM_TDB)				
L24	489	23 AND (reservoir tank)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 03:10 PM
L25	468	24 NOT (12 OR 7 OR 20 OR 17)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/15 03:11 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17961868
Filing Date	2022-10-07
First Named Inventor	Brad Thomas
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	31681-641

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	31681-641

	1	The Toro Company, Toro Operator's Manual TX 427 Compact Utility Loader, Form No. 3373-546 Rev B, published 2012, 48 pages.
	2	https://www.youtube.com/watch?v=tJ-Hwn8DaTQ, Thomas 35 Series Compact Tool Carrier, published August 4, 2012

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EXAMINER SIGNATURE

Examiner Signature	/DEAN J KRAMER/	Date Considered	03/15/2023

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**	Application Number	17961868
	Filing Date	2022-10-07
	First Named Inventor	Brad Thomas
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	31681-641

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Michael J. Vander Molen/	Date (YYYY-MM-DD)	2022-10-17
Name/Print	Michael J. Vander Molen	Registration Number	57274

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
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First Named Inventor	Brad Thomas
Art Unit	TBD
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Attorney Docket Number	31681-641

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	D631898	S	2011-02-01	Gary Edmund Major	
	2	D431574	S1	2000-10-03	Alan Theodore Alfred Porter	
	3	D359497	S	1995-06-20	Alister G. Rayner	
	4	9321386	B1	2016-04-26	Brad Thomas	
	5	9045882	B2	2015-06-02	Gary Major	
	6	8821104	B2	2014-09-02	Toyoaki Yasuda	
	7	8152433	B2	2012-04-10	Masami Yamada	
	8	7980569	B2	2011-07-19	John P. Azure	

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	First Named Inventor	Brad Thomas
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	31681-641

	9	7805864	B2	2010-10-05	John P. Azure	
	10	7695236	B2	2010-04-13	Kevin J. Green	
	11	7264435	B2	2007-09-04	Michael C. Layko	
	12	7214026	B2	2007-05-08	Michael J. Hilvers	
	13	6866466	B2	2005-03-15	Thomas J. Roan	
	14	6695568	B2	2004-02-24	Mark F. Bares	
	15	6616398	B2	2003-09-09	Brian R. Dershem	
	16	6474933	B1	2002-11-05	Lonnie D. Hoechst	
	17	6325589	B1	2001-12-04	Moo Hwan Jang	
	18	5609464	A	1997-03-11	John M. Moffitt	
	19	5542814	A	1996-08-06	Dale A. Ashcroft	

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	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	31681-641

	20	5470190	A	1995-11-28	Joseph C. Bamford	
	21	5423654	A	1995-06-13	David J. Rohrbaugh	
	22	5169278	A	1992-12-08	Lonnie D. Hoechst	
	23	4239444	A	1980-12-16	Michael Schmelzer	
	24	4117610	A	1978-10-03	George A. Yates	
	25	3586195	A	1971-06-22	Osmano Beltrami	
	26	3074572	A	1963-01-22	Bronislaus I. Ulinski	
	27	2980271	A	1961-04-18	Bronislaus I. Ulinski	
	28	2953264	A	1960-09-20	Bronislaus I. Ulinski	
	29	2849132	A	1958-08-26	Jesse E. Clark	
	30	2774496	A	1956-12-18	Evan E. Dorkins	

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	Examiner Name	TBD
	Attorney Docket Number	31681-641

	31	2558928	A	1951-07-03	Harry F. Bryan	
	32	2455474	A	1948-12-07	Edward A. Drott	
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	34	2298450	A	1942-10-13	David B. Baker	
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	Application Number	17961868
	Filing Date	2022-10-07
	First Named Inventor	Brad Thomas
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	31681-641

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	Attorney Docket Number	31681-641

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	Examiner Name	TBD
	Attorney Docket Number	31681-641

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
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	Examiner Name	TBD
	Attorney Docket Number	31681-641

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	ISO 3411:2007, Earth-moving machinery--Physical dimensions of operators and minimum operator space envelope, dated Jul. 2007, pp. 24.	
	2	ISO 6682:2008, Earth-moving machinery--Zones of comfort and reach for controls, dated Sep. 2008, pp. 18.	

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	Examiner Name	TBD
	Attorney Docket Number	31681-641

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Examiner Signature	/DEAN J KRAMER/	Date Considered	03/15/2023

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Michael J. Vander Molen/	Date (YYYY-MM-DD)	2022-10-11
Name/Print	Michael J. Vander Molen	Registration Number	57274

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/961,868	10/07/2022	Brad Thomas	31681-641

CONFIRMATION NO. 8378

PUBLICATION NOTICE

76656
Patent Docket Department
Armstrong Teasdale LLP
7700 Forsyth Boulevard
Suite 1800
St. Louis, MO 63105

OC00000137276473

Title:LOW PROFILE COMPACT TOOL CARRIERS

Publication No.US-2023-0026446-A1
Publication Date:01/26/2023

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17/961,868	10/07/2022	Brad Thomas	31681-641

CONFIRMATION NO. 8378

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St. Louis, MO 63105

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/961,868	10/07/2022		1820	31681-641	3	1

CONFIRMATION NO. 8378

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Suite 1800
St. Louis, MO 63105

Date Mailed: 10/21/2022

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Inventor(s)

Brad Thomas, Pleasant Hill, IA;
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Greg Langenfeld, Bettendorf, IA;
Matt Hutchinson, Pella, IA;

Applicant(s)

Vermeer Manufacturing Company, Pella, IA;

Power of Attorney: The patent practitioners associated with Customer Number 76656

Domestic Priority data as claimed by applicant

This application is a CON of 17/397,200 08/09/2021 PAT 11,465,891
which is a CON of 16/270,070 02/07/2019 ABN
which is a CON of 15/704,685 09/14/2017 PAT 10,202,266
which is a CON of 15/062,801 03/07/2016 PAT 9,975,750
which is a CON of 14/691,649 04/21/2015 PAT 9,321,386
which claims benefit of 62/118,860 02/20/2015

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Projected Publication Date: 01/26/2023
Non-Publication Request: No
Early Publication Request: No
Title

LOW PROFILE COMPACT TOOL CARRIERS

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/961,868

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	320
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(i))	3 minus 20 =	* 0			OR	x =	0
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*				x =	0
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1820

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17961868
Filing Date	2022-10-07
First Named Inventor	Brad Thomas
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	31681-641

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17961868
	Filing Date	2022-10-07
	First Named Inventor	Brad Thomas
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	31681-641

	1	The Toro Company, Toro Operator's Manual TX 427 Compact Utility Loader, Form No. 3373-546 Rev B, published 2012, 48 pages.	
	2	https://www.youtube.com/watch?v=tJ-Hwn8DaTQ, Thomas 35 Series Compact Tool Carrier, published August 4, 2012	

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Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17961868
	Filing Date	2022-10-07
	First Named Inventor	Brad Thomas
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	31681-641

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Michael J. Vander Molen/	Date (YYYY-MM-DD)	2022-10-17
Name/Print	Michael J. Vander Molen	Registration Number	57274

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Electronic Acknowledgement Receipt

EFS ID:	46828030
Application Number:	17961868
International Application Number:	
Confirmation Number:	8378
Title of Invention:	LOW PROFILE COMPACT TOOL CARRIERS
First Named Inventor/Applicant Name:	Brad Thomas
Customer Number:	76656
Filer:	Michael J. Vander Molen/Teddi Weber
Filer Authorized By:	Michael J. Vander Molen
Attorney Docket Number:	31681-641
Receipt Date:	17-OCT-2022
Filing Date:	
Time Stamp:	12:45:34
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS_31681-641-55989713.pdf	1350826 840af65848b47d6fd6f97795019b5795f5378349	no	4

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2	Non Patent Literature	Toro_Operators_Manual_2012-55989697.pdf	1512457 b280bb9c88fcaa25b32cf006819458eff9652817	no	48
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			Total Files Size (in bytes):	6298371	

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National Stage of an International Application under 35 U.S.C. 371

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New International Application Filed with the USPTO as a Receiving Office

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Electronic Acknowledgement Receipt

EFS ID:	46794234
Application Number:	17961868
International Application Number:	
Confirmation Number:	8378
Title of Invention:	LOW PROFILE COMPACT TOOL CARRIERS
First Named Inventor/Applicant Name:	Brad Thomas
Customer Number:	76656
Filer:	Michael J. Vander Molen/Teddi Weber
Filer Authorized By:	Michael J. Vander Molen
Attorney Docket Number:	31681-641
Receipt Date:	11-OCT-2022
Filing Date:	
Time Stamp:	16:44:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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43	Non Patent Literature	NPL28LitigationDocumentsFeb2019-42193059.pdf	2251966 ee36ed0e2c7757f89ed3c948860ab7ba250e722a	no	73
Warnings:					
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44	Non Patent Literature	NPL29BobcatMT52MinTrackLoaderBrochure-42200878.pdf	1942754 38d49a6ac89eaac623d4b87b6bf1746aa19b0b75	no	4
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45	Non Patent Literature	NPL30S650TXMiniSkidSteerBrochure-42200973.pdf	3967321 4c797926eed7666798de50f8a5decbff1a00023c	no	6
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46	Non Patent Literature	NPL31S800TXMiniSkidSteerBrochure-42201076.pdf	3327826 707c83ef11099e1c14f0c340fcd821bb0e096c60	no	8
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47	Non Patent Literature	NPL32LitigationDocuments2019Feb121pgs-42240709.pdf	8484355 e5d2a2f1f81f42b0a56e0591f35fa16ad99b607e	no	121
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48	Non Patent Literature	NPL33DedesigantedDiscoveryFeb2019_1-42240864.pdf	19179952 25e0b3344583f8d855f8ff600f49e421a8db80a4	no	56
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49	Non Patent Literature	NPL33DedesigantedDiscoveryFeb2019_2-42240937.pdf	22763052 e6075114a0a60c4b7c101cca987904b4400b9bc5	no	76
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50	Non Patent Literature	NPL33DedesigantedDiscoveryFeb2019_3-42240981.pdf	8842533 dde08534d6194edf1dc1176e3d585460031300ba	no	55
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51	Non Patent Literature	NPL33DedesigantedDiscoveryFeb2019_4-42241011.pdf	18059680 5555eed6db694032b3318a344948759df55a42ff	no	76
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52	Non Patent Literature	NPL33DedesigantedDiscoveryFeb2019_5-42241110.pdf	16474449 ec4876f9a7b51b8492e26fdbc7bb7727bb3f4f8c	no	60
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53	Non Patent Literature	NPL33DedesigantedDiscoveryFeb2019_6-42260312.pdf	15511653 e67aa0d6bf6fbb3a3d4f8ec0fb4c8d91733937cb	no	100
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54	Non Patent Literature	NPL33DedesigantedDiscoveryFeb2019_7-42260337.pdf	22418798 50c59ac3ac6fe74b5c3c193e295992ddd0878da5	no	100
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55	Non Patent Literature	NPL33DedesigantedDiscoveryFeb2019_8-42260374.pdf	15853660 9b9e5d7e1f46bc07c21a0e40c47b6b9f76f24a4e	no	100
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57	Non Patent Literature	NPL34HealthAndSafetyAuthority-42204333.pdf	20478392 21ef2af9c1d218213db237e994dcd37cc3dfc0c4	no	109
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(Not for submission under 37 CFR 1.99)

Application Number	17961868
Filing Date	2022-10-07
First Named Inventor	Brad Thomas
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	31681-641

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	Examiner Name	TBD
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	Attorney Docket Number	31681-641

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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Signature	/Michael J. Vander Molen/	Date (YYYY-MM-DD)	2022-10-11
Name/Print	Michael J. Vander Molen	Registration Number	57274

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TREATING VEHICLE FOR SOIL AND SNOW

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- cooperative:

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Abstract of JPS63265022 (A)

PURPOSE:To control the movement of gravity center caused by the vertical movement of bucket to a minimum by a method in which a number of arms are connectedly set with pivot shafts to make up a link mechanism, and the arms of the pivot shafts near the horizontal position of bucket are orderly turned to vertically move the bucket. CONSTITUTION:A bucket 10 is supported through a link mechanism 9 on the vehicular frame 2. The mechanism 9 consists of a pillar 11, an arm 12, a lift mechanism 13, and a dump mechanism 14. The arms 15, 21 and 24 are connected with pivot shafts 17, 20 and 26 in a turnable manner. The arms 15, 21 and 24 are turned in order from one at the nearest pivot shaft point in horizontal distance with the bucket 10 to vertically move the bucket 10.

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DESCRIPTION JPS63265022A

[0001]

13 (Industrial Application Field) The present invention relates to a vehicle for treating earth and sand, snow, etc., which is not allowed to be used by a person, but is used to scoop up earth and sand, snow, etc. and move it to another place, or to load it on a truck, etc. (Conventional technology) For example, in order to remove snow accumulated in the back alleys, under the roof, etc., a snowplow cannot pass, so a person scoops the snow with a shovel or the like. Performing such snow removal work manually is a heavy labor, and especially for women and elderly people, it takes physical strength and time to scoop up the snow with a shovel or the like and move the snow to another place. (Problem to be Solved by the Invention) Therefore, a bucket is attached to a small and easy-to-carry vehicle that is self-propelled without a person riding via a link mechanism, and the bucket is raised and lowered by the operation of this link mechanism. If the snow can be scooped out by the operation of this bucket, moved to another place, or loaded on a truck or the like, the work of removing the snow will be easy. By the way, when the Barakerat is attached to such a car via a link mechanism, it is a small one that can be operated without a person getting in the car. As disclosed in Japanese Patent Application Laid-Open No. 56-22823, a bucket that moves significantly back and forth cannot be applied because the movement of the center of gravity of the vehicle becomes large. The present invention has been made in view of such an actual situation, and an object of the present invention is to provide a vehicle for treating earth and sand, snow, etc., which minimizes the movement of the center of gravity due to the raising and lowering of the bucket and improves the stability. (Means for Solving the Problems) In order to solve the above problems, the present invention is used in a vehicle for processing earth and sand, snow, etc., in which a bucket is vertically attached to a vehicle body frame via a link mechanism. Is configured such that a plurality of arms are rotatably connected to each other on a pivot shaft, and the arm of the pivot shaft closest to the horizontal position of the bucket is sequentially rotated to raise and lower the bucket. It is characterized by that. (Action) In the present invention, the bucket

attached via the link mechanism sequentially rotates its elevating operation from the arm of the pivot shaft whose horizontal position is closest to the bucket, so that the bucket moves up and down by elevating and lowering. The amount of movement back and forth can be reduced with respect to the amount. Therefore, the amount of movement of the center of gravity of the processing vehicle can be minimized, and the balance of the center of gravity of the small vehicle is particularly improved. (Example) Next, an embodiment of the present invention will be described in detail together with the accompanying drawings. Reference numeral l in the figure is a small engine snow scoop as a vehicle for processing earth and sand, snow, etc. A crawler device 3 is provided on the front side of the vehicle body frame 2, and the crawler device 3 is a driven sprocket 4a arranged in the front and rear directions. It is composed of a drive sprocket 4b and a truck 5.

49 The engine 6 is mounted on the vehicle body frame 2 located above the drive sprocket 4b, the handle 7 is attached diagonally rearward to the rear end of the vehicle body frame 2, and the operation lever 8 is provided at the tip thereof. A bucket 10 is supported on the vehicle body frame 2 via a link mechanism 9, and the link mechanism 9 is composed of a pillar portion 11, an arm portion 12, a lift mechanism 13, and a dump mechanism 14. The left and right arms 15 of the pillar portion 11 are rotatably supported by a bracket 16 provided on the vehicle body frame 2 at a lateral position of the engine 7 via a pivot shaft 17. A stopper 18 for restricting the rotation of the arm 15 is provided on the front side of the bracket 16. A pivot shaft 20 is pivotally supported by a bracket 19 provided at the tip of the arm 15, the left and right arms 21 of the arm 12 are rotatably supported by the pivot shaft 20, and the tip of the arm 21 is a connecting shaft. They are integrally connected by 22.23. Further, the bases of the left and right arms 24 are connected to the connecting shaft 22.23, the central portion of the arms 24 is connected by the connecting shaft 25, and the bracket of the bucket 10 is connected to the tip of the arm 24 via the pivot shaft 26. 27 is rotatably supported. The hydraulic cylinder 28 of the lift mechanism 13 is supported by the bracket 29 of the vehicle body frame 2 via a pin 30, and the rod 31 is supported by a pin 32 at the base end of the arm 21 of the arm portion 12. The hydraulic cylinder 33 of the dump mechanism 14 is supported by the bracket 35 of the pivot shaft 20 via the pivot shaft 34, and the rod 36 is connected to one end of the operating lever 37 via a pin 38. The central portion of the operating lever 37 is rotatably supported by the bracket 39 of the connecting shaft 23 via the pivot shaft 40, and a rod 41 is connected to the other end of the operating lever 37 via a pin 42. The other end of the rod 41 is connected to the operating lever 43 via the pivot shaft 42, and the operating lever 43 is rotatably supported by the bracket 44 of the connecting shaft 25 via the pin 45. A rod 46 is connected to the tip of the operating lever 43 via a pin 47, and the other end thereof is connected to a bracket 48 of the bucket 15 by a pin 49. Therefore, as shown in FIG. 4, in the engine snow scoop 1, the operator 50 later operates the operation lever 9 by putting his / her hand on the tip of the handle 8 and "first, as shown in FIG. 3 (a)". With the bottom surface of the bucket 10 horizontal and the bucket 10 lowered to the ground surface 51, the multi-roller device 3 is operated to advance the bucket 10 to scoop the snow on the ground surface 51.

78 Next, when the hydraulic cylinder 28 of the lift mechanism 13 is operated to extend the rod 31, the arm 15 of the pillar part 11 rotates backward around the pivot shaft 17 and moves to

the position shown in (b). .. Then, the base of the arm 15 comes into contact with the stopper 18, which restricts the rotation of the arm 15, and when the rod 31 is further extended thereafter, the arm 21 of the arm 12 moves upward about the pivot shaft 20. It rotates and moves to the position shown in (c). Next, the crawler device 3 moves the bucket 10 above the loading platform 53 of the truck 52, or moves the loading platform 53 below the bucket 10 to operate the hydraulic cylinder 33 of the dump mechanism 14 to shorten the rod 36. Then, as shown in (d), the bucket! 0 rotates downward around the pivot shaft 49, and snow falls on the loading platform 53. That is, in the link mechanism 9, when the arm 15 starts to rotate around the pivot shaft 17 whose horizontal position of the bucket 10 is closest to the bucket 10 and the bucket 10 approaches the pivot + l: + d + 20 from the pot shaft 17, this time. The rotation about the pivot shaft 17 is stopped, and the arm 21 starts to rotate about the pivot shaft 18. In this way, since the arm is sequentially rotated from the arm at the pivot axis point having the closest horizontal distance to the bucket 10, the amount of forward and backward movement can be reduced with respect to the amount of vertical movement of the bucket 10 by 51PJ. Further, the bucket 10 can be raised and lowered in a substantially vertical direction on the front side of the vehicle body frame 2, whereas the engine 7 is mounted on the rear side of the vehicle body frame 2 to improve the balance of the center of gravity of the vehicle without enlarging the vehicle body. Can be made to. Further, since the dump mechanism 9 is supported at the same position as the engine 7 at the rear of the vehicle body frame 2, a new support member for supporting the link mechanism 9 is unnecessary, and the dump mechanism 9 is excellent in strength and balance. Further, since the arm 15.21 of the link mechanism 9 can be operated by one lift mechanism 13, the configuration of the link mechanism 13 becomes simple. Although the present invention has described a processing vehicle for treating snow, the present invention can be similarly applied to a vehicle for treating earth and sand and the like. (Effect of the Invention) As described above, in the present invention, a plurality of arms are rotatably connected to each other on a pivot shaft, and when the link mechanism is closest to the horizontal position of the bucket, the arms of the pot shaft are sequentially rotated. Since the bucket is configured to move up and down, the amount of movement back and forth is smaller than the amount of movement of the bucket up and down by raising and lowering, and the amount of movement of the center of gravity of the processing vehicle can be minimized. Stability is improved in small vehicles that are operated without a person getting on.

[0002]

115 A brief description of the drawing

[0003]

119 FIG. 1 is a partially broken side view of the engine snow dump truck, FIG. 2 is a plan view of the link mechanism, FIG. 3 is a partially broken side view showing the operation of the link mechanism, and FIG. 4 is a usage state of the engine snow dump truck. It is a side view which

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shows.

123 In the figure, reference numeral 1 is an engine snow dump, 2 is a vehicle body frame, 3 is a crawler device, 9 is a link mechanism, 10 is a bucket, 12 is an arm portion, 13 is a lift mechanism, and 14 is a dump mechanism.

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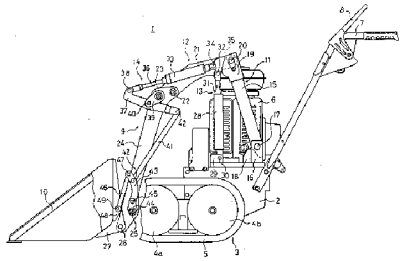
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CLAIMS JPS63265022A

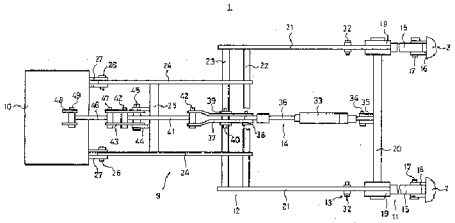
1.

13 In addition, in a vehicle for processing earth and sand, snow, etc., in which a bucket is mounted so as to be able to move up and down via a link mechanism, the link mechanism has a plurality of arms rotatably connected to each other by a pivot shaft, and the horizontal position of the bucket. A vehicle for processing earth and sand, snow, etc., which is configured to raise and lower the bucket by sequentially rotating the arm of the pivot shaft closest to the above.

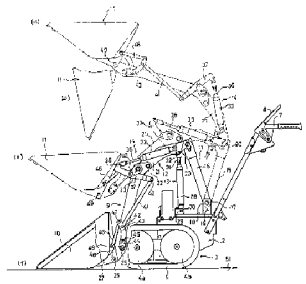
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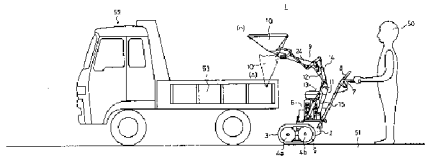
第 1 図



第 2 図



第 3 図



第 4 図

Drawing pages of JPS63265022 A

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⑲日本国特許庁（JP）　⑪特許出願公開

⑫公開特許公報（A）　昭63－265022

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E 02 F 3/34		6828－2D	
E 01 H 5/06		7012－2D	

審査請求　未請求　発明の数 1　（全5頁）

⑤4発明の名称　土砂、雪等の処理車

②1特　願　昭62－100914

②2出　願　昭62(1987)4月23日

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明　細　書

1．発明の名称

土砂、雪等の処理車

2．特許請求の範囲

車体フレームに、リンク機構を介してバケットを昇降可能に取付けた土砂、雪等の処理車において、前記リンク機構は複数のアームが各々ピボット軸で回動可能に連設してなり、前記バケットの水平位置に最も近い前記ピボット軸のアームを順次回動させて、前記バケットを昇降させるように構成される土砂、雪等の処理車。

3．発明の詳細な説明

（産業上の利用分野）

この発明は、人が乗車しないで、土砂、雪等をすくい取って他の場所に移動させたり、トラック等に積込む土砂、雪等の処理車に関する。

（従来の技術）

例えば、路地裏、屋根下等に積った雪を除去するには、除雪車が通行できないため、人がスコップ等で雪をすくい取っている。

このような除雪作業を人力により行なうことは重労働であり、特に女性や老人によっては、スコップ等で雪をすくい取り、さらにこの雪を他の場所に移動するに体力と時間を要する。

（発明が解決しようとする問題点）

このため、人が乗車しないで自走する小型で簡単に操作できる車にリンク機構を介してバケットを取付け、このリンク機構の操作でバケットを昇降させ、このバケットの操作で雪をすくい取り、他の場所へ移動したり、トラック等に積込むことができれば、積雪を除去する作業が容易になる。

ところで、このような車に、リンク機構を介してバッケットを取付ける場合には、車に人が乗車しないで操作するような小型なものであるため、例えば実開昭５７－１２４１９号公報や、特開昭５６－２２８２３号公報に開示されているようにバケットが前後に大きく移動するものは、車の重心移動が大きくなるため適用することができない。

この発明はこのような実状に鑑みてなされたも

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ので、バケットの昇降による重心移動を最小限に抑え、安定性の向上を図る土砂、雪等の処理車を提供することを目的としてる。

（問題点を解決するための手段）

この発明は前記問題点を解決するために、車体フレームに、リンク機構を介してバケットを昇降可能に取付けた土砂、雪等の処理車において、前記リンク機構は複数のアームが各々ピボット軸で回動可能に連設してなり、前記バケットの水平位置に最も近い前記ピボット軸のアームを順次回動させて、前記バケットを昇降させるように構成されることを特徴としている。

（作用）

この発明では、リンク機構を介して取付けられたバケットが、その昇降作動をバケットとの水平位置が最も近いピボット軸のアームから順次回動させて行なうので、昇降によるバケットの上下の移動量に対して前後の移動量を少なくできる。

このため、処理車の重心移動量を最小限に抑えることができ、特に小型の車の重心バランスが向上する。

（実施例）

次に、添付図面と共にこの発明の実施例を詳細に説明する。

図中符号１は土砂、雪等の処理車として小型のエンジンスノーダンプで、その車体フレーム２の前側にはクローラ装置３が設けられており、このクローラ装置３は前後に配置される従動スプロケット４ａと駆動スプロケット４ｂ及びトラック５で構成されている。この駆動スプロケット４ｂの上方位置の車体フレーム２にはエンジン６が搭載され、車体フレーム２の後端にはハンドル７が斜め後方に取付られ、その先端には操作レバー８が設けられている。

車体フレーム２にはリンク機構９を介してバケット１０が支持され、このリンク機構９はピラー部１１、アーム部１２、リフト機構１３及びダンプ機構１４とから構成される。

ピラー部１１の左右のアーム１５はエンジン７の側方位置で車体フレーム２に設けられたブラケット１６に、その基端部がピボット軸１７を介して回動可能に支持されている。ブラケット１６の前側にはアーム１５の回転を規制するストッパー１８が設けられている。

アーム１５の先端部に設けられたブラケット１９にはピボット軸２０が軸支されており、アーム部１２の左右のアーム２１はピボット軸２０に回動可能に支持され、アーム２１の先端は連結軸２２，２３により一体に連結されている。さらに、この連結軸２２，２３には左右のアーム２４の基部が接続され、このアーム２４の中央部は連結軸２５で連結され、アーム２４の先端にはピボット軸２６を介してバケット１０のブラケット２７が回動可能に支持されている。

前記リフト機構１３の油圧シリンダ２８は車体フレーム２のブラケット２９にピン３０を介して支持され、そのロッド３１はアーム部１２のアーム２１の基端部にピン３２を介して支持されている。

前記ダンプ機構１４の油圧シリンダ３３はピボット軸３４を介してピボット軸２０のブラケット３５に支持され、そのロッド３６は操作レバー３７の一端部にピン３８を介して連結されている。この操作レバー３７の中央部は連結軸２３のブラケット３９にピボット軸４０を介して回動可能に支持され、この操作レバー３７の他端にはロッド４１がピン４２を介して接続されている。このロッド４１の他端はピボット軸４２を介して操作レバー４３に接続され、この操作レバー４３は連結軸２５のブラケット４４にピン４５を介して回動可能に支持されている。操作レバー４３の先端部はロッド４６がピン４７を介して接続され、この他端はバケット１５のブラケット４８にピン４９で接続されている。

従って、第４図に示すように、エンジンスノーダンプ１は作業者５０が後からハンドル８の先端に手を添えて操作レバー９を操作し、まず第３図（イ）に示すようにバケット１０の底面を水平にしてバケット１０を地表面５１まで下げた状態から、クローラ装置３を作動させて前進させて地表

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面５１の雪をすくい取る。

次に、リフト機構１３の油圧シリンダ２８を作動してロッド３１を伸張させると、ビラー部１１のアーム１５がピボット軸１７を中心に後方に回動して（ロ）に示す位置まで移動する。そして、アーム１５の基部がストッパー１８に当接し、これによりアーム１５の回動が規制され、この後、更にロッド３１を伸張させると、アーム部１２のアーム２１がピボット軸２０を中心に上方に回動して（ハ）に示す位置に移動する。

次に、クローラ装置３でバケット１０をトラック５２の荷台５３の上方に移動するか、または荷台５３をバケット１０の下方に移動し、ダンプ機構１４の油圧シリンダ３３を作動して、ロッド３６を短縮すると（ニ）に示すようにバケット１０がピボット軸４９を中心に下方に回動して雪が荷台５３の上に落下する。

すなわち、リンク機構９はバケット１０の水平位置が最も近いピボット軸１７を中心にアーム１５が回動を始め、バケット１０がピボット軸１７から離れてピボット軸２０に接近したら、今度はピボット軸１７を中心とする回動を中止して、ピボット軸１８を中心としてアーム２１が回動を開始する。

このようにバケット１０との水平距離が最も近いピボット軸点のアームから順次回動させるので、昇降によるバケット１０の上下の移動量に対して前後の移動量を少なくすることができる。

また、バケット１０は車体フレーム２の前側で略垂直方向に昇降可能とし、これに対してエンジン７は車体フレーム２の後側に搭載されており、車体を大きくすることなく車体重心のバランスを向上させることができる。

また、リンク機構９は車体フレーム２の後部のエンジン７と同じ位置に支持されているので、リンク機構９を支持する新たな支持部材が不要で強度、バランスの点で優れている。さらに、リンク機構９のアーム１５，２１の作動は一個のリフト機構１３で作動することができるため、リンク機構１３の構成が簡単になる。

なお、この発明は雪を処理する処理車について説明したが、土砂等を処理する車にも同様に適用できる。

（発明の効果）

この発明は前記のように、リンク機構を複数のアームが各々ピボット軸で回動可能に連設してなり、バケットの水平位置に最も近いピボット軸のアームを順次回動させて、バケットを昇降させるように構成したから、昇降によるバケットの上下の移動量に対して前後の移動量が少なくなり、処理車の重心移動量を最小限に抑えることができるため、車が人が乗車しないで操作するような小型車において、安定性が向上する。

４．図面の簡単な説明

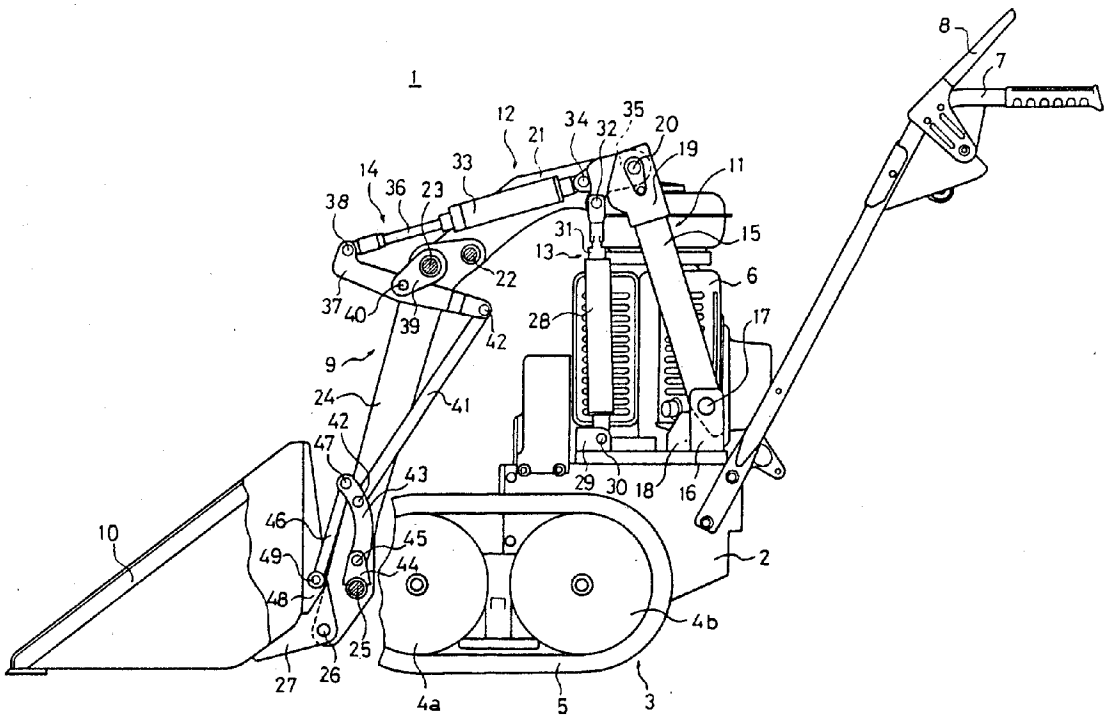
第１図はエンジンスノーダンプの一部破断側面図、第２図はリンク機構の平面図、第３図はリンク機構の作動を示す一部破断側面図、第４図はエンジンスノーダンプの使用状態を示す側面図である。

図中符号１はエンジンスノーダンプ、２は車体フレーム、３はクローラ装置、９はリンク機構、１０はバケット、１２はアーム部、１３はリフト機構、１４はダンプ機構である。

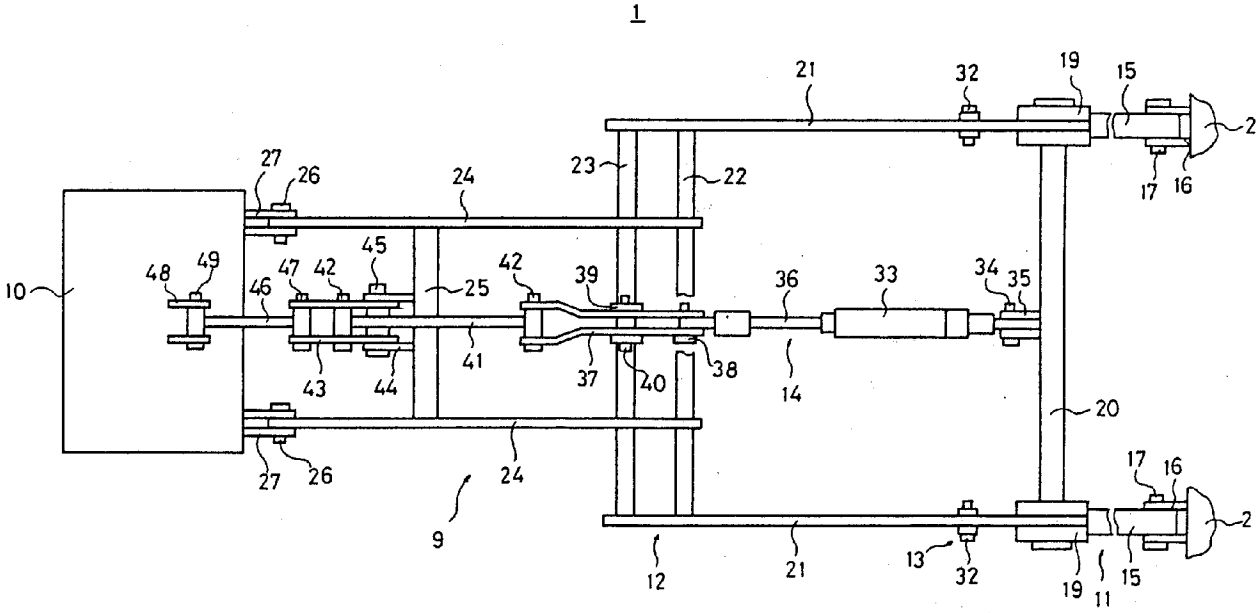
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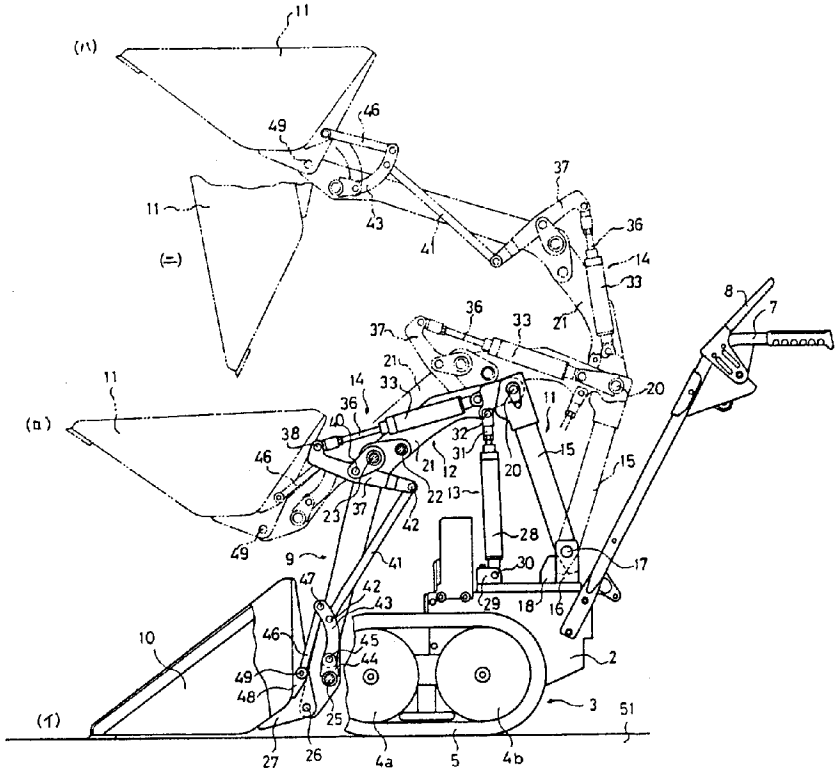


第 1 図

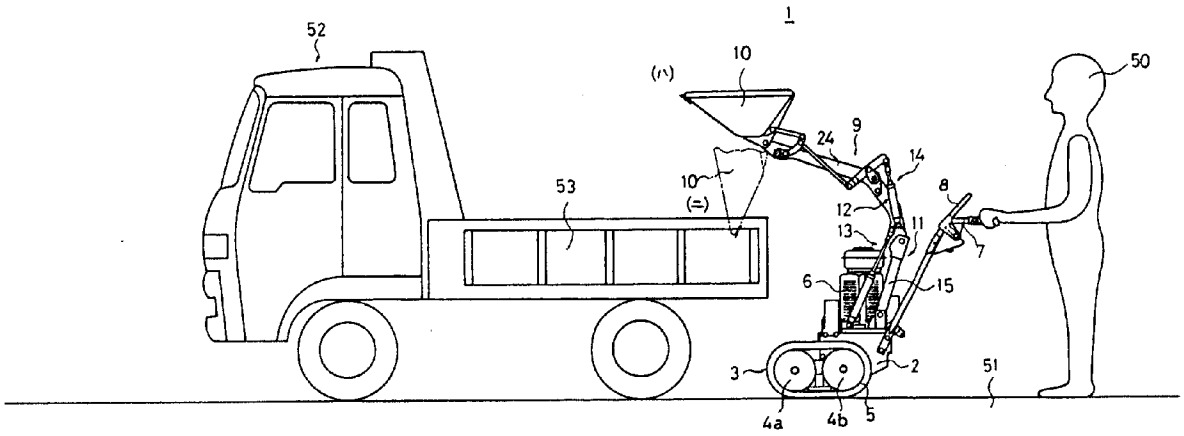


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第 3 図



第 4 図

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QUADRUPLE LINK MECHANISM OF WORKING VEHICLE

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Abstract of JPH11140900 (A)

PROBLEM TO BE SOLVED: To provide a quadruple link mechanism of a working vehicle which allows a driver to get on and off the vehicle while the vehicle is loaded; provides high visibility, and stability. SOLUTION: An arm 13 having a working member 14 is attached via a front link 11 and a rear link 12 to a vehicle body 1 in such a way as to be freely raised and lowered, so as to constitute a quadruple link 10, the vehicle body 1 having a front wheel 2, a rear wheel 3, and a driver's seat 4. Pivot parts 11b, 11a at the upper and lower ends of the front link 11 and pivot parts 12b, 12a at the upper and lower ends of the rear link 12 are located in front of a perpendicular line B-B passing through the center of the front wheel 3 and being perpendicular to the ground when the vehicle body 1 is viewed from its side. Therefore, a driver can get on and off the vehicle from the side of the vehicle body 1, high visibility is obtained because of the low position of the arm 13, and high stability is also obtained because of low center of gravity.

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DESCRIPTION JPH11140900A

[0001]

13 INDUSTRIAL APPLICABILITY The present invention relates to a link mechanism of a work vehicle, and more particularly to a link mechanism of a work machine of a work vehicle.

[0002]

18 FIG. 11 is a side view of a first example of a wheeled loading machine, which is an example of a conventional work vehicle, and shows a storage posture of a four-section link holding a bucket 57 near the ground. There is.

21 The vehicle body 50 is provided with two front wheels, three rear wheels, and a driver's cab 51. The lower end shaft support 52a of the rear link 52 is pivotally attached to the upper rear portion of the vehicle body 50, and the rear end portion of the arm 53 is pivotally attached to the upper end shaft support 52b of the rear link 52. The lower end shaft support 54a of the front link 54 is pivotally attached to the front portion of the vehicle body 50, and the upper end shaft support 54b of the front link 54 is pivotally attached to the tip of the arm portion 53a provided at the lower center of the arm 53. As described above, the 4-section link 55 is configured. The upper end shaft support 54b of the front link 54 is located below the straight line KK connecting the lower end shaft support 54a of the front link 54 and the upper end shaft support 52b of the rear link 52. The rear portion 53b of the arm portion 53a of the arm 53 and the vehicle body 50 are connected by a lift cylinder 56. A bucket 57 that is tilted and dumped by a bucket cylinder (not shown) is attached to the tip of the arm 53.

[0003]

36 The operation of the above configuration will be described with reference to FIG.

37 By extending the lift cylinder 56 of the bucket 57 (shown by a solid line) in a retracted posture

held near the ground, the arm 53 stands up and the bucket 57 also rises as shown by the alternate long and short dash line. At this time, the front link 54 rotates in the direction of the arrow d, and the upper end shaft support 54b approaches the straight line KK. Therefore, the rear link 52 rotates about the lower end shaft support 52a in the direction of the arrow e from the position of the retracted posture. Therefore, the bucket 57 moves backward. When the lift cylinder 56 is further extended, the arm 53 is further raised and the bucket 57 is further raised as shown by the broken line. At this time, the upper end shaft support 54b of the front link 54 crosses the straight line KK and then separates from the straight line KK. Therefore, the rear link 52 rotates forward about the lower end shaft support 52a as shown by the broken line arrow f. Therefore, the bucket 57 moves forward. The movement locus of the center of gravity G of the bucket 57 during that period is like a curve L, and the movement amount S1 in the front-rear direction is small.

[0004]

53 On the other hand, the side of the vehicle body 50 is dangerous because the arm 53 and the like move up and down. As shown in FIG. 11, a protective wire mesh 58 is attached to the side surface of the driver's cab 51, and the operator is in front of the vehicle body 50. It is designed to get on and off more.

[0005]

60 FIG. 13 is a side view of a second example of a wheeled loading machine.

61 The vehicle body 60 is provided with front wheels 2 and rear wheels 3, and a driver's seat 61 is provided substantially directly above the rear wheels 3.

63 The rear end shaft support 63a of the arm 63 is connected to the upper portion of the bracket 62 provided in front of the vehicle body 60, and the arm 63 is raised and lowered by the lift cylinder 64. A bucket 65 is attached to the tip of the arm 63. The operator is designed to get on and off from the side surface of the vehicle body 60. When the lift cylinder 64 is extended, the arm 63 rotates about the rear end shaft support 63a as shown by the alternate long and short dash line from the position of the solid line, and raises the bucket 65. At this time, the movement locus of the center of gravity G of the bucket 65 is as shown by the curve M, and the movement amount S2 in the front-rear direction is fixed at the position of the rear end shaft support 63a of the arm, so that the movement amount S1 of the first example is compared with the movement amount S1 of the first example. Will grow.

[0006]

76 However, the above-mentioned conventional configuration has the following problems.

77 (1) In the first example, since getting on and off the vehicle body is performed from the front of the vehicle, it is not possible to get on and off the vehicle body in the loaded state. Further, since the arm and the like are provided in the lateral direction and the frame and the like are

also provided in the rear lateral direction, the visibility in the lateral direction and the rear lateral direction is poor. (2) In the second example, since the amount of movement of the position of the center of gravity of the bucket in the front-rear direction when raising and lowering the bucket is large, the position of the center of gravity changes significantly, and the stability of the vehicle in the front-rear direction during loading is poor.

[0007]

88 In view of the above problems, it is an object of the present invention to provide a four-section link mechanism for a work vehicle that can get on and off the driver's seat even in a loaded state, has good visibility, and has good stability.

[0008]

94 [Means, Actions and Effects for Solving the Problems] In order to achieve the above object, the first of the four-section link mechanism of the work vehicle according to the present invention is a vehicle body and an arm having a work member at a tip portion. In a four-section link mechanism of a work vehicle having a front link connecting the front part of the vehicle body and the rear part of the arm and a rear link connecting the rear part of the vehicle body and a portion near the rear part of the arm, the work member is placed near the ground. The lower end shaft branch of the front link and the lower end shaft branch of the rear link connected to the vehicle body, and the upper end shaft branch of the front link and the upper end shaft branch of the rear link connected to the arm in the retracted posture of the four-section link held in However, when the vehicle body is viewed from the side, it is characterized in that it is located on the front side of a vertical line that passes through the center of the rear wheels and is perpendicular to the ground.

[0009]

109 According to the first configuration, the following effects are obtained.

110 Since the arm is supported on the vehicle body by a four-bar link mechanism, the amount of movement of the center of gravity in the front-rear direction when the working member is raised and lowered can be reduced by the action of the four-bar link, and the stability in the front-rear direction can be improved.

114 Further, since the connection points between the front and rear links and the vehicle body and the arm are located on the front side of the vertical line passing through the center of the rear wheels, the operator can get on and off from behind the rear links on the side surface of the vehicle body.

118 Therefore, the operator can get on and off the vehicle even in the loaded state. In addition, the mounting position of the arm on the vehicle body can be lowered to improve visibility, the frame structure of the vehicle body can be simplified, the center of gravity can be lowered, and a stable work vehicle can be obtained.

[0010]

125 Secondly, in the first configuration, when the four-section link is in the retracted posture, the upper end shaft support of the front link is on the rear link side of the straight line connecting the lower end shaft support of the front link and the upper end shaft support of the rear link. It is characterized by being located.

[0011]

132 According to the second configuration, the following effects are obtained.

133 When the 4-section link is retracted, the upper end of the front link is located on the rear link side with respect to the straight line connecting the lower end of the front link and the upper end of the rear link. The shaft branch will cross this straight line.

136 Therefore, the rear link rotates back and forth to move the front and rear positions of the working member to reduce the amount of movement of the center of gravity of the working member when ascending. Therefore, the stability of the work vehicle is improved.

[0012]

142 Thirdly, in the first configuration, a swingable bell crank is attached to the upper end shaft support of the rear link, and the working member and one end of the bell crank are connected to form a substantially parallel 4-section link with the arm. It is characterized in that it includes a front rod that connects the vehicle body and the other end of the bell crank to form a substantially parallel 4-node link with the rear link.

[0013]

150 According to the third configuration, the following effects are obtained.

151 Since the front rod, the rear rod, the arm, the working member, the bell crank, and the rear link form two substantially parallel four-bar links, the ground angle of the working member becomes almost constant when the arm is undulated. ..

154 Therefore, even if the arm is raised in the loaded state, the angle of the working member to the ground is almost constant. Therefore, it is not necessary to adjust the angle of the working member while raising the arm in order to prevent the load from spilling, and the workability is improved. improves.

[0014]

161 The fourth of the four-section link mechanism of the work vehicle according to the present invention is a vehicle body, an arm having a work member at the tip portion, a front link connecting the front portion of the vehicle body and the rear portion of the arm, the rear

portion of the vehicle body, and the above. In a four-section link mechanism of a work vehicle provided with a rear link connecting a portion near the rear part of the arm, the lower end shaft branch of the front link and the lower end shaft branch of the rear link are located below the driver's seat. It is a feature.

[0015]

171 According to the fourth configuration, the following effects are obtained.

172 Since the lower end shaft branches of the front link and the rear link are located below the driver's seat, good visibility can be obtained and boarding / alighting from the side of the vehicle body is possible.

[0016]

178 Fifth of the four-section link mechanism of the work vehicle according to the present invention includes a vehicle body, an arm having a work member at the tip portion, a front link connecting the front portion of the vehicle body and the rear portion of the arm, the rear portion of the vehicle body, and the above. In a four-section link mechanism of a work vehicle provided with a rear link connecting a portion near the rear part of the arm, a lower end shaft branch of the front link connected to the vehicle body, a lower end shaft branch of the rear link, and a front link connected to the arm. Of the four shaft branches, the upper end shaft branch of the front link and the upper end shaft branch of the rear link, at least the lower end shaft branch of the front link and the upper end shaft branch of the rear link are the four-section links that hold the working member near the ground. It is characterized in that it is located on the front side of a vertical line that passes through the seat index point of the driver's seat and is perpendicular to the ground when the vehicle body is viewed from the side in the retracted position.

[0017]

194 According to the fifth configuration, the following effects are obtained.

195 Since the arm is supported on the vehicle body by a four-bar link mechanism, the stability in the front-rear direction can be improved in the same manner as in the first configuration.

197 In addition, when the 4-section link is in the retracted position, at least the lower end shaft branch of the front link and the upper end shaft branch of the rear link are positioned on the front side of the seat index point of the driver's seat, so that the operator can get on and off from the rear part of the vehicle body. Is.

201 Moreover, the rear visibility during work and the omnidirectional visibility during the retracted posture of the 4-section link can be improved.

[0018]

206 BEST MODE FOR CARRYING OUT THE INVENTION Examples of a section 4 link mechanism of a work vehicle according to the present invention will be described in detail with reference to the drawings.

[0019]

212 FIG. 1 is a side view showing the work vehicle of the first embodiment, and shows the storage posture of the four-section link 10 holding the work member 14 near the ground.

214 In this embodiment, the bucket 14 is used as the working member 14.

215 The vehicle body 1 is provided with front wheels 2 and rear wheels 3, and a driver's seat 4 is provided substantially directly above the rear wheels 3. The driver's seat 4 may be provided on the front side or the rear side of the rear wheel 3 as needed. The lower end shaft support 11a of the front link 11 is pivotally attached to the rear of the front wheel 2 on the side surface of the vehicle body 1, and the lower end shaft support 12a of the rear link 12 is pivotally attached to the upper side of the rear wheel 3 on the side surface of the vehicle body 1. ing. The upper end shaft support portion 11b of the front link 11 is pivotally attached to the rear lower end portion of the arm 13, and the upper end shaft support portion 12b of the rear link 12 is pivotally attached to the rear upper end portion of the arm 13. As described above, the section 4 link 10 is configured. A bucket 14 is attached to the tip of the arm 13, and the front portion of the vehicle body 1 and the arm 13 are connected by a lift cylinder 15. The lower end shaft support 11a and the upper end shaft support 11b of the front link 11 and the lower end shaft support 12a and the upper end shaft support 12b of the rear link 12 are all on the front side (hatched portion side) of the perpendicular line BB passing through the center of the rear wheel 3.) Is located. The upper end shaft support 11b of the front link 11 is located on the rear link 12 side of the straight line CC connecting the lower end shaft support 11a of the front link 11 and the upper end shaft support 12b of the rear link 12. Therefore, the positions of the upper end shaft support portions 11b and 12b, which are the connection points between the arm 13 and the front link 11 and the rear link 12, can be lowered, and the center of gravity of the entire vehicle is lowered to provide a highly stable work vehicle. can get.

[0020]

239 2 to 4 are perspective views showing the arrangement of the lift cylinder 15.

240 FIG. 2 shows the first mounting example, in which the lower end portion of the lift cylinder 15 is attached to the lower center of the front surface of the vehicle body 1, and the piston rod 16 of the lift cylinder 15 is connected to the arm 13.

[0021]

246 FIG. 3 shows a second mounting example in which a pair of lift cylinders 15a and 15a are arranged at both left and right ends of the front surface of the vehicle body 1, and the piston

rods 16a and 16a are connected to the arm 13.

[0022]

252 FIG. 4 shows a third mounting example, in which the lower end portion of the lift cylinder 15b is attached to the upper center of the front surface of the vehicle body 1, and the piston rod 16b of the lift cylinder 15b is connected to the arm 13.

[0023]

258 Next, the operation will be described.

259 As shown in FIG. 5, the arm 13 and the bucket 14 (shown by the solid line) in the retracted posture held near the ground stand up and rise at the position of the alternate long and short dash line by extending the lift cylinder 15.

262 At this time, the front link 11 rotates in the direction of the arrow a about the lower end shaft support 11a, and the upper end shaft support 11b is a straight line CC connecting the lower end shaft support 11a and the upper end shaft support 12b of the rear link 12. Get closer to the top.

266 Therefore, the rear link 12 rotates about the lower end shaft support portion 12a in the direction of the arrow b, and moves the arm 13 and the bucket 14 rearward from the position of the retracted posture. Next, when the lift cylinder 15 is further extended, the arm 13 and the bucket 14 further stand up and rise as shown by the broken line. At this time, the front link 11 further rotates in the direction of the arrow a, and the upper end shaft support portion 11b crosses the straight line CC and then separates from the straight line CC. At the same time, the rear link 12 rotates in the direction of the dashed arrow c, moving the arm 13 and the bucket 14 forward. Therefore, the movement locus of the bucket 14 when the center of gravity G rises becomes like a curve E, and the movement amount S in the front-rear direction becomes smaller than the movement amount S2 of the second example of the conventional loading machine. Therefore, the stability of the vehicle in the front-rear direction is improved. Further, since the driver's seat 4 is located substantially directly above the rear wheels 3, the operator can get on and off from the side of the vehicle body 1, and therefore can get on and off even in the loaded state, and workability is improved.

[0024]

283 FIG. 6 is a side view showing a second embodiment of the work vehicle.

284 Since the configuration is almost the same as that of the first embodiment, the same members are designated by the same symbols, the description thereof will be omitted, and different parts will be described. The lower end shaft support 11a of the front link 11 is located above the upper surface 2a of the front wheel 2 at the front of the vehicle body 1, and the lower end shaft support 12a of the rear link 12 is located above the upper surface 3a of the rear wheel 3 at the rear of the vehicle body 1. ing. Therefore, the track 5 can be attached to the

front wheels 2 and the rear wheels 3, enabling work on soft ground and the like, and improving workability. Further, according to such a configuration, since the lower end shaft support portion 11a of the front link 11 and the lower end shaft support portion 12a of the rear link 12 are located below the driver's seat 4, better visibility can be obtained as compared with the conventional FIG. And it is possible to get on and off from the side of the vehicle body 1. The lower part of the driver's seat 4 may be lower than the seat surface of the driver's seat 4, but structurally, it is more preferable to be lower than the lower surface of the driver's seat 4.

[0025]

301 FIG. 7 is a side view showing a third embodiment of the work vehicle, and the mounting position of the lift cylinder 15 is different from that of the second embodiment of the work vehicle shown in FIG.

304 That is, the mounting position of the lift cylinder 15 in the second embodiment is positioned in front of the vehicle body 1 as in the first embodiment, but in the third embodiment, the lift cylinder 15c is positioned in front of the vehicle body 1 on the left and right sides. It is arranged below the link 11 and has a compact structure.

[0026]

311 FIG. 8 is a side view showing a fourth embodiment of the work vehicle, in which the bell crank 20 is additionally mounted on the work vehicle shown in the first embodiment.

313 Therefore, the same members as those in the first embodiment are designated by the same reference numerals, the description thereof will be omitted, and different parts will be described. The bell crank 20 is rotatably mounted on the upper end shaft support portion 12b of the rear link 12. One end of the bell crank 20 and the bucket 14 are connected by a front rod 21, and the arm 13, the bucket 14, the bell crank 20, and the front rod 21 form a substantially parallel 4-node link. Further, the other end of the bell crank 20 and the vehicle body 1 are connected by a rear rod 22, and the vehicle body 1, the rear link 12, the bell crank 20 and the rear rod 22 form a substantially parallel 4-section link. Therefore, when the arm 13 is raised, the attitude of the bucket 14 to the ground is almost the same. Therefore, when the arm 13 is raised in the loaded state, it is necessary to control the attitude of the bucket 14 so as not to spill the load. do not have. That is, workability is improved. Since other actions and effects are the same as those in the first embodiment, the description thereof will be omitted.

[0027]

329 FIG. 9 is a side view showing a fifth embodiment of the work vehicle, in which the lower end shaft support portion 11a of the front link 11 is pivotally attached to the upper part of the front wheel 2 and the front part of the vehicle body 1.

332 Other configurations are the same as those in the first embodiment, for example. With this configuration, the front link 11 becomes long and has a shape that allows it to lie down between the front and back. Then, the movement locus is further straight than the movement locus E of the center of gravity G of the bucket 14 shown in FIG. 5, for example, by the amount that the front link 11 is lengthened and the front link 11 is laid down between the front and rear. Become closer to. That is, the amount of movement of the bucket 14 in the front-rear direction is further smaller than the amount of movement S of FIG. Therefore, the stability of the vehicle in the front-rear direction is further improved.

[0028]

343 FIG. 10 is a side view showing a sixth embodiment of the work vehicle, in which the lower end shaft support portion 11a of the front link 11 is pivotally attached to the upper portion of the front wheel 2 and to the front portion of the vehicle body 1.

346 The lower end shaft support portion 12a of the rear link 12 is located at a position rearward with respect to the perpendicular line DD passing through the seat index point (abbreviated as SIP) 24 corresponding to the base end portion of the backrest of the driver's seat 4. , It is attached to the vehicle body 1. The upper end shaft support portion 11b of the front link 11 and the upper end shaft support portion 12b of the rear link 12 are pivotally attached to the rear lower end portion of the arm 13 and the rear upper end portion of the arm 13, respectively, and both are on the front side with respect to the seat index point 24. positioned. The lower ends of the pair of lift cylinders 15a and 15a are attached to the left and right sides of the front portion of the vehicle body 1, and the piston rods 16a and 16a are connected to the left and right arms 13 and 13. An operator boarding / alighting step 25 is arranged on the rear side of the vehicle body 1. Further, a fork 14 is attached as a working member 14.

[0029]

361 With the above configuration as well, as in the fifth embodiment, the movement locus of the fork 14 that is closer to a straight line can be obtained as compared with the movement locus E of FIG. 5, and the stability of the vehicle in the front-rear direction is improved.

364 Although FIG. 10 shows an example in which only the lower end shaft support portion 12a of the rear link 12 is located on the rear side of the perpendicular line DD, the lower end shaft support portion 12a of the rear link 12 and the upper end shaft support portion 11b of the front link 11 are shown. However, it may be configured so as to be located on the rear side of the perpendicular line DD. In other words, of the four shaft support portions 11a, 11b, 12a, 12b, at least the lower end shaft support portion 11a of the front link 11 and the upper end shaft support portion 12b of the rear link 12 are positioned on the front side of the perpendicular line DD. It should be configured as. Further, the operator can easily get on and off from the rear part of the vehicle body 1 by step 25. Moreover, the rear visibility during work and the omnidirectional visibility during the retracted posture of the 4-section link 10

are also good. The working member 14 is not limited to the bucket 14 or the fork 14, and general working members used in construction machinery, industrial machinery, agricultural machinery, and the like can be applied.

[0030]

380 A brief description of the drawing

[0031]

384 FIG. 1 is a side view of a work vehicle provided with a section 4 link according to the first embodiment of the present invention.

[0032]

389 FIG. 2 is a perspective view showing a first mounting example of the lift cylinder according to the present invention.

[0033]

394 FIG. 3 is a perspective view showing a second mounting example of the lift cylinder according to the present invention.

[0034]

399 FIG. 4 is a perspective view showing a third mounting example of the lift cylinder according to the present invention.

[0035]

404 FIG. 5 is an operation explanatory view of the first embodiment according to the present invention.

[0036]

409 FIG. 6 is a side view of a work vehicle provided with a section 4 link of the second embodiment according to the present invention.

[0037]

414 FIG. 7 is a side view of a work vehicle provided with a section 4 link according to a third embodiment of the present invention.

[0038]

419 FIG. 8 is a side view of a work vehicle provided with a section 4 link according to a fourth embodiment of the present invention.

[0039]

424 FIG. 9 is a side view of a work vehicle provided with a section 4 link according to a fifth embodiment of the present invention.

[0040]

429 FIG. 10 is a side view of a work vehicle provided with a section 4 link according to a sixth embodiment according to the present invention.

[0041]

434 FIG. 11 is a side view of a loading machine provided with a four-section link of the first conventional example.

[0042]

439 12 is an operation explanatory view of the loading machine of FIG.

[0043]

443 FIG. 13 is a side view of a loading machine provided with a four-section link of the second example of the conventional case.

[0044]

448 Code description

[0045]

452 1 Body 2 Front wheel 3 Rear wheel 4 Driver's seat 5 Track 10 4 Section link 11 Front link 12 Rear link 11a, 12a Lower end axle support 11b, 12b Upper end axle branch 13 Arm 14 Working members (bucket, fork) 15, 15a, 15b, 15c Lift cylinder 20 Bell crank 21 Front rod 22 Rear rod 24 Seat index point

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CLAIMS JPH11140900A

1.

13 A vehicle body (1), an arm (13) having a working member (14) at the tip, a front link (11) connecting the front portion of the vehicle body (1) and the rear portion of the arm (13), and a vehicle body (1).) And the rear link (12) connecting the rear part of the arm (13) to the vicinity part of the arm (13).), The lower end shaft branch (11a) of the front link (11) connected to the vehicle body (1), the lower end shaft branch (12a) of the rear link (12), and the front connected to the arm (13). The upper end shaft branch (11b) of the link (11) and the upper end shaft support (12b) of the rear link (12) pass through the center of the rear wheel (3) and with respect to the ground when the vehicle body (1) is viewed from the side. A four-section link mechanism for a work vehicle, characterized in that it is located on the front side of a vertical vertical line.

2.

26 In the 4-section link mechanism of the work vehicle according to claim 1, when the 4-section link (10) is in the retracted posture, the upper end shaft branch (11b) of the front link (11) is replaced with the lower end shaft branch (11a) of the front link (11).) And the upper end shaft branch (12b) of the rear link (12), which is located on the rear link (12) side of the straight line.

3.

34 In the four-section link mechanism of the work vehicle according to claim 1, a swingable bell crank (20) is attached to the upper end shaft branch (12b) of the rear link (12), and the work member (14) and the bell crank (The front rod (21), which connects one end of 20) to form a nearly parallel 4-node link with the arm (13), and the rear link, which connects the vehicle

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body (1) and the other end of the bell crank (20). A four-bar link mechanism for a work vehicle, characterized in that it includes a rear rod (22) that forms a substantially parallel four-bar link with (12).

4.

44 A vehicle body (1), an arm (13) having a working member (14) at the tip, a front link (11) connecting the front portion of the vehicle body (1) and the rear portion of the arm (13), and a vehicle body (1).) In a four-section link mechanism of a work vehicle provided with a rear link (12) connecting the rear portion of the arm (13) and a portion near the rear of the arm (13), the lower end shaft branch (11a) and the rear link (11a) of the front link (11). The lower end shaft branch (12a) of 12) is a four-section link mechanism of a work vehicle characterized in that it is located below the driver's seat (4).

5.

54 A vehicle body (1), an arm (13) having a working member (14) at the tip, a front link (11) connecting the front portion of the vehicle body (1) and the rear portion of the arm (13), and a vehicle body (1). The lower end shaft of the front link (11) connected to the vehicle body (1) in the four-section link mechanism of the work vehicle provided with the rear link (12) connecting the rear part of the arm (13) and the vicinity part of the rear part of the arm (13). The lower end shaft branch (12a) of the branch (11a) and rear link (12), and the upper end shaft branch (11b) and rear link (12) of the front link (11) connected to the arm (13). Of the four shaft branches (11a, 12a, 11b, 12b) with 12b), at least the lower end shaft branch (11a) of the front link (11) and the upper end shaft branch (12b) of the rear link (12) are When the four-section link (10) holding the work member (14) near the ground is in the retracted position, when the vehicle body (1) is viewed from the side, it passes through the seat index point (24) of the driver's seat (4) and touches the ground. A four-section link mechanism of a work vehicle characterized in that it is located on the front side of a vertical line perpendicular to the vertical line.

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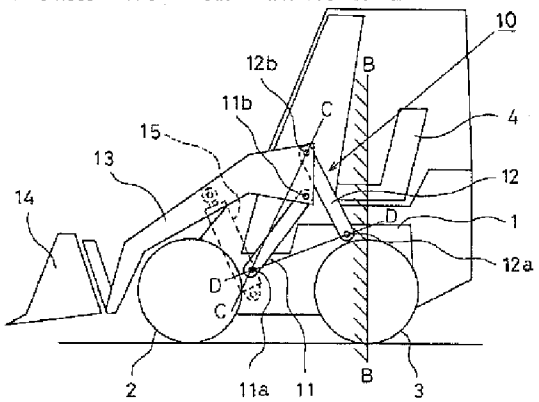
(54)【発明の名称】　作業車両の４節リンク機構

(57)【要約】

【課題】　荷積状態で乗降が可能で、視界が良く、安定性も良い作業車両の４節リンク機構を提供する。

【解決手段】　前輪（２）、後輪（３）及び運転席（４）を備える車体（１）に、前方リンク（１１）及び後方リンク（１２）を介して作業部材（１４）を有するアーム（１３）を起伏自在に取着し、４節リンク（１０）を構成する。前方リンク（１１）の上下端軸支部（１１ｂ，１１ａ）と後方リンク（１２）の上下端軸支部（１２ｂ，１２ａ）とは、車体（１）を側面視するとき、後輪（３）の中心を通りかつ地面に対して垂直となる垂線（Ｂ－Ｂ）の前方側に位置している。このため、車体（１）側面からの乗降が可能で、またアーム（１３）の位置が低いため視界性が良く、しかも低重心で安定性が良い。

第１実施例の４節リンクを備える作業車両の側面図



１：車体、２：前輪、３：後輪、４：運転席、１０：４節リンク、
１１：前方リンク、１２：後方リンク、１１ａ、１２ａ：下端軸支部、
１１ｂ、１２ｂ：上端軸支部、１３：アーム、１４：バケット、
１５：リフトシリンダ

【特許請求の範囲】
【請求項１】　車体(1) と、先端部に作業部材(14)を有するアーム(13)と、車体(1) の前部とアーム(13)の後部とを連結する前方リンク(11)と、車体(1) の後部と前記アーム(13)後部の近傍部位とを連結する後方リンク(12)とを備える作業車両の４節リンク機構において、作業部材(14)を地上近傍に保持した４節リンク(10)の格納姿勢時に、車体(1) に連結される前方リンク(11)の下端軸支部(11a) 及び後方リンク(12)の下端軸支部(12a) と、アーム(13)に連結される前方リンク(11)の上端軸支部(11b) 及び後方リンク(12)の上端軸支部(12b) とが、車体(1) を側面視するとき、後輪(3) の中心を通りかつ地面に対して垂直となる垂線の前方側に位置していることを特徴とする作業車両の４節リンク機構。
【請求項２】　請求項１記載の作業車両の４節リンク機構において、４節リンク(10)の格納姿勢時に、前方リンク(11)の上端軸支部(11b) は、前方リンク(11)の下端軸支部(11a) と後方リンク(12)の上端軸支部(12b) とを結ぶ直線よりも、後方リンク(12)側に位置していることを特徴とする作業車両の４節リンク機構。
【請求項３】　請求項１記載の作業車両の４節リンク機構において、後方リンク(12)の上端軸支部(12b) に揺動自在なベルクランク(20)を取着し、作業部材(14)とベルクランク(20)の一端とを連結してアーム(13)とでほぼ平行４節リンクを構成する前方ロッド(21)と、車体(1) とベルクランク(20)の他端とを連結して後方リンク(12)とでほぼ平行４節リンクを構成する後方ロッド(22)とを備えることを特徴とする作業車両の４節リンク機構。
【請求項４】　車体(1) と、先端部に作業部材(14)を有するアーム(13)と、車体(1) の前部とアーム(13)の後部とを連結する前方リンク(11)と、車体(1) の後部と前記アーム(13)後部の近傍部位とを連結する後方リンク(12)とを備える作業車両の４節リンク機構において、前方リンク(11)の下端軸支部(11a) 及び後方リンク(12)の下端軸支部(12a) は、運転席(4) よりも下方に位置していることを特徴とする作業車両の４節リンク機構。
【請求項５】　車体(1) と、先端部に作業部材(14)を有するアーム(13)と、車体(1) の前部とアーム(13)の後部とを連結する前方リンク(11)と、車体(1) の後部と前記アーム(13)後部の近傍部位とを連結する後方リンク(12)とを備える作業車両の４節リンク機構において、車体(1) に連結される前方リンク(11)の下端軸支部(11a) 及び後方リンク(12)の下端軸支部(12a) と、アーム(13)に連結される前方リンク(11)の上端軸支部(11b) 及び後方リンク(12)の上端軸支部(12b) との４個所の軸支部(11a,12a,11b,12b) の内、少なくとも前方リンク(11)の下端軸支部(11a) と後方リンク(12)の上端軸支部(12b) とは、作業部材(14)を地上近傍に保持した４節リンク(10)の格納姿勢時、車体(1) を側面視するときに、運転席(4) の座席指標点(24)を通りかつ地面に対して垂直となる垂線の前方側に位置していることを特徴とする作業車両の４節リンク機構。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、作業車両のリンク機構に係り、特に作業車両の作業機のリンク機構に関する。
【０００２】
【従来の技術】図１１は従来の作業車両の一例となる、装輪式の積み込み機械の第１例の側面図であり、バケット５７を地上近傍に保持した４節リンクの格納姿勢を示している。車体５０には前輪２、後輪３、運転室５１が設けられている。車体５０の後部上方には後方リンク５２の下端軸支部５２ａが軸着され、後方リンク５２の上端軸支部５２ｂにはアーム５３の後端部が軸着されている。車体５０の前部には前方リンク５４の下端軸支部５４ａが軸着され、前方リンク５４の上端軸支部５４ｂはアーム５３の中央下部に設けられたアーム部５３ａの先端に軸着されている。以上により、４節リンク５５を構成している。前方リンク５４の上端軸支部５４ｂは、前方リンク５４の下端軸支部５４ａと後方リンク５２の上端軸支部５２ｂとを結ぶ直線Ｋ－Ｋより、下方に位置している。アーム５３のアーム部５３ａの後部５３ｂと車体５０とはリフトシリンダ５６により連結されている。アーム５３の先端部にはバケットシリンダ（図示せず）によってチルトしダンプするバケット５７が取着されている。
【０００３】上記構成の作用を図１２を参照して説明する。地上近傍に保持した格納姿勢のバケット５７（実線で示す）は、リフトシリンダ５６を伸長することにより、一点鎖線に示すように、アーム５３が起立してバケット５７も上昇する。このとき前方リンク５４は矢印ｄ方向に回転し、上端軸支部５４ｂは直線Ｋ－Ｋに接近する。このため、後方リンク５２は格納姿勢の位置から矢印ｅの方向に下端軸支部５２ａを中心として回転する。従ってバケット５７は後方に移動する。さらにリフトシリンダ５６を伸長すると、破線に示すように、アーム５３がさらに起立してバケット５７はさらに上昇する。このとき前方リンク５４の上端軸支部５４ｂは直線Ｋ－Ｋをよぎった後、直線Ｋ－Ｋから離れる。そのため、後方リンク５２は破線の矢印ｆのように下端軸支部５２ａを中心として前方に回転する。従ってバケット５７は前方に移動する。その間におけるバケット５７の重心Ｇの移動軌跡は曲線Ｌのごとくであり、前後方向の移動量Ｓ１は小さい。
【０００４】一方、車体５０の側方はアーム５３等が上下移動するため危険であり、図１１に示すように、運転室５１の側面には防護用の金網５８が取着され、オペレータは車体５０の前方より乗降するようになっている。
【０００５】図１３は装輪式の積み込み機械の第２例の

側面図である。車体６０には前輪２及び後輪３が設けられ、後輪３のほぼ真上には運転席６１が設けられている。車体６０の前方に設けられたブラケット６２の上部にはアーム６３の後端軸支部６３ａが連結され、アーム６３はリフトシリンダ６４により起伏されるようになっている。アーム６３の先端部にはバケット６５が取着されている。オペレータは車体６０の側面から乗降するようになっている。リフトシリンダ６４を伸長すると、アーム６３は実線の位置から一点鎖線に示すように、後端軸支部６３ａを中心として回転し、バケット６５を上昇させる。このときのバケット６５の重心Ｇの移動軌跡は曲線Ｍのごとくであり、前後方向の移動量Ｓ２はアーム後端軸支部６３ａの位置が固定しているので、第１例の移動量Ｓ１に比べて大きくなる。

【０００６】

【発明が解決しようとする課題】しかしながら上記従来の構成には、以下のような問題がある。

（１）第１例は、車体への乗降を車両の前方から行うため、荷積み状態では車体への乗降ができない。また横方向にアーム等があり、また後方横にもフレーム等が有るため、横方向及び後横方向の視界性が悪い。

（２）第２例は、バケット昇降時のバケット重心位置の前後方向への移動量が大きいため、重心位置変化が大きく、積載時の車両の前後方向の安定性が悪い。

【０００７】本発明は上記の問題点に鑑み、荷積み状態でも運転席への乗降ができ、視界性が良く、しかも安定性の良い作業車両の４節リンク機構を提供することを目的とする。

【０００８】

【課題を解決するための手段、作用および効果】上記の目的を達成するために、本発明に係る作業車両の４節リンク機構の第１は、車体と、先端部に作業部材を有するアームと、車体の前部とアームの後部とを連結する前方リンクと、車体の後部と前記アーム後部の近傍部位とを連結する後方リンクとを備える作業車両の４節リンク機構において、作業部材を地上近傍に保持した４節リンクの格納姿勢時に、車体に連結される前方リンクの下端軸支部及び後方リンクの下端軸支部と、アームに連結される前方リンクの上端軸支部及び後方リンクの上端軸支部とが、車体を側面視するとき、後輪の中心を通りかつ地面に対して垂直となる垂線の前方側に位置していることを特徴としている。

【０００９】上記第１構成によれば、次のような作用効果を奏する。アームを車体に４節リンク機構で支持したため、４節リンクの作用により作業部材昇降時の重心の前後方向移動量を少なくして、前後方向の安定性を向上させることができる。また、前方及び後方リンクと車体及びアームとの連結点を、後輪の中心を通る垂線の前方側に位置させたため、車体側面の後方リンクの後方からオペレータの乗降が可能となる。従って積み荷状態でもオペレータは車両への乗降が可能となる。またアームの車体への取付位置を低くでき、視界性を向上させるとともに、車体のフレーム構造を簡単にでき、重心が低くなって安定性の良い作業車両が得られる。

【００１０】第２に、上記第１構成において、４節リンクの格納姿勢時に、前方リンクの上端軸支部は、前方リンクの下端軸支部と後方リンクの上端軸支部とを結ぶ直線よりも、後方リンク側に位置していることを特徴としている。

【００１１】上記第２構成によれば、次のような作用効果を奏する。４節リンクの格納姿勢時に、前方リンクの下端軸支部と後方リンクの上端軸支部とを結ぶ直線に対し、前方リンクの上端軸支部を後方リンク側に位置させたため、アーム上昇時には前方リンクの上端軸支部はこの直線をよぎることとなる。このため、後方リンクは前後に回転し、作業部材の前後位置を移動させて上昇時の作業部材の重心移動量を少なくする。このため作業車両の安定性が向上する。

【００１２】第３に、上記第１構成において、後方リンクの上端軸支部に揺動自在なベルクランクを取着し、作業部材とベルクランクの一端とを連結してアームとでほぼ平行４節リンクを構成する前方ロッドと、車体とベルクランクの他端とを連結して後方リンクとでほぼ平行４節リンクを構成する後方ロッドとを備えることを特徴としている。

【００１３】上記第３構成によれば、次のような作用効果を奏する。前方ロッドと、後方ロッドと、アームと、作業部材と、ベルクランクと、後方リンクとでほぼ平行４節リンクを２つ構成したため、アームを起伏した場合、作業部材の対地角度がほぼ一定となる。従って荷積み状態でアームを上昇させても作業部材の対地角度がほぼ一定しているため、荷こぼれを防止するためにアームを上昇させながら作業部材の角度を調整する必要はなく、作業性が向上する。

【００１４】本発明に係る作業車両の４節リンク機構の第４は、車体と、先端部に作業部材を有するアームと、車体の前部とアームの後部とを連結する前方リンクと、車体の後部と前記アーム後部の近傍部位とを連結する後方リンクとを備える作業車両の４節リンク機構において、前方リンクの下端軸支部及び後方リンクの下端軸支部が、運転席よりも下方に位置していることを特徴としている。

【００１５】上記第４構成によれば、次のような作用効果を奏する。前方リンク及び後方リンクの各下端軸支部を運転席よりも下方に位置させたため、良好な視界性が得られ、かつ車体側方よりの乗降が可能となる。

【００１６】本発明に係る作業車両の４節リンク機構の第５は、車体と、先端部に作業部材を有するアームと、車体の前部とアームの後部とを連結する前方リンクと、車体の後部と前記アーム後部の近傍部位とを連結する後

方リンクとを備える作業車両の４節リンク機構において、車体に連結される前方リンクの下端軸支部及び後方リンクの下端軸支部と、アームに連結される前方リンクの上端軸支部及び後方リンクの上端軸支部との４個所の軸支部の内、少なくとも前方リンクの下端軸支部と後方リンクの上端軸支部とは、作業部材を地上近傍に保持した４節リンクの格納姿勢時、車体を側面視するときに、運転席の座席指標点を通りかつ地面に対して垂直となる垂線の前方側に位置していることを特徴としている。

【００１７】上記第５構成によれば、次のような作用効果を奏する。アームを車体に４節リンク機構で支持したため、上記第１構成と同様にして、前後方向の安定性を向上させることができる。また、４節リンクの格納姿勢時、少なくとも前方リンクの下端軸支部と後方リンクの上端軸支部とを、運転席の座席指標点よりも前方側に位置させたため、オペレータは、車体後部から乗降可能である。しかも、作業時おける後方視界性、及び４節リンクの格納姿勢時における全方位視界性も向上できる。

【００１８】

【発明の実施の形態】本発明に係る作業車両の４節リンク機構の実施例を図面を参照して詳述する。

【００１９】図１は第１実施例の作業車両を示す側面図であり、作業部材１４を地上近傍に保持した４節リンク１０の格納姿勢を示している。本実施例では、作業部材１４として、バケット１４を用いている。車体１には前輪２及び後輪３が設けられ、後輪３のほぼ真上に運転席４が設けられている。尚、運転席４は、必要に応じて後輪３の前方側に又は後方側に設けてよい。車体１の側面の前輪２の後方には前方リンク１１の下端軸支部１１ａが軸着されており、車体１の側面の後輪３の上方には後方リンク１２の下端軸支部１２ａが軸着されている。前方リンク１１の上端軸支部１１ｂはアーム１３の後部下端部に軸着され、後方リンク１２の上端軸支部１２ｂはアーム１３の後部上端部に軸着されている。以上により４節リンク１０を構成している。アーム１３の先端部にはバケット１４が取着されており、車体１の前部とアーム１３とはリフトシリンダ１５によって連結されている。前方リンク１１の下端軸支部１１ａ及び上端軸支部１１ｂ、並びに後方リンク１２の下端軸支部１２ａ及び上端軸支部１２ｂは、いずれも後輪３の中心を通る垂線Ｂ－Ｂの前方側（ハッチング部側）に位置している。また前方リンク１１の上端軸支部１１ｂは、前方リンク１１の下端軸支部１１ａと後方リンク１２の上端軸支部１２ｂとを結ぶ直線Ｃ－Ｃより、後方リンク１２側に位置している。このため、アーム１３と前方リンク１１及び後方リンク１２との連結点である上端軸支部１１ｂ、１２ｂの位置を、低くすることができ、車両全体の重心が低くなって安定性のよい作業車両が得られる。

【００２０】図２～図４はリフトシリンダ１５の配置を示す斜視図である。図２はその第１取付例を示し、車体１の前面中央下部にリフトシリンダ１５の下端部を取着し、リフトシリンダ１５のピストンロッド１６をアーム１３に連結している。

【００２１】図３は第２取付例を示し、車体１の前面の左右両端部に一対のリフトシリンダ１５ａ、１５ａを配置したもので、ピストンロッド１６ａ、１６ａをアーム１３に連結している。

【００２２】図４は第３取付例を示し、車体１の前面中央上部にリフトシリンダ１５ｂの下端部を取着し、リフトシリンダ１５ｂのピストンロッド１６ｂをアーム１３に連結している。

【００２３】次に作用を説明する。図５に示すように、地上近傍に保持した格納姿勢のアーム１３及びバケット１４（実線で示す）は、リフトシリンダ１５を伸長することにより、一点鎖線の位置に起立し上昇する。このとき、前方リンク１１が下端軸支部１１ａを中心にして矢印ａの方向に回転し、上端軸支部１１ｂは、その下端軸支部１１ａと後方リンク１２の上端軸支部１２ｂとを結ぶ直線Ｃ－Ｃ上に接近する。このため、後方リンク１２は下端軸支部１２ａを中心として矢印ｂの方向に回転し、アーム１３及びバケット１４を格納姿勢の位置から後方に移動させる。次にさらにリフトシリンダ１５を伸長すると、アーム１３及びバケット１４は破線に示すようにさらに起立し、上昇する。このとき、前方リンク１１はさらに矢印ａの方向に回転し、上端軸支部１１ｂは直線Ｃ－Ｃをよぎった後に直線Ｃ－Ｃから離れる。同時に、後方リンク１２は破線の矢印ｃの方向に回転し、アーム１３及びバケット１４を前方に移動させる。このため、バケット１４の重心Ｇの上昇時の移動軌跡は曲線Ｅのごとくなり、前後方向の移動量Ｓが従来の積み込み機の第２例の移動量Ｓ２に比べて小さくなる。従って車両の前後方向の安定性が向上する。また運転席４は後輪３のほぼ真上に位置しているため、オペレータは車体１側方より乗降することができ、従って積み荷状態においても乗降が可能となり、作業性が向上する。

【００２４】図６は作業車両の第２実施例を示す側面図である。構成は第１実施例とほぼ同一であるので、同一部材には同一記号を付し、説明は省略し、異なる部分について説明する。前方リンク１１の下端軸支部１１ａは車体１前部の前輪２の上面２ａの上方に位置しており、後方リンク１２の下端軸支部１２ａは車体後部の後輪３の上面３ａの上方に位置している。このため、前輪２及び後輪３に履帯５を巻装することができ、軟弱地等での作業を可能とし、作業性を向上することができる。また、かかる構成によれば、前方リンク１１の下端軸支部１１ａ及び後方リンク１２の下端軸支部１２ａが運転席４の下方に位置するので、従来の図１１と比較し、良好な視界性が得られ、かつ車体１側方よりの乗降が可能である。なお、運転席４の下方とは、運転席４の座面より下方でよいのであるが、構造上、運転席４の下面より下

方の方がより好ましい。

【００２５】図７は作業車両の第３実施例を示す側面図であり、図６に示した作業車両の第２実施例に対し、リフトシリンダ１５の装着位置を異なる位置にしたものである。即ち、第２実施例でのリフトシリンダ１５の装着位置は第１実施例と同様、車体１の前方に位置させてあるが、第３実施例ではリフトシリンダ１５ｃを車体１の左右側方の前方リンク１１の下方に配設したものであり、コンパクトな構成となっている。

【００２６】図８は作業車両の第４実施例を示す側面図であり、第１実施例に示した作業車両にベルクランク２０を追加装着したものである。従って第１実施例と同一部材には同一符号を付して説明は省略し、異なる部分について説明する。後方リンク１２の上端軸支部１２ｂに回転自在にベルクランク２０を装着する。ベルクランク２０の一端とバケット１４とを前方ロッド２１で連結し、アーム１３と、バケット１４と、ベルクランク２０と、前方ロッド２１とで、ほぼ平行４節リンクを構成する。またベルクランク２０の他端と車体１とを後方ロッド２２で連結し、車体１と、後方リンク１２と、ベルクランク２０と、後方ロッド２２とで、ほぼ平行４節リンクを構成する。このため、アーム１３を上昇させたとき、バケット１４の対地姿勢がほぼ同じであり、このため、積み荷状態でアーム１３を上昇させるときに、荷をこぼさないためのバケット１４姿勢制御を行う必要がない。つまり作業性が向上する。その他の作用、効果については第１実施例と同一なので説明は省略する。

【００２７】図９は作業車両の第５実施例を示す側面図であり、前輪２の上方で、かつ車体１の前部に、前方リンク１１の下端軸支部１１ａを軸着している。他の構成は例えば上記第１実施例と同一とした。このように構成すると、前方リンク１１が長くなり、かつ前後間で伏せるような形状になる。そして、前方リンク１１が長くなった分だけ、かつ前方リンク１１が前後間で伏せた分だけ、移動軌跡は、例えば図５に示したバケット１４の重心Ｇの移動軌跡Ｅと比べて、さらに直線に近くなる。すなわち、バケット１４の前後方向の移動量は、図５の移動量Ｓと比べて、さらに小さくなる。従って車両の前後方向の安定性がさらに向上する。

【００２８】図１０は作業車両の第６実施例を示す側面図であり、前方リンク１１の下端軸支部１１ａは、前輪２の上方で、かつ車体１の前部に軸着している。後方リンク１２の下端軸支部１２ａは、運転席４の背もたれの基端部に相当する座席指標点（Seat Index Point：略してＳＩＰという）２４を通る垂線Ｄ－Ｄに対し、後方側の位置で、車体１に軸着している。前方リンク１１の上端軸支部１１ｂ及び後方リンク１２の上端軸支部１２ｂは、それぞれアーム１３の後部下端部及びアーム１３の後部上端部に軸着され、また共に座席指標点２４に対して前方側に位置している。一対のリフトシリンダ１５ａ、１５ａは、下端部を車体１の前部の左右両側に取着し、ピストンロッド１６ａ、１６ａを左右のアーム１３，１３に連結している。車体１の後部側には、オペレータの乗降用ステップ２５を配設している。更に、作業部材１４としてフォーク１４を装着している。

【００２９】上記構成によっても、第５実施例と同様にして、図５の移動軌跡Ｅと比べて、直線に近いフォーク１４の移動軌跡が得られ、車両の前後方向の安定性が向上する。尚、図１０では、後方リンク１２の下端軸支部１２ａのみが垂線Ｄ－Ｄの後方側位置である例を示しているが、後方リンク１２の下端軸支部１２ａ及び前方リンク１１の上端軸支部１１ｂが、垂線Ｄ－Ｄの後方側位置となるように構成しても良い。換言すれば、４個所の軸支部１１ａ，１１ｂ，１２ａ，１２ｂの内、少なくとも前方リンク１１の下端軸支部１１ａ及び後方リンク１２の上端軸支部１２ｂが、垂線Ｄ－Ｄの前方側位置となるように構成すれば良い。また、オペレータは、ステップ２５により車体１後部から容易に乗降可能である。しかも、作業時おける後方視界性、及び４節リンク１０の格納姿勢時における全方位視界性も良好である。尚、作業部材１４は、上記バケット１４又はフォーク１４に限定するものではなく、建設機械、産業機械、農業機械などで用いられる一般的な作業部材が適用可能である。

【図面の簡単な説明】

【図１】本発明に係る第１実施例の４節リンクを備える作業車両の側面図である。

【図２】本発明に係るリフトシリンダの第１取付例を示す斜視図である。

【図３】本発明に係るリフトシリンダの第２取付例を示す斜視図である。

【図４】本発明に係るリフトシリンダの第３取付例を示す斜視図である。

【図５】本発明に係る第１実施例の作動説明図である。

【図６】本発明に係る第２実施例の４節リンクを備える作業車両の側面図である。

【図７】本発明に係る第３実施例の４節リンクを備える作業車両の側面図である。

【図８】本発明に係る第４実施例の４節リンクを備える作業車両の側面図である。

【図９】本発明に係る第５実施例の４節リンクを備える作業車両の側面図である。

【図１０】本発明に係る第６実施例の４節リンクを備える作業車両の側面図である。

【図１１】従来の第１例の４節リンクを備える積み込み機械の側面図である。

【図１２】図１１の積み込み機械の作動説明図である。

【図１３】従来の第２例の４節リンクを備える積み込み機械の側面図である。

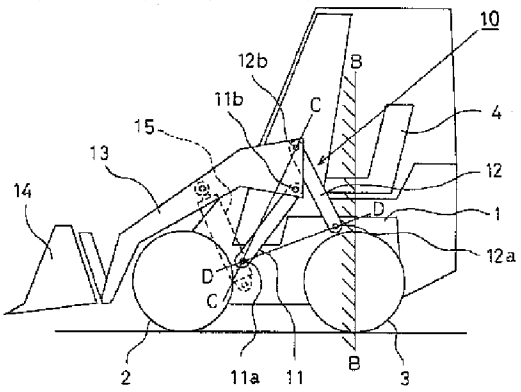
【符号の説明】

１　車体

２　前輪
３　後輪
４　運転席
５　履帯
１０　４節リンク
１１　前方リンク
１２　後方リンク
１１ａ、１２ａ　下端軸支部
１１ｂ、１２ｂ　上端軸支部
１３　アーム
１４　作業部材（バケット、フォーク）
１５、１５ａ、１５ｂ、１５ｃ　リフトシリンダ
２０　ベルクランク
２１　前方ロッド
２２　後方ロッド
２４　座席指標点

【図１】

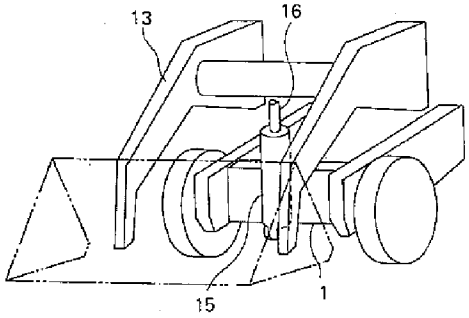
第１実施例の４節リンクを備える作業車両の側面図



１：車体、２：前輪、３：後輪、４：運転席、１０：４節リンク、
１１：前方リンク、１２：後方リンク、１１ａ、１２ａ：下端軸支部、
１１ｂ、１２ｂ：上端軸支部、１３：アーム、１４：バケット、
１５：リフトシリンダ

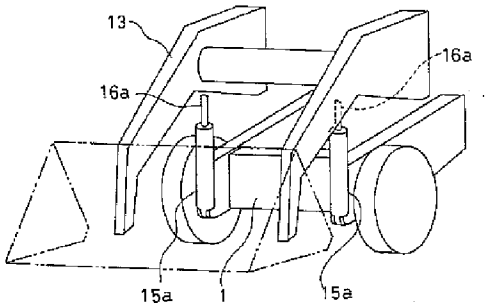
【図２】

リフトシリンダの第１取付例を示す斜視図



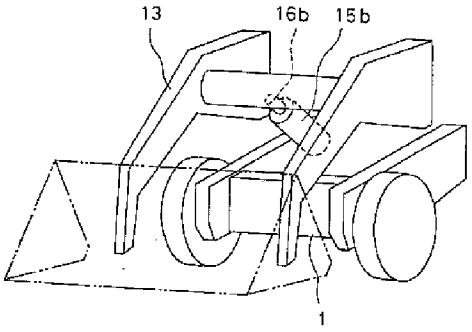
【図３】

リフトシリンダの第２取付例を示す斜視図



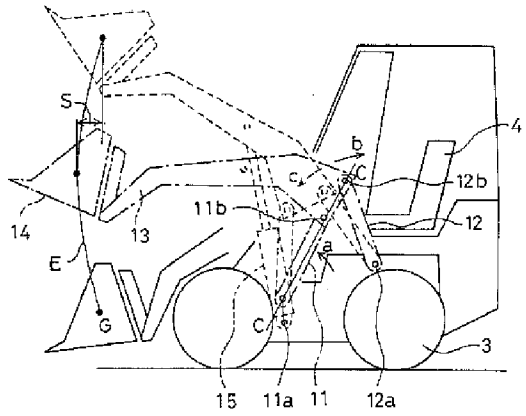
【図４】

リフトシリンダの第３取付例を示す斜視図



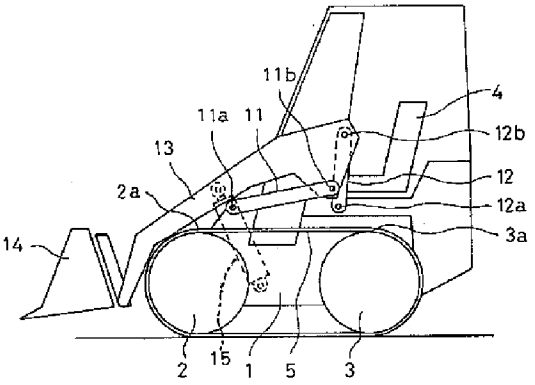
【図５】

第１実施例の作動説明図



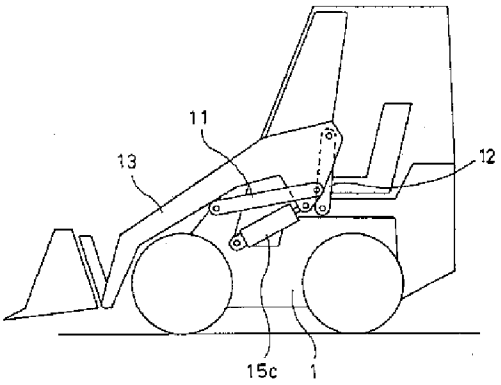
【図６】

第２実施例の４節リンクを備える作業車両の側面図



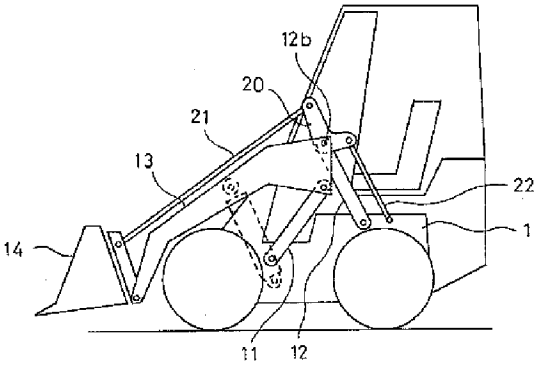
【図７】

第３実施例の４節リンクを備える作業車両の側面図



【図８】

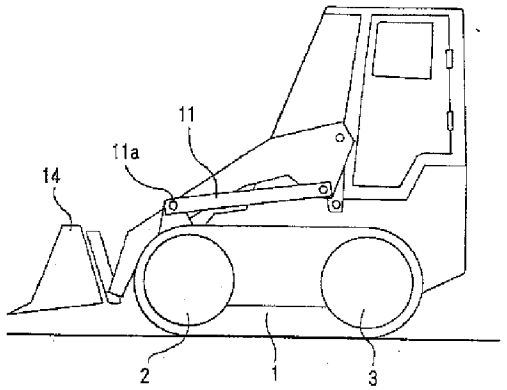
第４実施例の４節リンクを備える作業車両の側面図



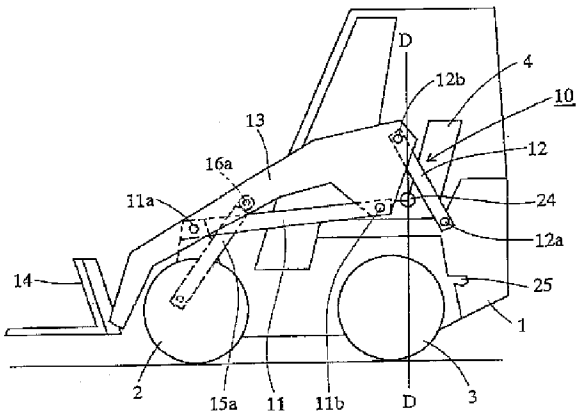
【図９】

【図１０】

第５実施例の４節リンクを備える作業車両の側面図

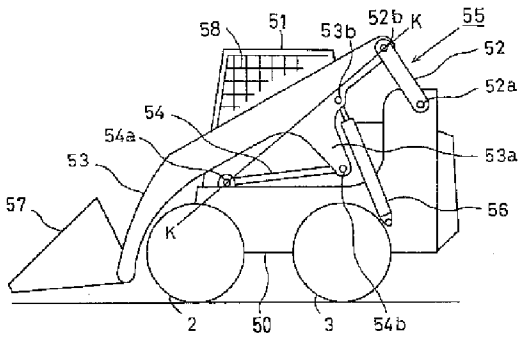


第８実施例の４節リンクを備える作業車両の側面図



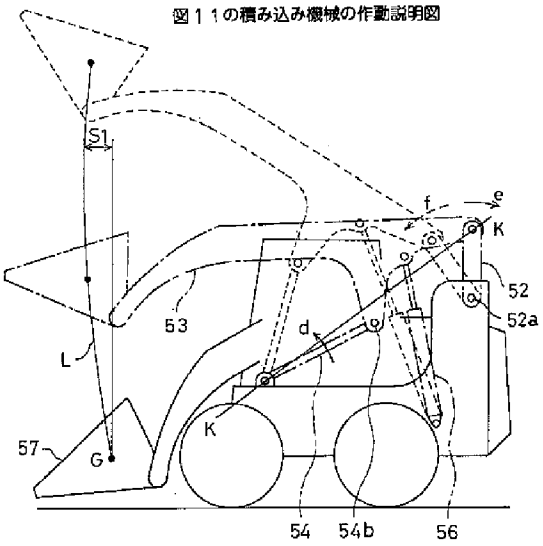
【図１１】

従来の第１例の４節リンクを備えた積み込み機械の側面図



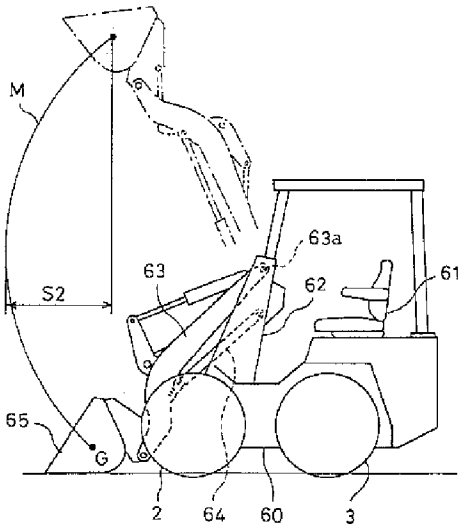
【図１２】

図１１の積み込み機械の作動説明図



【図１３】

従来の第２例の４節リンクを備えた積み込み機械の側面図



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E02F 3/38

(52) UK CL (Edition T)
B8H HCN HFB H320 H340 H403 H430 H557

(56) Documents Cited
US 5964301 A US 5535533 A

(58) Field of Search
UK CL (Edition S) B8H HAY HCN HEA HFB
INT CL[7] E02F 3/22 3/28 3/36 3/38
ONLINE: EPODOC, WPI, JAPIO

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B3 3HP, United Kingdom

(54) Abstract Title
A machine with working arm and having inclined tilt levers

(57) A machine (10) having a working arm (25), is characterised in that first ends (58) of rear tilt levers (55, 56) are spaced closer together than intermediate portions of the rear tilt levers (55, 56). The arrangement enhances operator visability and simplifies construction of the working arm.

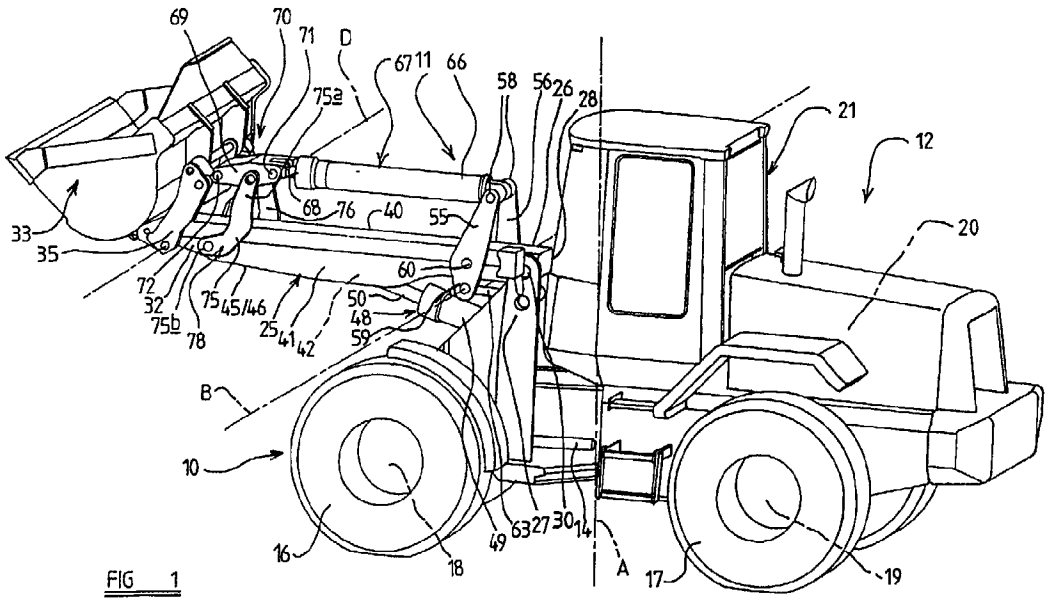


FIG 1

GB 2 368 573 A

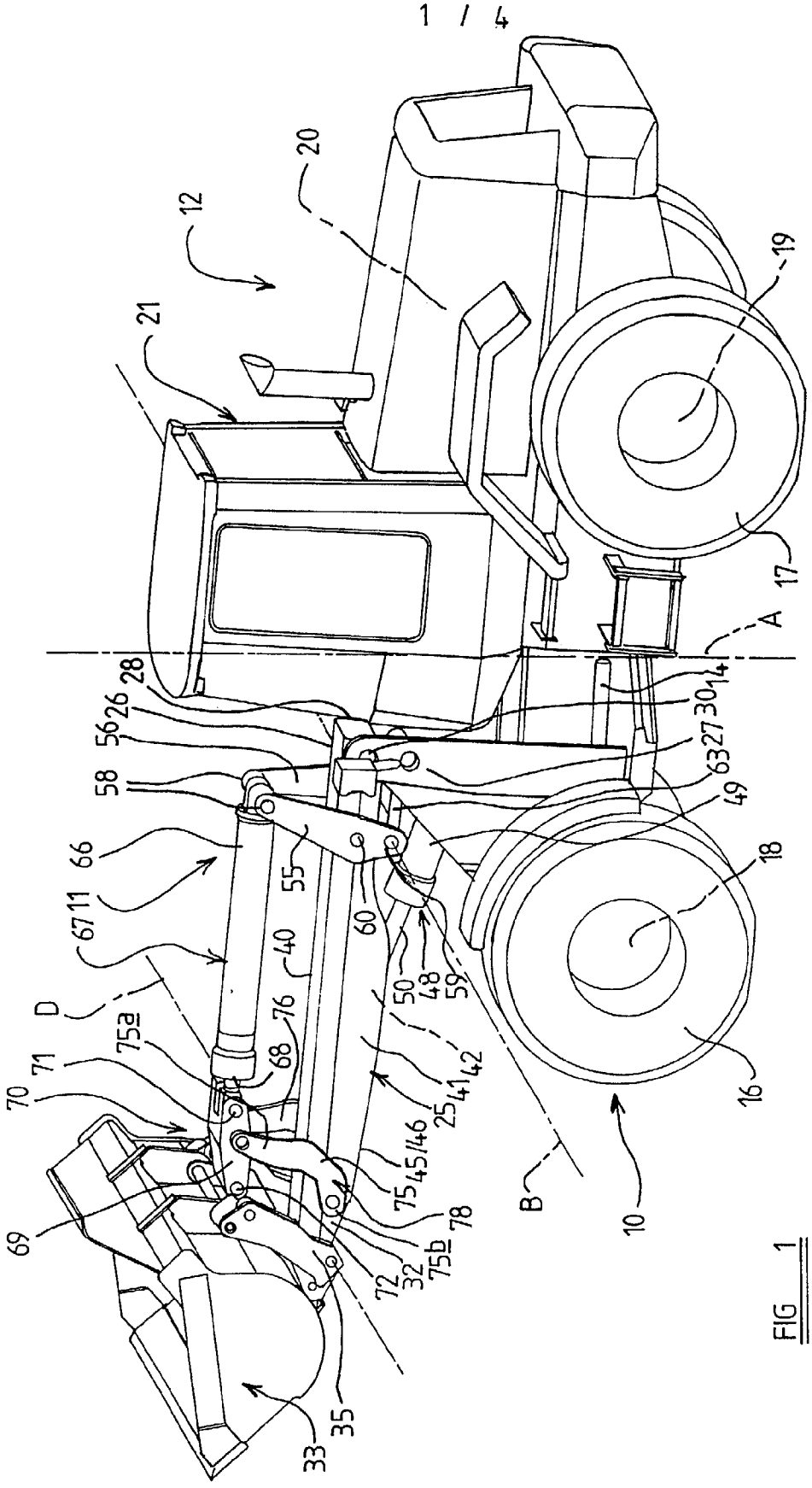

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A
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66
67
11
D
75a
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69
33
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32
75b
78
75
45
46
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FIG 1

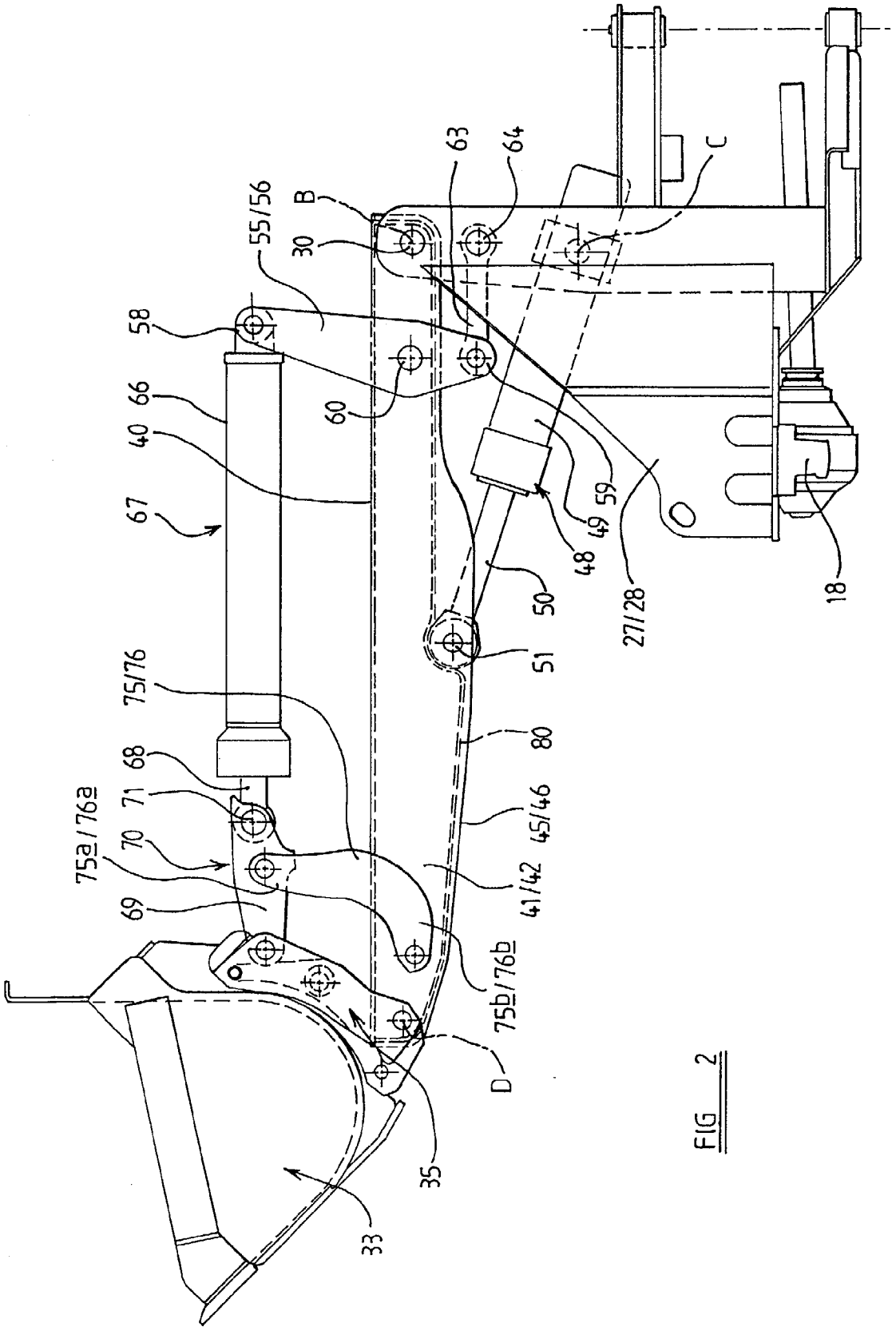

63
64
C
B
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58
66
40
67
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18
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80
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75a/76a
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75b/76b
D
35
33

FIG 2

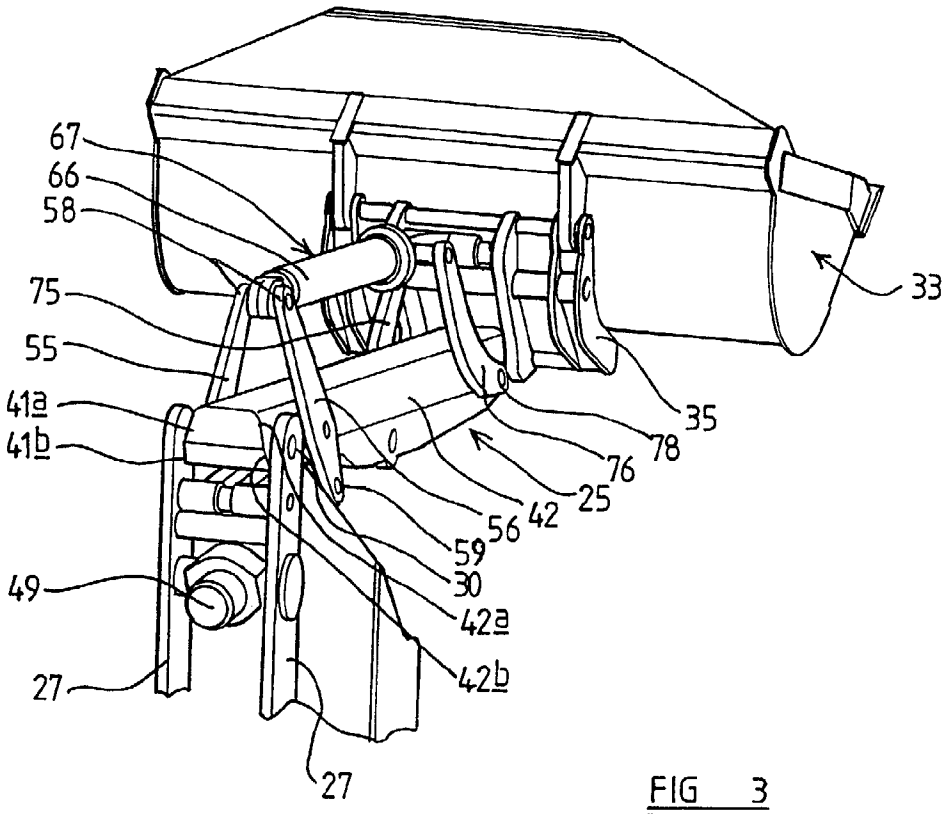


FIG 3

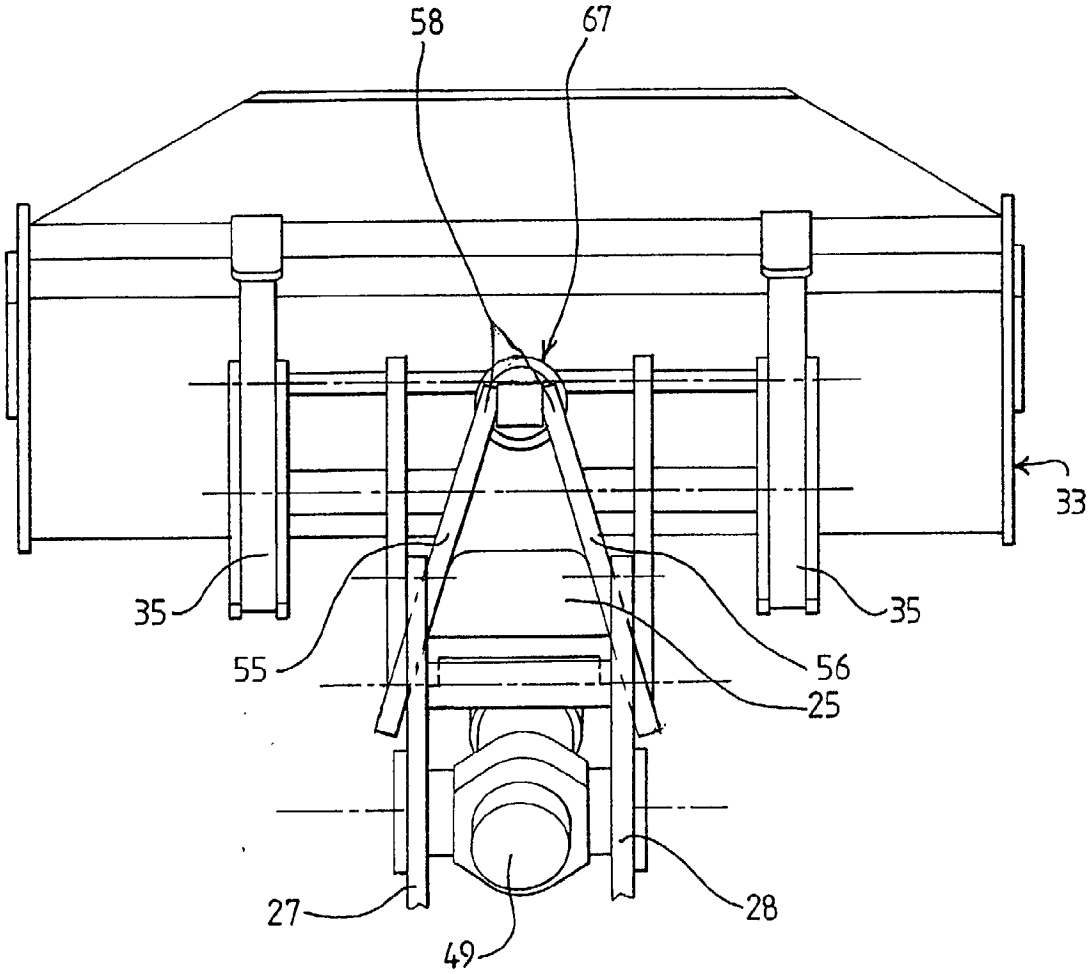


FIG 4

PATENTS ACT 1977

Title: A Machine Having a Working Arm

Description of Invention

This invention relates to a machine having a working arm and more particularly but not exclusively to a machine known as an articulated shovel which has a first body part connected to a second body part of the machine by an articulated connection which permits of relative movement between the first and second body parts of the machine about a generally upright axis. Usually an engine or other power means for the machine, together with an operator's cab are provided on the second body part, and the first body part mounts the working arm which carries at an end thereof remote from the first body part, a bucket or other working implement.

Conventionally articulated loading shovels have had a pair of spaced apart working arms, which are both mounted at first ends thereof on the first body part, and carry between them at their second ends, the bucket or other working implement. A pair of working arms have been provided primarily in order to provide the necessary strength as the arm lifts heavy loads. Thus each arm has usually been provided with its own lifting actuator.

Articulated loading shovels with single working arms of general box configurations have been proposed, for example in GB patent application 2333759. Such box configuration single working arms have advantages over providing a pair of working arms in that the single working arm can be made lighter than comparable twin arm arrangements, thereby improving the lifting performance of the working arm.

In patent application 2333759, tilting of the working implement is achieved by a tilt cylinder which is mounted above the working arm. A first end of the tilt cylinder is pivotally connected to one end of a rear tilt link lever

which in turn is pivotally connected to the working arm. A rear tilt link is pivotally connected to a second end of the rear tilt link lever and to a body of the machine. A second end of the tilt cylinder is pivotally connected to a front tilt lever, which is in turn pivotally connected to the working implement. The front tilt link lever is also pivotally connected to the working arm by means of a front tilt link.

Such a geometry enables an orientation of the working implement to be maintained automatically as the working arm is raised or lowered.

In GB2333759, to accommodate the rear tilt link lever, which passes from above the working arm to below the working arm, and the front tilt link, the working arm is provided with forked ends.

The provision of forked ends compromises the strength of the working arm, and increases the complexity of the working arm configuration, and hence increases the cost of constructing the working arm.

It has been suggested in UK patent application no. 001138.5 to provide a pair of rear tilt link levers and a pair of front tilt links, and to position one of each pair on either side of the working arm. The working arm has top part and a pair of generally parallel side walls, and the rear tilt levers, and front tilt links are pivotally connected to each side wall.

The rear tilt link levers and front tilt links are generally parallel, so, if it is required to increase the separation of the side walls of the working arm, for example to increase the strength and stiffness of the working arm, the separation of the rear tilt link levers and the front tilt links must also increase. Thus the rear tilt link levers and front tilt links may compromise visibility for an operator from the cab, down to the working implement.

According to one aspect of the present invention we provide a machine having a working arm, the working arm having two side walls, and the machine including a body part to which a first end of the arm is attached for relative pivotal movement about a first generally horizontal axis and the working arm

having a second end adapted to mount a working implement for movement relative to the working arm about a second generally horizontal axis, such movement of the working implement being effected by tilting means including first and second tilting members and a pair of rear tilt levers, the tilting means be arranged such that an orientation of the working implement may be maintained as the working arm is lowered or raised, an intermediate portion of one rear tilt lever of the pair being pivotally attached at each side of the working arm to a respective side wall of the working arm, the rear tilt levers further each having a first end positioned above the top part of the working arm, and a second end positioned below the working arm, the first ends of the rear tilt levers being pivotally connected to the first tilting member which extends generally along the top part of the working arm, and the second ends of the rear tilt levers being pivotally connected to the second tilting member which is pivotally connected to the body part of the machine, characterised in that the first ends of the rear tilt levers are spaced closer together than the intermediate portions of the rear tilt levers.

By virtue of eliminating the need to provide the working arm with a forked end to receive the rear tilt levers, the working arm may be made very economically.

Moreover, the tilting actuator and rear tilt levers may present an obstacle to an operator's view along the top of the working arm to the working implement, but by virtue of the invention, the separations of the second ends of the rear tilt levers may be minimised in order to minimise the extent to which the operator's view is blocked. In addition, if, in order for the working arm to have the required strength and stiffness for useful operation, it is required to provide a working arm with a large separation between the side walls, by virtue of the invention, it is possible to increase the separations of the intermediate portions of the rear tilt levers, without increasing the separations of the second ends of the rear tilt levers.

Preferably, the tilting means includes a linearly extending actuator, extension and retraction of which causes movement of the working implement relative to the working arm. The first tilting member may be the linearly extending actuator, and the second tilting member may be a rear tilt link, or vice versa.

Preferably, the first tilting member is connected at a second end to the working arm by means including a pair of front tilt links, and to the working implement by means of a pair of front tilt levers, first ends of the front tilt links being mechanically connected to the second end of the first tilting member, and second ends of the front tilt links being pivotally connected to the working arm e.g. to a respective side wall of the working arm. Thus the first ends of the front tilt links may be spaced closer together than the second ends of the front tilt links.

By virtue of eliminating the need to provide the working arm with a forked end to receive the front tilt links, the cost of constructing the working arm may be reduced further.

In addition, the front tilt links means may also present an obstacle to an operator's line of sight along the working arm to the working implement, but by virtue of the invention, the separations of the second portions of the front tilt links may be minimised in order to further minimise the extent to which the operator's view is blocked.

The rear tilt levers may be generally planar, such that, in use, an angle between the two levers is generally constant from the first ends to the second ends of levers. Alternatively, the rear tilt levers may be bent between the first and second ends, such that the levers include a first and a second part mutually inclined at an angle of between 90 and 180°. In this case the rear tilt levers may be located, in use, such that the second parts are mutually inclined at an angle of greater than 0° and less than 90°, the second parts including the second ends and intermediate portions, and the first parts of the two rear tilt levers are

generally mutually parallel, the first parts including the first ends of the rear tilt levers.

Similarly, the front tilt links may be generally planar, such that the angle between the two front tilt links is generally constant from the first ends to the second ends of the tilt links. Alternatively, the front tilt links may be bent between the first and second end such that each link includes a first part and a second part mutually inclined at an angle of between 180 and 90°. The front tilt links may then be located, in use, such that the second parts of the two tilt links are generally mutually parallel, the second parts including the second ends and intermediate portions, and the first parts are mutually inclined at an angle of greater than 0° and less than 90°, the first parts including the first ends.

The invention will now be described with reference to the accompanying drawings in which:-

FIGURE 1 is an illustrative perspective view of a machine having a working arm, in accordance with the invention;

FIGURE 2 is a side detailed view of part of the machine of figure 1; and

FIGURE 3 is an illustrative perspective view of the working arm of the machine of figures 1 and 2.

Referring to figures 1 and 2 of the drawings, a machine 10 of the kind known as an articulated loading shovel, includes a first, front, body part 11 and a second, rear, body part 12, the first and second body parts 11, 12 being articulated for relative movement about a generally upright axis A, in this example, by linear acting hydraulic actuators, the position of one of which being indicated in the drawings at 14. Each body part 11, 12 has a pair of ground engaging wheels 16, 17 respectively, carried on respective axles 18, 19, and the wheels 16, 17 being driven via a mechanical and/or hydrostatic transmission from an engine the position of which is indicated at 20, provided on the second body part 12.

Thus the machine 10 may be driven over the ground, and steered by relatively articulating the body parts 11, 12. The machine 10 is controlled from an operator's cab 21 positioned on the second body part 12 between the engine 20 and the first body part 11.

The machine 10 includes a working arm 25 which is pivotally connected at a first end 26 thereof, to the first body part 11. To achieve this, the first body part 11 includes a pair of mounting members 27, 28 which provide a space between them in which the first end 26 of the arm 25 is received. A pivot pin 30 extends through the mounting members 27, 28 and through the arm 25 as hereinafter described.

At a second end 32 of the working arm 25, there is mounted a working implement 33 which in this example includes a bucket, and a so called "quick hitch" device 35 on the arm 25 to facilitate mounting buckets of different configuration and capacity at the second end 32 of the arm 25.

In accordance with the present invention, the working arm 25 is of substantially inverted channel configuration having a top part 40 and a pair of depending integrally formed side walls 41, 42. The side walls 41, 42 have a first portion 41a, 42a which extends along the length of the working arm 25 adjacent to the top part 40, wherein the first portions 41a, 42a of the side walls 41, 42 are mutually inclined at an angle of greater than 0°, such that in transverse cross-section, the first portions 41a, 42a of the side walls 41, 42 taper towards the top part 40. The side walls 41, 42 also include a second portion 41b, 42b which extends along the length of the arm 25, wherein the second portions 41b, 42b of the side walls 41, 42 are substantially parallel.

The arm 25 is substantially straight between the first 26 and second 32 ends thereof and of generally constant width. The top part 40 and side walls 41, 42 are formed by pressing from a blank as described in UK patent application 0011138.5. The depths of the side walls 41, 42 from the top part 42 to free edges 45, 46 thereof, may vary along the length of the working arm 25.

This configuration is achieved with no or minimal machining, i.e. during the pressing operation.

The pivot pin 30 which connects the first end 26 of the working arm 25 to the mounting members 27, 28 passes through openings in the side walls 41, 42 of the arm 25, which openings may have journalled therein, bearings. Alternatively, or in addition, the pivot pin 30 may be fixed relative to the arm 25, and be received by bearings journalled in openings in the mounting members 27, 28 which receive the pivot pin 30. In each case, the openings in the side walls 41, 42 of the arm 25 and/or in the mounting members 27, 28 may be strengthened, e.g. by attaching keyhole castings, as is well known in the art.

The working arm 25 may be moved about a first generally horizontal axis B co-incident with the axis of the pivot pin 30, relative to the first body part 11 of the machine 10, to lift and low the arm 25, by a single linearly acting hydraulic actuator 48. In this example a cylinder part 49 of the actuator 48 is pivotally connected to the first body part 11 intermediate the ends of the cylinder part 49, for pivoting relative to the first body part abut an axis C, whilst a piston part 50 of the actuator 48 is pivotally connected to the working arm 25. In another arrangement the actuator 48 may be reversed so that the piston part 50 is pivotally connected to the first body part 11 and the cylinder part 49 to the arm 25. However the arrangement described is preferred, particularly with the cylinder part 49 being pivoted intermediate its ends for pivoting about axis C, as the actuator 48 can then occupy less space forwardly of the axis C than the required stroke of the actuator 48. This connection may be a so-called trunnion mounting.

The pivotal connection of the lifting actuator 48 with the arm 25 is provided by the piston part 50 of the actuator 48 having a so-called hammer head construction, with there being a pivot pin 51 ends of which are received in openings in the side walls 41, 42 of the working arm 25 with the piston part 50 of the actuator 48 providing a bearing connection with the pin 51. Thus as the

lifting actuator 48 is extended and retracted, the actuator 48 my pivot relative to the first body part 11 and relative to the working arm 25, as the working arm 25 is raised and lowered.

It can be seen that the depths of the side walls 41, 42 of the working arm 25 are at a maximum in the region of the pivotal connection (pins 51) of the lifting actuator 48 to the arm 25, where maximum strength is required.

The working implement 33 is pivotally mounted at the second end 32 of the working arm 25, for pivotal movement relative to the arm 25 about a generally horizontal axis D. To achieve such pivotal movement, a tilting means is provided which includes a pair of rear tilt link levers 55, 56, an intermediate portion of each being pivotally mounted to the first portions 41a, 42a of respective side walls 41, 42 of the arm 25 at a position adjacent the first end 26 of the arm 25. The tilt levers 55, 56 each have a first upper end 58 located above the top part 40 of the arm 25, and a lower second end 59 located below the arm 25. A pivot pin 60 extends through the first portion 41a, 42a of the side walls 41, 42 of the arm 25 and has an intermediate portion of the tilt levers 55, 56 mounted on the ends thereof, again with bearings being provided in openings in the side walls 41a, 42a of the arm 25, in which the ends of the pivot pin 60 are journalled.

The second lower ends 59 of the tilt levers 55, 56 are each pivotally connected to one or one of a pair of rear tilt links 63, which are the second tilting means and are pivotally connected to the first body part 11 of the machine 10 at the position indicated at 64, e.g. by a pivot pin received in the mounting members 27, 28. The first upper ends 58 of the rear tilt levers 55, 56 are pivotally connected to one end, in this example a cylinder end 66, of a linearly acting tilting actuator 67 which is the first tilting member.

The rear tilt levers 55, 56 are mutually inclined at an angle of approximately 30°, such that the second ends 58 are spaced further apart than the middle portions, and the middle portions are spaced further apart than the

first ends 59. The rear tilt levers 55, 56 are generally planar, such that the angle between the two rear tilt levers 55, 56 is generally constant from the first end 58 to the second end 59. By virtue of this arrangement, the extent to which the first ends 58 of the rear tilt levers 55, 56 block an operator's field of view is minimised, even if the separation between the side walls 41, 42 of the working arm 25 is large.

A piston end 68 of the tilting actuator 67 is connected to a first pivot connection 71 of a front tilt lever 69 which couples the tilting actuator 67 to the working implement 33. A second pivot connection 72 of the front tilt lever 69 is pivotally connected to the quick hitch 35 of the working implement 33.

Intermediate the first and second pivot connections 71, 72 of the front tilt lever 69, the coupling member 69 is pivotally connected to a pair of front tilt links 75, 76. Each front tilt link 75, 76 is pivotally connected at a first end 75a, 76a to the front tilt lever 69 between the first 71 and second pivot connections 72. A second end 75b, 75b of one of the pair of front tilt links 75, 76 is pivotally attached to each side of the working arm 25 to the first portion 41a, 42a of a respective side wall 41, 42 of the working arm 25.

The front tilt links 75, 76 are mutually inclined at an angle of approximately 30° such that the first ends 75a, 76a are spaced closer together than the second ends 75b, 76b. The front tilt links 75, 76 are generally planar such that the angle between the two front tilt links 75, 76 is generally constant from the first end 75a, 76a to the second end 75b, 76b.

The geometry of the tilt mechanism is such that when the working implement 33 is set in an orientation relative to the ground by extending or retracting the tilt actuator 67, when the lifting actuator 48 is operated to raise or lower the arm 25, the working implement 33 will retain its orientation relative to the ground. Thus the tilt mechanism is so-called self levelling, without it being necessary to extend and/or retract the tilt actuator 67 during lifting and

lowering of the arm 25, at least over a large range of lifting/lowering movement of the arm 25.

When it is desired to change the orientation of the working implement 33 relative to the ground, for example to load or unload the bucket thereof, the tilt actuator 67 will of course need to be extended and/or retracted.

The arm 25 being substantially straight and of generally constant width along the entire length of the arm 25, will be strong and light. However to add further strength, in accordance with the invention, a strengthening member 80 is provided, the configuration of which is best seen in figure 2.

The strengthening member 80 is preferably formed from a plate-like structure, and is connected, typically by welding, to each of the side walls 41, 42, interiorially of the channel shape of the arm 25. Over a major part of the length of the arm 25, the strengthening member 80 is positioned close to the free edges 45, 46 of the side walls 41, 42, so as to provide a void within the arm 25 which may convey hydraulic and/electrical control lines if desired.

In the region of connection of the arm 25 to the lifting actuator 48, where the side walls 41, 42 are of maximum depth, the strengthening member 80 extends between the pivotal connection 51 and the top part 40 of the arm. Thus the strengthening member 48 does not inhibit lowering of the arm 25 by obstructing the lifting actuator 48.

The pivot pins 30 (to connect the arm to the mounting members 27, 28) and 60 (for the tilt links 55, 56) are however contained within the void of the arm 25 with the strengthening member 80 beneath the pivotal connections, adjacent the free edges 45, 46 of the side walls 41, 42. At the first end 26 of the arm 25, the strengthening member 80 is configured to close or at least substantially close the end of the arm 25, and in the example shown, the strengthening member 80 is connected, by welding to the underside of the top part 40.

In the particular example illustrated in the drawings, the arm 25 is about 3m in length, about 400mm wide, and the maximum depths of the side walls 41, 42, in the region of the pivotal connection 51 to the lifting ram 48, is about 300mm. The sheet from which the arm 25 is cut, typically may have a thickness of about 15mm only. These dimensions are given for illustrative purposes only, and may significantly be varied.

Various modifications in addition to those already identified may be made without departing from the scope of the invention. For example, the rear tilt levers 55, 56 may be bent between the first end and second end, such that each rear tilt lever 55, 56 includes a first part and a second part which are mutually inclined at an angle of between 90 and 180°. The rear tilt levers 55, 56 are located, in use, such that the second parts of the two tilt levers 55, 56, which include the second ends and intermediate portions, are generally mutually parallel, and the first parts, which include the first ends, are mutually inclined at an angle of greater than 0° and less than 90°.

Similarly, the front tilt links 75, 76 may be bent between the first and second end, such that each tilt link 75, 76 includes a first part and a second part. The front tilt links 75, 76 are located, in use, such that the second parts of the two tilt links 75, 76, which include the second ends, are generally mutually parallel, and the first parts, which include the first ends, are mutually inclined at an angle of greater than 0° and less than 90°.

In this case, the side walls 41, 42 of the working arm 25 need not have a first 41a, 42a and second 41b, 42b portion. The side walls 41, 42 may substantially parallel over their entire depth.

Alternatively, one of each pair of rear tilt levers 55, 56 or front tilt links 75, 76 may be generally planar, and the other of the pair may be bent.

The articulated connection between the first and second 11, 12 body parts may permit of some relative pivotal movement about a longitudinal axis of the machine in addition to the upright axis A. Preferably though the

articulated connection only permits movement about upright axis A with the axle 18 on which the wheels 17 of the rear second body part 12 are mounted, being mounted for oscillation about a longitudinal axis relative to the second body part 12.

If desired an alternative tilting mechanism geometry to that described may be provided. For example the tilting actuator 67 may be provided beneath the arm 25, and/or the positions of the tilt actuator 67 and the rear tilt links 63 which connect the rear tilt levers 55, 56 and the first body part 11 may be transposed.

The working arm may be moved about the first generally horizontal axis by more than one linearly acting actuator 48.

In each case preferably the integrity of the arm 25 is not compromised by the provision of any slot of the like to accommodate any component part of the tilt mechanism and/or to pivotally mount the arm 25 on the first body part 11 of the machine 10.

The invention may be applied to other kinds of machine to the articulated loading shovel described, for example to a non-articulated loading or excavating/loading machine, having a working arm and steerable wheels or even tracks. However the invention has particular application where the working arm is mounted generally centrally of a body part of the machine, so as to extend forwardly of an operator's cab 21, where a working arm 25 and associated working implement 33, and work implement 33 tilting means 63, 55, 56, 67, 75, 76, 69 constructed and configured as described, can provide for good visibility for an operator from the cab 21 during working operations.

Whereas the strengthening member 80 preferably is a unitary member which extends substantially from one end of the arm 25 to the other, in another example, the strengthening member 80 may be made up from separate parts and need only be provided along the arm 25 where strengthening is required.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any machine of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

1. A machine having a working arm, the working arm having two side walls, and the machine including a body part to which a first end of the arm is attached for relative pivotal movement about a first generally horizontal axis and the working arm having a second end adapted to mount a working implement for movement relative to the working arm about a second generally horizontal axis, such movement of the working implement being effected by tilting means including first and second tilting members and a pair of rear tilt levers, the tilting means be arranged such that an orientation of the working implement may be maintained as the working arm is lowered or raised, an intermediate portion of one rear tilt lever of the pair being pivotally attached at each side of the working arm to a respective side wall of the working arm, the rear tilt levers further each having a first end positioned above the top part of the working arm, and a second end positioned below the working arm, the first ends of the rear tilt levers being pivotally connected to the first tilting member which extends generally along the top part of the working arm, and the second ends of the rear tilt levers being pivotally connected to the second tilting member which is pivotally connected to the body part of the machine, characterised in that the first ends of the rear tilt levers are spaced closer together than the intermediate portions of the rear tilt levers.

2. A machine as claimed in claim 1 characterised in that the tilting means includes a linearly extending actuator, extension and retraction of which causes movement of the working implement relative to the working arm.

3. A machine as claimed in claim 2 characterised in that the first tilting member is the linearly extending actuator, and the second tilting member is a rear tilt link.

4. A machine as claimed in claim 2 characterised in that the first tilting member is a rear tilt link, and the second tilting member is the linearly extending actuator.

5. A machine as claimed in any preceding claim characterised in that the first tilting member is connected at a second end to the working arm by means including a pair of front tilt links, and to the working implement by means of a pair of front tilt levers, first ends of the front tilt links being mechanically connected to the second end of the first tilting member, and second ends of the front tilt links being pivotally connected to a respective side wall of the working arm.

6. A machine as claimed in claim 5 characterised in that the first ends of the front tilt links are spaced closer together than the second ends of the front tilt links.

7. A machine as claimed in any preceding claim characterised in that the rear tilt levers are generally planar, such that, in use, an angle between the two rear tilt levers is generally constant from the first ends to the second ends of the rear tilt levers.

8. A machine as claimed in any one of claims 1 to 7 characterised in that the rear tilt levers are bent between the first and second ends, such that the levers include a first and a second part mutually inclined at an angle of between 90 and 180°.

9. A machine as claimed in claim 8 characterised in that the rear tilt levers are located, in use, such that the second parts are mutually inclined at an angle

of greater than 0° and less than 90°, the second parts including the second ends and intermediate portions, and the first parts of the two rear tilt levers are generally mutually parallel, the first parts including the first ends of the rear tilt levers.

10. A machine as claimed in any preceding claim characterised in that the front tilt links are generally planar, such that the angle between the two front tilt links is generally constant from the first ends to the second ends of the tilt links.

11. A machine as claimed in any one of claims 1 to 9 characterised in that the front tilt links are bent between the first and second end such that each link includes a first part and a second part mutually inclined at an angle of between 180 and 90°.

12. A machine as claimed in claim 11 characterised in that the front tilt links are located, in use, such that the second parts of the two tilt links are generally mutually parallel, the second parts including the second ends and intermediate portions, and the first parts are mutually inclined at an angle of greater than 0° and less than 90°, the first parts including the first ends.

13. A machine having a working arm substantially as hereinbefore described and/or and shown in the accompanying drawings.

14. Any novel feature or novel machine of features described herein and/or shown in the accompanying drawings.

Application No: GB 0026533.0
Claims searched: 1 - 14
Examiner: Richard Baines
Date of search: 21 March 2001

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): B8H (HAY, HCN, HEA, HFB)

Int Cl (Ed.7): E06F 3/22, 3/28, 3/36, 3/38

Other: Online: EPODOC, WPI, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	US 5,964,301 A (GLASGOW) Note front tilt levers	
A	US 5,535,533 A (CATERPILLAR) Figure 5	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Espacenet

Bibliographic data: JP2006307498 (A) — 2006-11-09

WORK VEHICLE AND SKID STEERING LOADER

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Applicant(s): TOYOTA IND CORP ± (TOYOTA INDUSTRIES CORP)

Classification: **- international:** *B66F9/065; E02F3/34*
- cooperative: E02F3/3414 (EP)

Application number: JP20050129851 20050427 Global Dossier

Priority number(s): JP20050129851 20050427

Abstract of JP2006307498 (A)

PROBLEM TO BE SOLVED: To provide a work vehicle enabling the easy maintenance of an engine 5 at the rear of a vehicle body. ;SOLUTION: A skid steering loader 1 as the work vehicle comprises a lift arm 11 having a bucket 7 fitted to the tip thereof, a front link 22, a rear link 21, and a lift cylinder 23. Each of the front link 22, the rear link 21, and the lift cylinder 23 is connected, at its one end, to the lift arm 11 and connected, at its other end, to a frame 2 on the vehicle side. The height h of the connected position (position of a pin 31) of the rear link 21 to the frame 2 is set near half the height the height ha of the vehicle body. ;COPYRIGHT: (C)2007,JPO&INPIT

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DESCRIPTION JP2006307498A

10 Work vehicle and skid steer loader

[0001]

14 The present invention relates to a work vehicle provided with a work tool and a lift arm capable of raising and lowering the work tool and capable of raising and lowering the work tool with a substantially vertical trajectory, and preferably relates to a structure of a skid steer loader.

[0002]

21 A skid steer loader is disclosed in, for example, Patent Document 1, and the skid steer loader of Patent Document 1 raises a bucket (corresponding to a work tool) at the tip of a boom (corresponding to a lift arm) substantially vertically. I'm getting it. The boom is connected to the main frame of the vehicle via a control link on the front side, a boom support link on the rear side, and a cylinder. Further, Patent Documents 2 and 3 also disclose a skid steer loader or a work vehicle having the same basic configuration. 米国特許第６４７４９３３号公報（FIG.2, ABSTRACT等, main boom section 24A, bucket 40, control link 50, boom support link 28, cylinder 56, main frame 4） 米国特許第６６１６３９８号公報（Fig.1） 米国特許第５６０９４６４号公報（FIG.2）

[0003]

33 However, in the configuration of Patent Document 1, since (A) the connection position (position of reference numeral 32) of the boom support link with respect to the main frame is high, a robust structure capable of supporting the weight of the boom, cargo handling object, or the like. Is formed by standing up vertically by a considerable height on the vehicle body side, and the boom support link must be connected there. Therefore, it is difficult to secure a

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large opening for accessing the engine compartment 15 arranged at the rear of the vehicle from above, which makes the maintenance work of the engine difficult.

[0004]

43 Further, in the configuration of the above-mentioned Patent Document 1, (B) when the boom is raised, the control link in a standing posture obstructs the side view of the seat (FIG. 2 of Patent Document 1 and FIG. 2). See FIG.3).

46 On the other hand, (C) when the boom is lowered, the boom itself blocks the field of view diagonally rearward over a wide area (see FIG. 1 of Patent Document 1). Therefore, the operator's field of view is narrowed, and there is room for improvement in terms of workability.

[0005]

53 In the configurations of Patent Documents 2 and 3, at least the problems of (A) and (C) can be pointed out in the same manner.

[0006]

58 Further, in general, work vehicles (particularly skid steer loaders) are often used for work on narrow roads and the like, and the compactness of the entire vehicle is strongly required.

60 On the other hand, from the viewpoint of operator comfort, there is also a request to secure the living space of the vehicle seat as large as possible, and a configuration that can solve the two contradictory requests is desired.

63 Means and effects to solve problems

[0007]

67 The problem to be solved by the present invention is as described above, and next, the means for solving this problem and its effect will be described.

[0008]

72 ◆ According to the viewpoint of the present invention, a work vehicle having the following configuration is provided.

74 It includes a lift arm to which a work tool is attached to the tip, and a front link, a rear link, and a lift cylinder, one end of which is connected to the lift arm and the other end of which is connected to a frame on the vehicle side.

77 The height of the connection position of the rear link with respect to the frame is close to the height of 1/2 of the height of the vehicle body.

[0009]

82 As a result, the strong structural member for supporting the weight of the lift arm, the object to be transported, etc. can be configured not to extend to a very high position via the rear link, so that the opening that opens the upper part of the engine room can be widened. It can be secured and the maintenance workability of the engine etc. can be improved.

86 Further, since the connection position of the rear link with respect to the frame is low, it becomes easy to lower the connection position of the rear link with respect to the lift arm.

88 Therefore, it is possible to secure a wide field of view diagonally behind the operator in the lowered state of the lift arm.

[0010]

93 ◆ In the work vehicle, it is preferable that the rear link has a shape in which the upper side bends toward the front side of the vehicle with the vicinity of the connecting portion with respect to the lift arm as a boundary.

[0011]

99 As a result, the rear link and the members attached to the rear link have a layout that does not easily interfere with the opening above the engine, and maintenance workability of the engine or the like through the opening can be further improved.

[0012]

105 ◆ In the work vehicle, the connection position of the front link with respect to the frame is located between the front axle and the rear axle of the vehicle, and is a position that divides the front axle and the rear axle into two equal parts. It is preferably located on the rear side.

[0013]

111 As a result, even if the lift arm is raised and the front link is in a standing position, the front link does not easily block the operator's side view, so that workability can be improved.

[0014]

116 ◆ In the work vehicle, the lift arm, the front link, the rear link, and the lift cylinder are arranged so as to overlap at least a part of the front and rear wheels of the vehicle in a plan view. Is preferable.

[0015]

122 As a result, the front and rear wheels, the lift arm, and the elevating configuration thereof can be rationally arranged in a compact space, so that the vehicle body can be compact in the width direction, which makes it easy to work even on narrow roads, and at the same time, the position sandwiched between the lift arms and the like. It is possible to secure a wide living space for the operator, especially in the width direction.

[0016]

130 ◆ In the work vehicle, an engine is provided on the rear side of the work vehicle, a hinge is provided at the front end of a cover covering the upper part of the engine, and the rear end of the cover is rotatable by the hinge. Is preferable.

[0017]

136 As a result, the cover can be opened with a large rotation stroke for work, so that maintenance work for the engine or the like can be easily performed.

[0018]

141 (◆) In the work vehicle, the cover preferably includes at least a ceiling portion that covers the upper surface side of the storage space of the engine and a side wall portion that covers at least a part of the side surface side of the storage space.

[0019]

147 As a result, when the cover is rotated and opened, the side surface side of the engine storage space is exposed particularly greatly, so that access to the engine, especially from the side surface, becomes easy, and maintenance work for the engine and the like is further performed. Easy to do.

[0020]

154 ◆ The above configuration can be applied to, for example, a skid steer loader.

[0021]

158 That is, the present invention is particularly suitable for a skid steer loader provided with a lift arm and often used in narrow roads, which requires good operator visibility.

[0022]

163 Next, an embodiment of the invention will be described.

164 FIG. 1 is an overall side view of the skid steer loader according to the embodiment of the present invention, FIG. 2 is a perspective view also seen from above, and FIG. FIG. 4 is a side view showing the state of the latter half of the cargo handling ascending operation.

[0023]

170 In FIGS. 1 and 2, in the skid steer loader 1 as a work vehicle, the front wheels 3 and the rear wheels 4 are suspended on a frame-shaped frame 2, and the front wheels 3 and the rear wheels are suspended by the engine 5 provided in the frame 2. 4 can be driven.

173 A cabin 6 for accommodating an operator's driver's seat is fixedly installed in the front portion of the frame 2, and a counterweight (not shown) and the engine 5 are installed in the rear portion.

[0024]

179 The skid steer loader 1 is provided with an opening 24 for opening the upper side and the upper side of the engine 5, and a cover 25 is installed so as to cover the opening 24.

181 The front end of the cover 25 is pivotally supported on the vehicle body side by a hinge 26.

182 In this configuration, when the rear end of the cover 25 is rotated upward and opened as shown by the chain line in FIG. 1, the engine 5 and its peripheral devices are moved upward and laterally through the opening 24 for maintenance work and the like. It is possible to access from.

[0025]

189 In particular, in the present embodiment, the cover 25 has a rear wall portion 41 covering the rear surface side of the storage space, and a rear wall portion 41 covering the upper surface side of the engine 5 (upper surface side of the storage space of the engine 5) from the end portion of the ceiling portion 39. The side wall portion 40 that covers the side surface side of the storage space is configured to extend downward.

194 In other words, the cover 25 has a shape that covers a part of the rear surface side and the side surface side of the storage space of the engine 5.

196 Therefore, when the cover 25 is rotated upward, not only the upper surface side of the engine chamber but also the rear surface side upper portion and the side surface side upper portion are greatly opened.

199 As a result, access to the rear surface and the side surface of the engine 5 is facilitated, and maintenance workability is greatly improved.

[0026]

204 The skid steer loader 1 is provided with a lift arm 11 that can be raised and lowered, and a bucket (working tool) 7 is rotatably provided at the tip of the lift arm 11 via a pin 38.

206 In the present embodiment, as shown in FIG. 2, the lift arms 11 are provided in pairs on the left and right so as to sandwich the cabin 6 in between, and are configured as a so-called two-arm type lift arm.

[0027]

212 The left and right lift arms 11 are arranged at positions directly above the left and right wheels 3.4 (positions that overlap the left and right wheels 3.4 in the vehicle width direction).

215 In the lowered state of the lift arm 11 shown in FIGS. 1 and 2, the lift arm 11 extends the space directly above the wheels 3 and 4 slightly diagonally forward, and its tip extends substantially along the peripheral edge of the front wheel 3. It is curved downward.

[0028]

221 A bucket cylinder (not shown) for rotating the bucket 7 is attached to the tip end side of the lift arm 11.

223 Further, the lift arm 11 can be lifted and lowered according to the configuration of the lifting device 10 described below.

225 Note that FIGS. 1 and 2 show a state in which the lift arm 11 is lowered to the lower limit position.

[0029]

230 The lower end of the rear link 21 is rotatably connected to the rear end portion of the frame 2 of the skid steer loader 1 via a pin 31.

232 As shown in FIG. 2, the rear links 21 are arranged in pairs on the left and right, the lower ends of the rear links 21 are pivotally connected to the left and right side surfaces of the frame 2, and the upper ends are connected to each other by a cross member 32.

235 Further, as shown in FIG. 1, the height h of the position of the pin 31 (that is, the connection position of the rear link 21 with respect to the frame 2) is slightly higher than the height of 1/2 of the vehicle body height ha of the skid steer loader 1. Although it is small, it is about half the height of the vehicle body ha.

[0030]

242 In the descending state shown in FIGS. 1 and 2, the rear link 21 is in an upright posture substantially vertically upward, but the rear link 21 is an upper portion with a height portion in the middle as a boundary. Is bent in the direction of approaching the front side of the vehicle, and the tip has a shape that extends forward and upward.

246 The most basic end portion of the lift arm 11 is rotatably connected to the bent portion by a pin 33.

[0031]

251 Further, the front ends of the front links 22 arranged in pairs on the left and right are rotatably connected to the frame 2 via pins 34.

253 The pin 34 is arranged at a height slightly lower than the connecting pin 31 at the lower end of the rear link 21, and is located at the center of the front and rear of the frame 2.

255 Speaking of the relationship between the front and rear axles 3a and 4a, the pin 34 is arranged at a position between the front axle 3a and the rear axle 4a, and the pin 34 is the front axle 3a and the rear axle 4a. It is located behind the intermediate position P.

258 In other words, the pin 34 is located on the rear side of the bisection point P of the line segment connecting the front axle 3a and the rear axle 4a, and on the front side of the rear axle 4a.

261 On the other hand, the rear end of the front link 22 is rotatably connected to the downward projecting portion 11a near the base end portion of the lift arm 11 via the pin 35.

[0032]

266 Further, the end portion of the lift cylinder 23 on the cylinder portion side is rotatably connected to the rear end portion of the frame 2 at the substantially lowermost end portion immediately below the pin 31 via the pin 36. ing.

269 On the other hand, the end portion of the lift cylinder 23 on the movable rod side is rotatably connected to the portion on the base end side of the lift arm 11 via a pin 37.

[0033]

274 As shown in FIG. 2, the lift arm 11, the lift cylinder 23, the front link 22, the rear link 21, and the like are provided on both sides of the vehicle body in pairs on the left and right.

276 The lift arm 11, the front link 22, the rear link 21, and the lift cylinder 23 are all arranged so as to overlap the wheels (front and rear wheels 3.4) in the vehicle width direction.

[0034]

281 The lift cylinder 23 is a fluid pressure cylinder, specifically a hydraulic cylinder, and a control valve (for example, a solenoid valve) (not shown) is used for a hydraulic supply means (for example, an oil pump connected to the engine 5) (not shown). Is connected.

284 The control valve is opened and closed by a control means (not shown), for example, a microcomputer-type controller.

286 In the present embodiment, the lifting device 10 of the lift arm 11 is configured to include at least a lift cylinder 23, a front link 22, and a rear link 21.

[0035]

291 Hereinafter, the operation of the lifting device 10 when the cargo handling is lifted will be described.

293 In the state of FIGS. 1 and 2 in which the lift arm 11 is lowered, the lift cylinder 23 is sufficiently retracted, the front link 22 is oriented substantially horizontally toward the rear side of the vehicle when viewed from the pin 34, and the rear link 21 is It is slightly backward and upward when viewed from the pin 31.

[0036]

300 In this state, when the operator seated in the driver's seat of the cabin 6 operates the cargo handling operating means (for example, lever, pedal, etc.) shown in the drawing, pressure oil is supplied to the lift cylinder 23 to extend the lift cylinder 23, and the front link 22 stands up. The lift arm 11 rises with rotation in the direction.

[0037]

307 At the initial stage of this rise (FIG. 3), at the same time as the lift arm 11 rises, the rear link 21 rotates about the pin 31 so as to fall backward.

309 Therefore, since the lift arm 11 moves its base side to the rear, the bucket 7 at its tip is pulled to the rear of the vehicle.

311 As a result, the locus of the tip of the lift arm 11 in the first half of the cargo handling lift is a substantially linear locus, although it slightly bulges forward.

313 The tip of the lift arm 11 has the maximum reach in the middle of the ascent.

[0038]

317 After the lift cylinder 23 is further extended and the height of the tip of the lift arm 11 reaches an intermediate height (about the height of the pin 33), the rear link 21 is centered on the pin 31 as shown in FIG. On the contrary, it rotates so as to fall forward.

320 Therefore, since the base side of the lift arm 11 moves forward and upward, the lift arm 11 and the bucket 7 at the tip thereof move upward while being slightly pushed forward.

[0039]

325 Finally, the lift arm 11 reaches the upper limit position shown by the solid line in FIG.

326 At this upper limit position, the tip of the lift arm 11 realizes a large reach amount, although it is slightly shorter than the maximum reach in the above-mentioned ascending intermediate period.

329 Further, at the upper limit position, the front link 22 is tilted slightly backward from the vertical position, and the height of the pin 35 at the upper end thereof is slightly higher than the pin 33 connecting the lift arm 11 and the rear link 21. It has become.

[0040]

335 As described above, in the skid steer loader 1 of the present embodiment, the tip of the lift arm 11 is pulled backward in the initial stage of loading and unloading, and is pushed forward in the latter stage.

338 As a result, the locus of the tip end portion (pin 38) of the lift arm 11 to which the bucket 7 is attached draws a gentle curve close to a vertical straight line as shown by reference numeral T in FIG.

341 This locus T rises while moving slightly forward from the lower limit position, then rises while moving backward by the above-mentioned pulling action, and finally rises while moving forward by the above-mentioned extrusion action. It becomes an S-shaped curve.

344 As for the operation when the cargo handling is lowered, the reverse of the above-mentioned operation when the cargo handling is raised may be performed.

[0041]

349 With such a configuration, the reach amount at the raised position of the lift arm 11 can be increased as compared with the case where the cargo handling is raised / lowered by drawing a simple arc locus, and the cargo handling workability can be improved. , The maximum load capacity can be increased.

[0042]

356 As described above, in the skid steer loader 1 of the present embodiment, the height h of the connection position (position of the pin 31) of the rear link 21 with respect to the frame 2 is approximately ½ of the vehicle body height ha. It is configured to be.

359 Therefore, on the vehicle body side, the structure is such that the strong structural member for supporting the pin 31 does not extend to a very high position, so that the opening 24 that opens the upper part of the engine room can be secured in a wide area. It is possible to improve the maintenance workability of the engine 5 and its peripheral devices.

363 Further, since the connection position (pin 31 position) of the rear link 21 with respect to the frame 2 is low, it is easy to lower the connection position (pin 33) of the rear link 21 with respect to the lift arm 11.

366 Therefore, in the lift arm lowered state shown in FIG. 1 and the like, a wide field of view diagonally rearward of the operator can be secured.

[0043]

371 Further, the rear link 21 is configured such that the upper portion of the rear link 21 bends toward the front side of the vehicle with the vicinity of the connecting portion (the portion where the pin 33 is provided) to the lift arm 11 as a boundary.

374 Therefore, a layout in which the rear links 21 (or the cross member 32 that connects the pair of rear links 21 to each other) does not interfere with the opening 24 is realized, and the maintenance workability of the engine 5 and the like through the openings 24 is further improved. Can be improved.

[0044]

381 Further, in the present embodiment, the connection position of the front link 22 with respect to the frame 2 (the position of the pin 34) is located between the front axle 3a and the rear axle 4a of the vehicle, and the front axle 3a and the rear axle 4a. It is located behind the middle position (point P) of.

385 Therefore, even if the lift arm 11 is raised and the front link 22 is in a standing position as shown in FIG. 4, the front link 22 does not obstruct the side view of the operator, so that workability can be improved.

[0045]

391 Further, in the skid steer loader 1 of the present embodiment, as shown in FIG. 2, the lift arm 11, the front link 22, the rear link 21, and the lift cylinder 23 are the front wheels 3 and the rear wheels of the vehicle. It is arranged so as to overlap with respect to 4 in a plan view.

394 Therefore, as compared with the configuration shown in Fig. 6 of US Pat. No. 6,796,762, for example, the front and rear wheels 3.4 and the lift arm 11 and the like can be rationally arranged inside a compact width, so that the work can be performed even on narrow roads and the like. A compact vehicle body can be easily formed in the width direction, and at the same time, a wide living space (particularly in the width direction) of the cabin 6 located between the lift arms 11 and the like can be secured.

[0046]

403 Further, in the present embodiment, the engine 5 is provided on the rear side of the vehicle, a hinge 26 is provided at the front end of the cover 25 covering the upper part of the engine 5, and the rear end of the cover 25 is rotated by the hinge 26. It is said to be movable.

406 Therefore, as shown in FIG. 1, a large rotation stroke of the cover 25 can be secured, so that maintenance work of the engine 5 and the like can be easily performed.

[0047]

411 Further, in the present embodiment, the cover 25 includes a ceiling portion 39 that covers the upper surface side of the storage space (engine chamber) of the engine 5, and a side wall portion 40 that covers at least a part of the side surface side of the storage space. ing.

414 Therefore, when the cover 25 is rotated upward, the engine chamber is largely exposed not only on the upper surface side but also on the side surface side upper portion.

416 Moreover, as described above, since the connection position of the rear link 21 with respect to the frame 2 is a low position near the height of 1/2 of the vehicle body height, the lower end of the side wall portion 40 is positioned near the connection position. If this is done, a large exposed area on the side surface of the engine chamber when the cover 25 is opened can be secured.

421 As a result, access to the side surface of the engine 5 becomes extremely easy, and maintenance workability is remarkably improved.

[0048]

426 Although the preferred embodiment of the present invention has been shown above, the above embodiment can be changed as follows, for example.

[0049]

431 (1) The working tool is not limited to the illustrated bucket 7, and for example, a fork or the like can be adopted.

433 Further, the work tool may be detachably attached to the tip of the lift arm 11.

[0050]

437 (2) The lift arm 11, the front link 22, the rear link 21, and the lift cylinder 23 are all arranged so as to overlap the front and rear wheels 3 and 4, but the present invention is not limited to this, and only a part thereof overlaps. May be placed in.

[0051]

443 (3) The locus T at the tip of the lift arm 11 illustrated in FIG. 4 can be appropriately changed depending on the circumstances such as the use of the work vehicle.

445 Further, it is said that the orientation and the arrangement position of the front link 22, the rear link 21, and the lift cylinder 23 shown in the above embodiment can be appropriately changed according to the locus of the tip of the lift arm 11 to be realized, the lift amount, and the like. Not to mention.

449 For example, by appropriately changing the layout of the front link 22, the rear link 21, etc., not only the substantially S-shaped locus illustrated in FIG. 4 but also, for example, a substantially C-shaped locus can be obtained, or other loci. It is also possible to realize a curved locus.

[0052]

456 (4) Further, in the above embodiment, the tip of the lift arm 11 is configured to have the maximum reach in the intermediate period of ascending, but for example, the maximum

reach is achieved near the upper limit position (a position slightly below the upper limit position). The locus T may be changed as described above, and by doing so, the workability of the cargo handling work can be improved.

[0053]

464 (5) The method of connecting the front link 22, the rear link 21, and the lift cylinder 23 to the frame 2 and the lift arm 11 is not limited to the connection by pins.

466 Further, the lift arm 11, the two links 21 and 22, and the lift arm 11 are not limited to being provided in a pair on the left and right sides of the vehicle, and may be provided in two or more pairs, for example.

[0054]

472 (6) The present invention is suitable for application to the skid steer loader 1 which is often used on narrow roads, but the present invention is not limited to this, and the present invention is applied to all work vehicles provided with a lift arm that can be raised and lowered. It is possible to apply.

[0055]

479 The whole side view of the skid steer loader which concerns on one Embodiment of this invention.

481 Similarly, a perspective view seen from above.

482 A side view showing the state of the first half of the cargo handling lifting operation of the skid steer loader.

484 A side view showing the state of the latter half of the cargo handling lifting operation.

485 Code description

[0056]

489 1 Skid steer loader (working vehicle) 2 Frame 3 Front wheel 3a Front axle 4 Rear wheel 4a Rear axle 5 Engine 6 Cabin 7 Bucket (working tool) 10 Lift arm lifting device 11 Lift arm 21 Rear link 22 Front link 23 Lift cylinder 24 Opening 25 for engine maintenance Cover 26 Hinge

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CLAIMS JP2006307498A

1.

13 A lift arm to which a work tool is attached to the tip, and a front link, a rear link, and a lift cylinder, one end of which is connected to the lift arm and the other end of which is connected to a frame on the vehicle side, are provided. A work vehicle characterized in that the height of the connection position of the link with respect to the frame is close to a height of 1/2 of the vehicle body height.

2.

21 The work vehicle according to claim 1, wherein the rear link is configured such that the upper side bends toward the front side of the vehicle with the vicinity of the connecting portion with respect to the lift arm as a boundary.

3.

27 The work vehicle according to claim 1 or 2, wherein the connection position of the front link with respect to the frame is located between the front axle and the rear axle of the vehicle, and the front axle and the rear axle. A work vehicle characterized in that it is located on the rear side of the position that divides the space into two equal parts.

4.

34 The work vehicle according to any one of claims 1 to 3, wherein the lift arm, the front link, the rear link, and the lift cylinder are used for the front wheels and the rear wheels of the vehicle. A work vehicle characterized in that it is arranged so as to overlap at least a part in the vehicle width direction.

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5.

41 A claim, wherein an engine is provided on the rear side of the work vehicle, a hinge is provided at a front end of a cover covering the upper portion of the engine, and the rear end of the cover is rotatable by the hinge. The work vehicle according to any one of claims 1 to 4.

6.

47 The work vehicle according to claim 5, wherein the cover includes at least a ceiling portion that covers the upper surface side of the storage space of the engine and a side wall portion that covers at least a part of the side surface side of the storage space.

7.

53 The skid steer loader as a work vehicle according to any one of claims 1 to 6.

Drawing pages of JP2006307498 A

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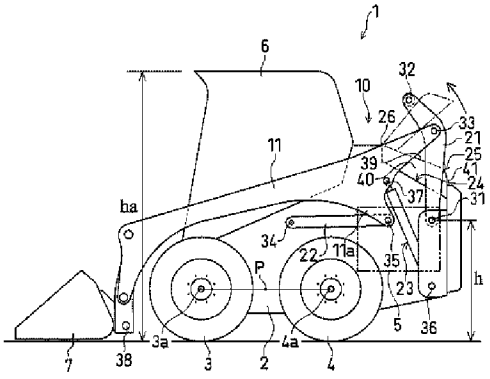
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(54)【発明の名称】作業車両及びスキッドステアローダ

(57)【要約】
【課題】　車体後部のエンジン５のメンテナンスが容易な作業車両を提供する。
【解決手段】　作業車両としてのスキッドステアローダ１は、先端にバケット７が取り付けられるリフトアーム１１と、前リンク２２と、後リンク２１と、リフトシリンダ２３と、を備える。前リンク２２、後リンク２１、及びリフトシリンダ２３のそれぞれは、一端側が前記リフトアーム１１に連結され、他端側が車両側のフレーム２に連結されている。そして、後リンク２１の前記フレーム２に対する連結位置（前記ピン３１の位置）の高さｈが、車体高さｈａの１／２の高さの近傍とされている。
【選択図】　図１



【特許請求の範囲】
【請求項1】
先端に作業具が取り付けられるリフトアームと、
それぞれの一端側が前記リフトアームに連結され、他端側が車両側のフレームに連結された、前リンク、後リンク、及びリフトシリンダと、を備え、
前記後リンクの前記フレームに対する連結位置の高さが、車体高さの１／２の高さの近傍であることを特徴とする作業車両。
【請求項2】
請求項１に記載の作業車両であって、前記後リンクは、前記リフトアームに対する連結部分付近を境として、上側が車両前方側へ曲がる形状に構成されていることを特徴とする作業車両。
【請求項3】
請求項１又は請求項２に記載の作業車両であって、前記前リンクの前記フレームに対する連結位置が、車両の前車軸と後車軸の間に位置しており、且つ、前車軸と後車軸との間を２等分する位置より後方側に位置していることを特徴とする作業車両。
【請求項4】
請求項１から請求項３までの何れか一項に記載の作業車両であって、前記リフトアーム、前記前リンク、前記後リンク、前記リフトシリンダの四者が、車両の前輪及び後輪に対し車両幅方向で少なくとも一部重複するように配置されることを特徴とする作業車両。
【請求項5】
前記作業車両の後部側にエンジンを備え、そのエンジンの上方を覆うカバーの前端にヒンジが設けられ、当該ヒンジによって前記カバーの後端が回動自在とされていることを特徴とする、請求項１から請求項４までの何れか一項に記載の作業車両。
【請求項6】
前記カバーは、前記エンジンの収納空間の上面側を覆う天井部と、前記収納空間の側面側を少なくとも一部覆う側壁部と、を少なくとも備えることを特徴とする請求項５に記載の作業車両。
【請求項7】
請求項１から請求項６までの何れか一項に記載の作業車両としてのスキッドステアローダ。

【発明の詳細な説明】
【技術分野】
【0001】
本発明は、作業具と昇降可能なリフトアームを備え、作業具をほぼ垂直な軌跡をもって昇降させることができる作業車両に関し、好適にはスキッドステアローダの構成に関する。
【背景技術】
【0002】
スキッドステアローダは例えば特許文献１に開示されており、この特許文献１のスキッドステアローダは、ブーム（リフトアームに相当）の先端のバケット（作業具に相当）を、実質的に垂直に上昇させ得るようになっている。前記ブームは、前側の制御リンクと、後側のブーム支持リンクと、シリンダとを介して、車両のメインフレームに連結されている。また、特許文献２及び３も、同様の基本的構成を具備したスキッドステアローダないし作業車両を開示している。
【特許文献1】米国特許第６４７４９３３号公報（FIG.2, ABSTRACT等, main boom section 24A, bucket 40, control link 50, boom support link 28, cylinder 56, main frame 4）
【特許文献2】米国特許第６６１６３９８号公報（Fig.1）
【特許文献3】米国特許第５６０９４６４号公報（FIG.2）
【発明の開示】

【発明が解決しようとする課題】
【0003】
しかし、特許文献１の構成では、（Ａ）ブーム支持リンクのメインフレームに対する接続位置（符号32の位置）が高いために、ブームや荷役対象物等の重量をサポートし得るだけの堅牢な構造物を車両本体側において相当の高さだけ垂直に立ち上げて形成し、そこにブーム支持リンクを連結せざるを得ない。従って、車両の後部に配置されたエンジン室（engine compartment 15）に上側からアクセスするための開口を大きく確保することが難しい構成となっており、これがエンジンの整備作業を困難にしている。
【0004】
また、上記特許文献１の構成では、（Ｂ）ブームを上昇させた場合において、立姿勢となる制御リンクが座席の側方の視界を遮る構成となっている（特許文献１のFIG.2やFIG.3を参照）。一方、（Ｃ）ブームを下降させた場合は、今度はブーム自体が斜め後方の視界を広面積で遮る（特許文献１のFIG.1を参照）。従って、オペレータの視界が狭くなっており、作業性の点で改善の余地が残されていた。
【0005】
なお、上記特許文献２及び３の構成においても、少なくとも前記（Ａ）及び（Ｃ）の課題を同様に指摘することができる。
【0006】
また、一般に作業車両（特にスキッドステアローダ）は、狭路等での作業に用いられる場合も少なくなく、車両全体のコンパクト性が強く要請されている。一方、オペレータの快適性の観点からは、車両座席の居住空間はできるだけ広く確保したいという要請もあり、矛盾する二つの要請を解決できる構成が望まれている。
【課題を解決するための手段及び効果】
【0007】
本発明の解決しようとする課題は以上の如くであり、次にこの課題を解決するための手段とその効果を説明する。
【0008】
◆本発明の観点によれば、以下のように構成する、作業車両が提供される。先端に作業具が取り付けられるリフトアームと、それぞれの一端側が前記リフトアームに連結され、他端側が車両側のフレームに連結された、前リンク、後リンク、及びリフトシリンダと、を備える。前記後リンクの前記フレームに対する連結位置の高さが、車体高さの１／２の高さの近傍である。
【0009】
これにより、後リンクを介してリフトアームや搬送対象物等の重量を支持するための強固な構造部材があまり高い位置まで延出しない構成とできるので、エンジンルームの上方を開放する開口を広面積で確保でき、エンジン等のメンテナンス作業性を向上させることができる。また、後リンクのフレームに対する連結位置が低いことから、後リンクのリフトアームに対する連結位置も低くすることが容易になる。従って、リフトアームの下降状態において、オペレータの斜め後方の視界を広く確保することができる。
【0010】
◆前記の作業車両においては、前記後リンクは、前記リフトアームに対する連結部分付近を境として、上側が車両前方側へ曲がる形状に構成されていることが好ましい。
【0011】
これにより、後リンクやそれに付設される部材がエンジンの上方の前記開口の邪魔になりにくいレイアウトとなり、開口を介してのエンジン等のメンテナンス作業性を一層良好にすることができる。
【0012】
◆前記の作業車両においては、前記前リンクの前記フレームに対する連結位置が、車両の前車軸と後車軸の間に位置しており、且つ、前車軸と後車軸との間を２等分する位置より後方側に位置していることが好ましい。

【0013】
これにより、リフトアームが上昇されて前リンクが立姿勢になっても、前リンクがオペレータの側方視界を遮りにくいので、作業性を向上させることができる。
【0014】
◆前記の作業車両においては、前記リフトアーム、前記前リンク、前記後リンク、前記リフトシリンダの四者が、車両の前輪及び後輪に対し平面視で少なくとも一部重複するように配置されることが好ましい。
【0015】
これにより、前後輪、リフトアーム及びその昇降構成をコンパクトなスペースに合理的に配置できるから、狭路等でも作業し易い幅方向でコンパクトな車体とできると同時に、リフトアーム等に挟まれた位置にあるオペレータの居住空間を、特に幅方向に広く確保できる。
【0016】
◆前記の作業車両においては、前記作業車両の後部側にエンジンを備え、そのエンジンの上方を覆うカバーの前端にヒンジが設けられ、当該ヒンジによって前記カバーの後端が回動自在とされていることが好ましい。
【0017】
これにより、カバーを大きな回動ストロークをもって開放して作業できるので、エンジン等のメンテナンス作業を容易に行うことができる。
【0018】
◆前記の作業車両においては、前記カバーは、前記エンジンの収納空間の上面側を覆う天井部と、前記収納空間の側面側を少なくとも一部覆う側壁部と、を少なくとも備えることが好ましい。
【0019】
これにより、前記カバーを回動して開放した際にエンジン収納空間の側面側が特に大きく露出されるので、エンジンへのアクセス、特に側方からのアクセスが容易になり、エンジン等のメンテナンス作業を一層容易にできる。
【0020】
◆前記の構成は、例えばスキッドステアローダに適用することができる。
【0021】
即ち、本発明は、リフトアームを備えるとともに、狭路で使用されることが多く、オペレータの視界が良好であることが要求されるスキッドステアローダに特に好適である。
【発明を実施するための最良の形態】
【0022】
次に、発明の実施の形態を説明する。図１は本発明の一実施形態に係るスキッドステアローダの全体側面図、図２は同じく上方側からみた斜視図、図３はスキッドステアローダの荷役上昇動作の前半期の様子を示す側面図、図４は荷役上昇動作の後半期の様子を示す側面図である。
【0023】
図１及び図２において、作業車両としてのスキッドステアローダ１は、枠体状のフレーム２に前輪３及び後輪４を懸架するとともに、前記フレーム２に備えられたエンジン５によって前輪３及び後輪４を駆動できるようになっている。上記フレーム２の前部には、オペレータの運転座席を収容するキャビン６が固設されるとともに、その後部には、図略のカウンタウェイトや、前記エンジン５が設置されている。
【0024】
スキッドステアローダ１は、前記エンジン５の上方及び側方上部を開放させる開口２４を備えており、この開口２４を覆うようにカバー２５が設置されている。このカバー２５の前端はヒンジ２６によって車両本体側に枢支されている。この構成で、図１の鎖線で示すようにカバー２５の後端を上方へ回動して開放すると、メンテナンス作業等のために前記開口２４を介してエンジン５やその周辺装置へ上方や側方からアクセスすることが可能

になっている。

【0025】

特に本実施形態では、前記カバー２５は、エンジン５の上方（エンジン５の収納空間の上面側）を覆う天井部３９の端部から、該収納空間の後面側を覆う後壁部４１、及び、収納空間の側面側を覆う側壁部４０を、下方へ延出させた構成になっている。言い換えればカバー２５は、エンジン５の収納空間の後面側及び側面側の一部を覆う形状となっている。従って、カバー２５の上方回動時には、エンジン室の上面側だけでなく、後面側上部及び側面側上部も含め大きく開放されることになる。この結果、エンジン５の後面及び側面へのアクセスが容易になっており、メンテナンス作業性が大きく向上されている。

【0026】

前記スキッドステアローダ１はリフトアーム１１を昇降自在に備え、このリフトアーム１１の先端にはバケット（作業具）７がピン３８を介して回動自在に備えられている。本実施形態では図２に示すように、リフトアーム１１はキャビン６を間に挟むようにして左右一対で設けられており、いわゆる両腕式のリフトアームに構成されている。

【0027】

左右それぞれのリフトアーム１１は、左右の車輪３・４の直上方の位置（左右の車輪３・４と車両幅方向で重複する位置）に配置されている。図１及び図２に示すリフトアーム１１の下降状態において、リフトアーム１１は車輪３・４の直上方の空間を前下がり状にやや斜めに延出し、その先端は前輪３の周縁にほぼ沿うように下向きに湾曲している。

【0028】

上記リフトアーム１１の先端側には、前記バケット７を回動させるための図示しないバケットシリンダが取り付けられている。また、上記リフトアーム１１は、以下に説明する昇降装置１０の構成によって昇降自在とされている。なお図１及び図２は、リフトアーム１１を下限位置まで下降させた状態を示している。

【0029】

スキッドステアローダ１のフレーム２の後端部位には、後リンク２１の下端が、ピン３１を介して回動自在に連結されている。図２に示すように後リンク２１は左右一対で配置され、そのそれぞれの下端が前記フレーム２の左右の側面に枢結されるとともに、上端同士はクロスメンバ３２により相互に結合されている。また図１で示すように、前記ピン３１の位置（即ち、後リンク２１のフレーム２に対する連結位置）の高さｈは、スキッドステアローダ１の車体高さｈａの１／２の高さよりも若干小さいが、車体高さｈａのほぼ１／２の高さ付近になっている。

【0030】

図１及び図２に示す下降状態において上記の後リンク２１はほぼ鉛直上方に向けて起立した姿勢となっているが、この後リンク２１は、その途中高さの部分を境にして上側の部分が車両前方側へ近づく方向に折れ曲がっており、先端が前上方に向けて延出した形状になっている。そして、その折れ曲がった箇所には、前記リフトアーム１１の最基端部がピン３３により回動自在に連結されている。

【0031】

また、前記フレーム２には、左右一対で配置された前リンク２２のそれぞれの前端が、ピン３４を介して回動自在に連結されている。このピン３４は、前記後リンク２１の下端部の連結ピン３１よりも若干低い高さに配置されており、かつ、前記フレーム２の前後中央部に位置している。前後の車軸３ａ・４ａとの関係で言えば、このピン３４は、前車軸３ａと後車軸４ａの間の位置に配置されており、また前記ピン３４は、前車軸３ａと後車軸４ａとの中間位置Ｐよりも後方側に位置している。言い換えれば前記ピン３４は、前車軸３ａと後車軸４ａとを結ぶ線分の２等分点Ｐよりも後方側、且つ、前記後車軸４ａよりも前方側に位置している。一方、前リンク２２の後端は、リフトアーム１１の基端部近傍の下方突出部１１ａに対し、ピン３５を介して回動自在に連結されている。

【0032】

また、前記フレーム２の後端部位であって、前記ピン３１の直下方のほぼ最下端の部位

には、リフトシリンダ２３のシリンダ部側の端部がピン３６を介して回動自在に連結されている。一方、リフトシリンダ２３の可動ロッド側の端部は、リフトアーム１１の基端側の部位に対し、ピン３７を介して回動自在に連結されている。

【0033】

なお、図２に示すように、リフトアーム１１、リフトシリンダ２３、前リンク２２、後リンク２１等は、車体の両脇に左右一対で設けられている。リフトアーム１１、前リンク２２、後リンク２１、リフトシリンダ２３の四者は、いずれも車輪（前後輪３・４）に対し車両幅方向で重複するように配置されている。

【0034】

上記リフトシリンダ２３は流体圧シリンダ、具体的には油圧シリンダとされ、図示しない油圧供給手段（例えば、前記エンジン５に連結されたオイルポンプ）に対し、図略の制御バルブ、例えば電磁弁を介して接続されている。この制御バルブは、図略の制御手段、例えばマイクロコンピュータ式のコントローラによって開閉制御される。本実施形態では、リフトアーム１１の昇降装置１０は、リフトシリンダ２３、前リンク２２、後リンク２１を少なくとも備えた構成になっている。

【0035】

以下、上記昇降装置１０による荷役上昇時の動作について説明する。リフトアーム１１を降ろした図１や図２の状態では、リフトシリンダ２３は十分に縮退されており、前リンク２２はピン３４からみて車両後方側へほぼ水平に向けられており、後リンク２１はピン３１からみてやや後方上向きになっている。

【0036】

この状態で、キャビン６の運転座席に着座するオペレータが図略の荷役操作手段（例えば、レバーやペダル等）を操作すると、リフトシリンダ２３に圧油が供給されて伸張し、前リンク２２の起立方向への回動を伴ってリフトアーム１１が上昇する。

【0037】

この上昇の初期（図３）では、リフトアーム１１の上昇と同時に、後リンク２１はピン３１を中心に後方へ倒れるように回動する。従ってリフトアーム１１は、その基部側を後方へ移動させるので、その先端のバケット７は車両後方へ引き込まれる。この結果、荷役上昇時の前半期のリフトアーム１１の先端の軌跡は、僅かに前方に膨らんではいるものの、実質的に直線状の軌跡となっている。リフトアーム１１の先端は、上昇の中間期で最大リーチとなっている。

【0038】

リフトシリンダ２３が更に伸張し、リフトアーム１１の先端の高さが中間高さ程度（ピン３３の高さ程度）に達した後は、図４に示すように、後リンク２１はピン３１を中心に、逆に前方へ倒れるように回動する。従って、リフトアーム１１の基部側が前上方へ移動するので、リフトアーム１１及びその先端のバケット７が、前方へ若干押し出されつつ上昇することになる。

【0039】

こうして最終的には、リフトアーム１１は図４の実線に示す上限位置に至る。この上限位置では、リフトアーム１１の先端は、前述の上昇中間期における最大リーチよりは若干短いものの、大きなリーチ量を実現している。また、上限位置では、前リンク２２は垂直より後方へやや傾いた姿勢とされており、その上端のピン３５の高さは、リフトアーム１１と後リンク２１とを連結するピン３３よりも若干高くなっている。

【0040】

以上のように、本実施形態のスキッドステアローダ１では、荷役上昇の当初の段階ではリフトアーム１１の先端が後方へ引き込まれ、後半段階では逆に前方へ押し出される。この結果、バケット７が取り付けられるリフトアーム１１の先端部（ピン３８）の軌跡は、図４に符号Ｔで示すような、垂直な直線に近い緩やかな曲線を描くことになる。この軌跡Ｔは、下限位置から若干前方へ移動しながら上昇し、次に、前述の引込み作用によって後方へ移動しながら上昇し、最後に、前述の押出し作用によって前方へ移動しながら上昇す

る、略Ｓ字状のカーブとなる。なお、荷役下降時の動作については、前述の荷役上昇時の動作の逆を行えば良い。

【0041】

このような構成とすることで、単なる円弧軌跡を描いて荷役上昇／下降を行う場合に比べ、リフトアーム１１の上昇位置でのリーチ量を大きくすることができ、荷役作業性を向上させ得るとともに、最大積載荷重を大きくすることができる。

【0042】

以上に示すように本実施形態のスキッドステアローダ１は、前記後リンク２１の前記フレーム２に対する連結位置（前記ピン３１の位置）の高さｈが、車体高さｈａのほぼ１／２の高さとなるように構成されている。従って、車両本体側において、ピン３１を支持するための強固な構造部材をあまり高い位置まで延出させない構造とできるので、エンジンルームの上方を開放する開口２４を広面積で確保することができ、エンジン５やその周辺装置のメンテナンス作業性を向上させることができる。また、後リンク２１のフレーム２に対する連結位置（ピン３１の位置）が低いことから、後リンク２１のリフトアーム１１に対する連結位置（ピン３３）も低くすることが容易になっている。従って、図１等に示すリフトアーム下降状態において、オペレータの斜め後方の視界を広く確保することができる。

【0043】

また、前記後リンク２１は、前記リフトアーム１１に対する連結部分（前記ピン３３が設けられている部分）付近を境に、上部が車両前方側へ曲がる形状に構成されている。従って、後リンク２１（あるいは、一対の後リンク２１同士を連結するクロスメンバ３２）が前記開口２４の邪魔になりにくいレイアウトが実現され、開口２４を介してのエンジン５等のメンテナンス作業性を一層向上させることができる。

【0044】

また本実施形態では、前リンク２２の前記フレーム２に対する連結位置（前記ピン３４の位置）が、車両の前車軸３ａと後車軸４ａの間に位置し、且つ、前車軸３ａと後車軸４ａとの中間位置（Ｐ点）より後方側に位置している。従って、図４のようにリフトアーム１１が上昇されて前リンク２２が立姿勢になっても、その前リンク２２がオペレータの側方視界を妨げないので、作業性を向上させることができる。

【0045】

また、本実施形態のスキッドステアローダ１では、図２に示すように、前記リフトアーム１１、前記前リンク２２、前記後リンク２１、前記リフトシリンダ２３の四者が、車両の前輪３及び後輪４に対し平面視で重複するように配置されている。従って、例えば米国特許第６７９６７６２号公報のFig.6に示す構成に比較して、前後輪３・４及びリフトアーム１１等をコンパクトな幅の内部に合理的に配置できるから、狭路等でも作業し易い幅方向でコンパクトな車体とできると同時に、リフトアーム１１等に挟まれた位置にあるキャビン６の居住空間を（特に幅方向に）広く確保できる。

【0046】

また、本実施形態では、車両の後部側にエンジン５が備えられており、そのエンジン５の上方を覆うカバー２５の前端にヒンジ２６が設けられ、当該ヒンジ２６によって前記カバー２５の後端が回動自在とされている。従って、図１に示すようにカバー２５の回動ストロークを大きく確保できるので、エンジン５等のメンテナンス作業を容易に行うことができる。

【0047】

また、本実施形態では、前記カバー２５は、前記エンジン５の収納空間（エンジン室）の上面側を覆う天井部３９と、前記収納空間の側面側を少なくとも一部覆う側壁部４０と、を備えている。従って、カバー２５の上方回動時には、エンジン室は、上面側だけでなく側面側上部も含め大きく露出される。しかも前述したとおり、前記後リンク２１の前記フレーム２に対する連結位置が車体高さの１／２の高さ近傍という低い位置になっているので、側壁部４０の下端をその連結位置の近傍に位置させることとすれば、カバー２５の

開放時におけるエンジン室の側面側露出面積を大きく確保できる。この結果、エンジン５の側面へのアクセスが極めて容易になり、メンテナンス作業性が顕著に向上される。

【0048】

以上に本発明の好適な実施形態を示したが、上記の実施形態は例えば以下のように変更することもできる。

【0049】

（１）作業具としては、例示したバケット７に限らず、例えばフォーク等を採用することができる。また、作業具は、リフトアーム１１の先端に着脱可能に取り付けられていても良い。

【0050】

（２）リフトアーム１１や前リンク２２、後リンク２１、リフトシリンダ２３は、前後輪３・４に対し全部重複するように配置しているが、これに限定されず、一部のみ重複するように配置されても良い。

【0051】

（３）図４に例示するリフトアーム１１の先端の軌跡Ｔは、作業車両の用途等の事情に応じて適宜変更することができる。また、上記実施形態に示す前リンク２２、後リンク２１、リフトシリンダ２３の向きや配設位置は、実現したいリフトアーム１１先端の軌跡やリフト量などに応じて、適宜変更可能であることはいうまでもない。例えば、前リンク２２や後リンク２１等のレイアウトを適宜変更することで、図４に例示した略Ｓ字状の軌跡のみならず、例えば略Ｃ字状の軌跡とすることもできるし、他の曲線状の軌跡を実現することもできる。

【0052】

（４）また上記実施形態では、リフトアーム１１の先端は上昇の中間期で最大リーチとなっているように構成したが、例えば上限位置近傍（上限位置よりやや下の位置）で最大リーチとなるように軌跡Ｔを変更しても良く、こうすることによって荷役作業の作業性を向上させることができる。

【0053】

（５）前リンク２２や後リンク２１、リフトシリンダ２３のフレーム２やリフトアーム１１への連結方法としては、ピンによる連結に限られない。また、リフトアーム１１や２つのリンク２１・２２、リフトアーム１１は車両の左右一対に設けられることに限らず、例えば二対以上設けられていても良い。

【0054】

（６）本発明は、狭路で使用されることが多いスキッドステアローダ１に適用するのに好適であるが、これに限定されず、昇降可能なリフトアームを備える作業車両全般に本発明を適用することが可能である。

【図面の簡単な説明】

【0055】

【図1】本発明の一実施形態に係るスキッドステアローダの全体側面図。

【図2】同じく上方側からみた斜視図。

【図3】スキッドステアローダの荷役上昇動作の前半期の様子を示す側面図。

【図4】荷役上昇動作の後半期の様子を示す側面図。

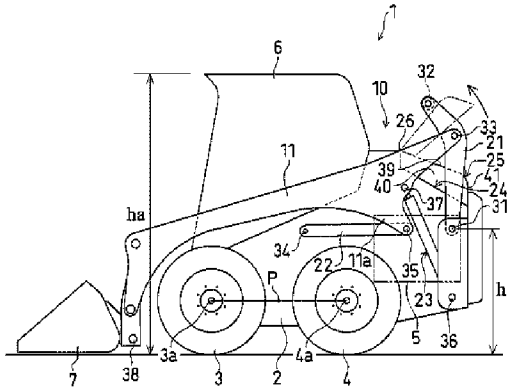
【符号の説明】

【0056】

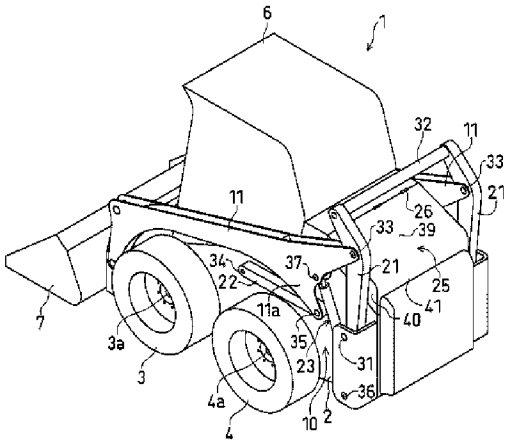
１　スキッドステアローダ（作業車両）
２　フレーム
３　前輪
３ａ　前車軸
４　後輪
４ａ　後車軸
５　エンジン

６　キャビン
７　バケット（作業具）
１０　リフトアームの昇降装置
１１　リフトアーム
２１　後リンク
２２　前リンク
２３　リフトシリンダ
２４　エンジン整備用の開口
２５　カバー
２６　ヒンジ

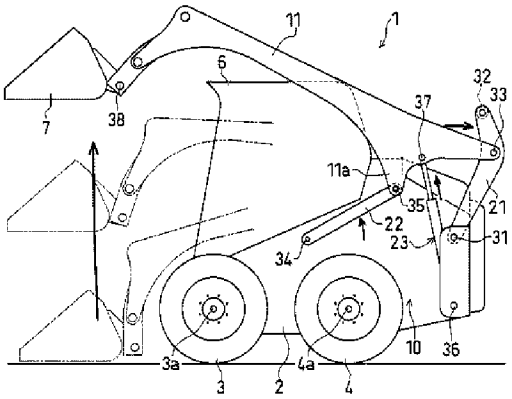
【図1】



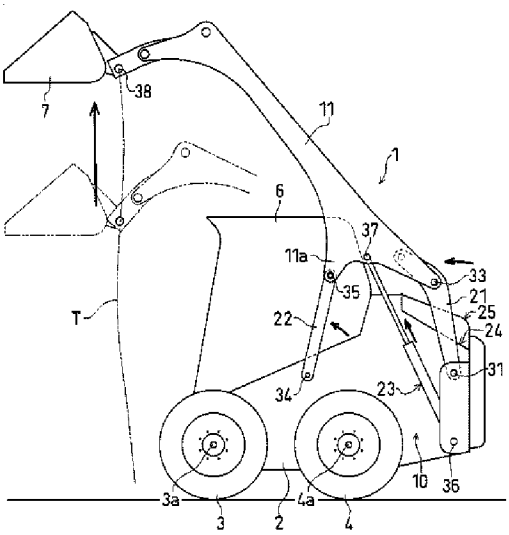
【図2】



【図3】


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37
11a
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21
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3a
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4a
4

【図4】


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3a
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4a
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(54) Vertical lift arm device

(57) A skid steer loader having an operator compartment (300,700) attached to a frame (100,500). Lift assemblies (200,600) are movably mounted to the frame (100,500) and are movable between a retracted position and an extended position. As the lift assemblies (200,600) are moved between the retracted position and the extended position, joining plates (204,604), first links (202,602) and second links (206,606) are positioned behind the operator compartment (300,700) to provide a better field of vision for the operator.

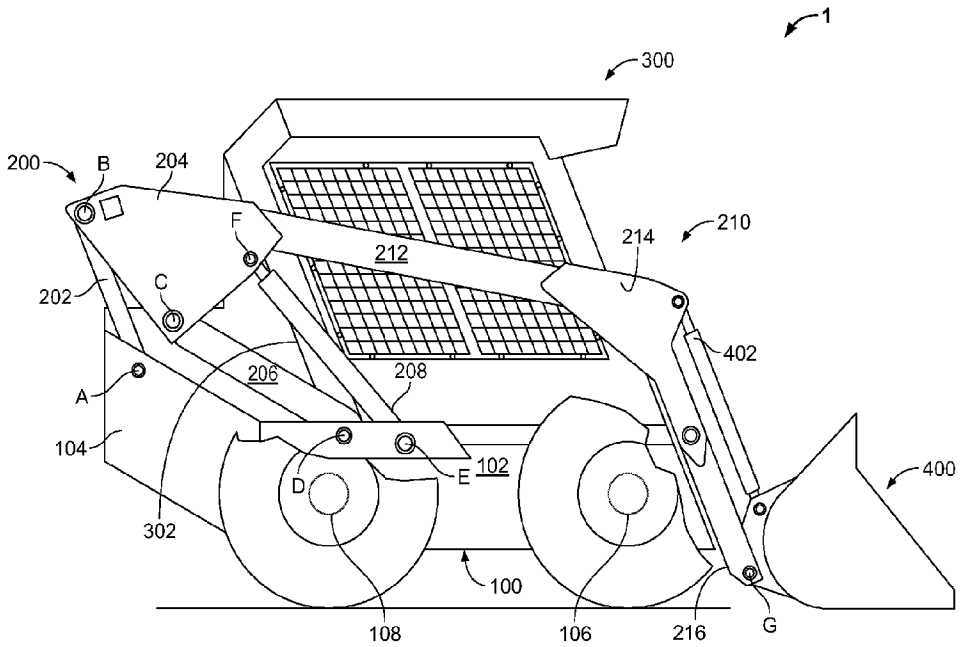


FIG. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a loader arm device, and in particular, to a vertical lift arm device for use on a skid steer loader.

BACKGROUND OF THE INVENTION

[0002] Skid steer loaders are compact vehicles useful on farms and construction sites to maneuver in tight spaces and transport heavy or bulky items. Typical skid steer loaders include a boom that can be raised and lowered and a bucket attached to the end of the boom whereby items can be lifted off the ground, transported, and placed back on the ground or dumped into a receptacle with high walls, such as a dump truck. The skid steer loaders are generally considered to have either a radial lift load-arm, in which the boom has a single pivot point, or a vertical lift load-arm, in which a four-bar linkage is used to raise and lower the boom.

[0003] Operators want to be able to service their skid steer loader easily. The operator compartment of a skid steer loader typically pivots on the frame to reveal engine components for servicing. Four-bar linkage designs generally provide a linkage that is coupled to the operator compartment, complicating the pivoting of the operator compartment and making access to engine components difficult.

[0004] In addition, operators need to have a good view of their surroundings when the boom is in the down position. Radial lift skid steer loaders generally obstruct the operator's view, thereby creating potential safety concerns.

[0005] It would, therefore, be beneficial to have a skid steer loader which allows the operator compartment to be opened for improved service access and which provides enhanced visibility for the operator when the boom is lowered for improved safety.

SUMMARY OF THE INVENTION

[0006] One aspect of the invention is directed to a skid steer loader having an operator compartment attached to a frame. Lift assemblies are movably mounted to the frame and are movable between a retracted position and an extended position. Joining plates are rigidly coupled to the lift assemblies. First links are pivotally coupled to the frame proximate a back of the operator compartment and are pivotally coupled to the joining plates. Second links are pivotally coupled to the frame proximate a back of the operator compartment and are pivotally coupled to the joining plates. As the lift assemblies are moved between the retracted position and the extended position, the joining plates, the first links and the second links are positioned behind the operator compartment to provide a better field of vision for the operator.

[0007] The skid steer loader may further have lift actuators pivotally connected to the frame proximate the rear wall of the operator compartment and pivotally coupled to the joining plates, the lift actuators may be adapted to extend between a first position and a second position, whereby as the actuators are moved to the second position, the lift assemblies are moved to the extended position.

[0008] The skid steer loader may further have a second link and a lift actuator being positioned so that in response to movement of the lift actuator from its retracted position to its fully extended position, the second link and the lift actuator remain coplanar such that the forces exerted on one side of the boom act in a plan which coincides with the plane of the second link and the lift actuator.

[0009] In one embodiment of the skid steer loader described herein, the operator will have a generally unobstructed field of view of the work area and surroundings regardless of the position of the lift assemblies or, thereby providing for ease of operation and increased safety. In addition, the operator compartment may be easily opened or pivoted to allow for better service access to parts of the engine and other components. In addition, as the first links, the second links and the lift actuators may be mounted on the frame at the rear of the skid steer loader, the operator compartment can easily be pivoted forward whether the lift assemblies are lowered or raised or in any position therebetween. The positioning of the pivot points on the frame, where substantial structure must be provided to strengthen the base regardless of the presence of the pivot points, obviates the need to provide additional structure to support the lift assembly. Also, the placement of the lift actuator is such that the full lift height of the bucket is achieved with a shorter actuator than is possible with some prior-art designs.

[0010] Other features and advantages of the present invention will be apparent from the following more detailed description of the preferred embodiment, taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is an elevation view of a skid steer loader according to a first embodiment;

[0012] FIG. 2 is an enlarged, partial perspective view of a frame member according to the first embodiment;

[0013] FIG. 3 is an elevation view of a skid steer loader according to the first embodiment with a lift assembly fully extended;

[0014] FIG. 4 is a perspective view of the lift assembly shown in FIGS. 1 and 3;

[0015] FIGS. 5 and 6 are enlarged partial views of the lift assembly shown in FIGS. 1, 3 and 4;

[0016] FIG. 7 is a graphic representation of normalized lift force that can be applied by a lift actuator of the skid steer loader according to the first embodiment;

[0017] FIG. 8 is a perspective view of a second em-

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bodiment of a skid steer loader;

[0018] FIG. 9 is a perspective view of the second embodiment of the skid steer loader of FIG. 8 with a lift assembly fully extended; and

[0019] FIG. 10 is an elevation view of the second embodiment of the skid steer loader of FIG. 8.

DETAILED DESCRIPTION OF THE INVENTION

[0020] As shown in FIG. 1, a skid steer loader 1 according to a first embodiment includes a frame 100. An operator compartment 300 is attached to the top of the frame 100. The frame 100 includes a base 102, on which a plurality of wheels or a pair of tracks are rotatably mounted on front and rear axles 106, 108 or the like, and a rearward extending engine-mounting portion 104 that houses drive components (not shown) such as an engine and hydraulic pumps. Alternative or additional drive components such as chains, hydraulic motors, a transmission, drive shafts, electric motors or the like may be housed within the base. The drive components provide motive power to the skid steer loader in addition to driving a hydraulic pump to provide pressurized fluid for hydraulic actuators 208 and 402. The implement actuator 402 actuates a tipping motion of an implement, such as a bucket 400, and the hydraulic lift actuator 208 extends and retracts a lift assembly.

[0021] The frame 100 includes a plurality of pivot points A, D, E. In the embodiment shown in FIG. 1, the pivot points A, D, E are generally disposed with pivot points A at the rear of the skid steer loader on the engine-mounting portion 104 of the frame 100, pivot points D between pivot points A and E, and pivot points E forward of and above the rear axle 108 in one embodiment. Pivot points A may be disposed above pivot points D and E. Although only one of each pivot point is shown, duplicate pivot points are provided on the side of the frame which is not shown.

[0022] As shown in FIGS. 1 and 2, the frame includes U-shaped brackets 106 in which respective pivot points A, D, E are formed. Holes are formed in the brackets 106 at each pivot point in such a manner as to allow shafts or pins, preferably double-shear pins, to be placed in the holes and to rotate in the holes. Alternatively, the holes may be formed through a wall of the frame 100 itself, or through such other structure on the frame 100 that is sufficiently strong to withstand the loads placed on it during the course of use of the skid steer loader. Also, the brackets may be any shape sufficient for the purpose; a U-shape is not essential.

[0023] As shown in FIG. 1, lift assemblies 200 are attached to either side of the frame 100 at the pivot points A, D, E (only one side of the frame 100 is shown in FIGS. 1 and 3) such that the lift assemblies 200 are movable relative to the frame 100. Each lift assembly 200 has a first link 202, a second link 206, a pair of rear joining plates 204 (only one joining plate is shown in FIG. 1), a hydraulic lift actuator 208, and a boom 210. Each boom 210 has a top arm 212 and a front arm 216 joined by a pair of front joining plates 214. As shown in FIGS. 4-6, a pair of joining plates 214 connects a respective top arm 212 and front arm 216 such as by welding. Likewise, the rear joining plates 204 connect respective top arm 212.

[0024] Each first link 202 is pivotally connected to the frame 100 at pivot point A and to the joining plate 204 at point B, while each second link 206 is pivotally connected to the frame at pivot point D and to the joining plate 204 at pivot point C, and each lift actuator 208 is pivotally connected to the frame, proximate the operator compartment 300, at pivot point E and to the joining plate at pivot point F. Pivot points B, C and F may each be disposed near corners of the rear joining plate, with pivot points B being disposed near the rear of the joining plates when the lift assemblies are in the retracted position, pivot points C near the bottom and pivot points F near the front and just below where the booms and the joining plates are welded (or otherwise coupled) together.

[0025] As shown in FIGS. 1 and 3, the first links 202, the rear joining plates 204 between pivot points B and C, the second links 206 and the frame between pivot points D and A form a four-bar linkage. The lengths of the components making up the four-bar linkage are such that the first and second links are oscillating or rocking links. It will be understood that the position of the pivot points can be altered to accommodate different lengths for the first links, the second links and the lift actuators. Moreover, although the rear joining plates are shown in FIGS. 1 and 2 as having a pentagonal shape, it will be understood by one having ordinary skill in the art that the shape can be any number of shapes, such as polygons with more or fewer sides, a whole or part of a circle or ellipse, and the like. Regardless, the joining plates are shaped in one embodiment so that the first and second links are as short as possible while maintaining an acceptable maximum height for the bucket 400. Shorter links are less susceptible to collapsing under compressive loads and are more cost effective than longer links.

[0026] FIG. 3 shows the lift assemblies 200 in their fully raised position. In traversing the path from the retracted position shown in FIG. 1 to the raised position shown in FIG. 3, a lower point on the front arms 216 travels in a generally bifurcated path, including a lower path section 250 and an upper path section 252. The bifurcation point occurs when the pivot points B, C and D are aligned.

[0027] In one embodiment, the lower path section 250 is substantially half of the path and is shaped as a slowly curving line that is bowed slightly away from the skid steer loader. The upper section 252 is substantially linear and angled slightly away from the skid steer loader. In this way, the lower points G of the front arms 216, which constitute a connection point for the bucket 400 or implement, begin moving away from the frame of the skid steer loader as soon as an operator starts extending the lift assemblies 200, and the lower points G generally continue to move away from the frame without exhibiting a substantially retrograde motion toward the frame. Slight retrograde motion, or retrograde motion over small sections

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of the path of the lower points G, is possible, but generally the lower points G move away from the frame throughout the entire path, i.e., between fully retracted and fully extended positions.

[0028] While traversing the lower path section 250, the lift assemblies generally exhibit high mechanical advantage and low speed. That is, mechanical advantage is relatively high-allowing an operator to lift heavy items-but the speed of the lower points G is relatively slow. In contrast, while traversing the upper path section 252, the lift assemblies generally exhibit lower mechanical advantage but higher speed.

[0029] In operation, the lift assemblies 200 are extended by extending the lift actuators 208 so as to move pivot points F along a curve taking them further from pivot points E (which are fixed on the frame 100). As the lift actuators 208 are extended, the first links 202 and the second links 206 rotate clockwise about their respective pivot points A and D. Pivot points B and C travel about a circular arc with the center of the circle being pivot points A and D, respectively.

[0030] As shown in FIG. 4, the skid steer loader has a pair of lift assemblies 200 joined by a rear cross member 220 and a front cross member 218. The rear cross member 220 is welded or otherwise rigidly attached to at least one of the pair of rear joining plates 204. Alternatively, the rear cross member 220 could be welded or otherwise rigidly attached to the first links 202 or in other positions, provided the rear cross member 220 provides rigidity. The front cross member 218 is welded or otherwise rigidly attached to at least one of the front joining plates 214. Alternatively, the front cross member 218 could be welded or otherwise rigidly attached in other positions, provided the front cross member 218 lends rigidity to the lift assemblies 200.

[0031] As shown in FIGS. 4-6, the placement of the joining plates and pivot points A-F in the rear joining plate and on the frame allow each lift actuator 208 and respective first and second links 202, 206 to move substantially in the same plane between the fully retracted and extended positions. The associated boom 210 also moves in this plane with the respective first and second links. As a result, each lift assembly 200 is not subjected to twisting moments about its longitudinal axis. In other words, by virtue of the single-plane construction of each lift assembly 200 and the lift assembly's connection to the frame, forces, including torsional forces, exerted on one side of the lift assembly as a result of lifting a heavy implement or bucket full of material act in a single plane substantially coinciding with the plane of the first and second links, the lift actuator and the boom 210. Without having to contend with torsional forces, pin connections 222 (shown in FIG. 6) may be thinner and less expensive than is required in applications where any one of the front arm 216 (shown in FIG. 4), links 202, 206 and lift actuator 208 is positioned in a different plane than the top arm 212.

[0032] As shown in FIGS. 5 and 6, the pivot pins are double-shear pins. Such pins are easier to manufacture (and therefore less expensive) than single-shear pins. Double-shear pins are subject to shear loading on two, generally parallel planes. In contrast, single-shear pins are subject to a larger shear loading on only one plane and generally require more structure than double-shear pins.

[0033] In addition to using less expensive pivot pins, the skid steer loader according to the first embodiment may include lift assemblies having pre-formed tubing. The use of such tubing is made possible because of the lack of twisting moments and is generally less expensive than a custom-formed, welded lift assembly.

[0034] The skid steer loader according to the first embodiment has an advantage of providing the greatest lift force when the lift assemblies are fully retracted (as shown in FIG. 7), and the lift force remains at this maximum level as the lift assemblies are raised until approximately 30% of the maximum lift height is achieved. Even at 75% of maximum lift height, 90% of maximum breakout force is available. Accordingly, if an operator wishes to pry a root or chunk of concrete or asphalt from the ground, he can do so with the maximum force available. Moreover, if an item is so heavy as to exceed the maximum lift capability of the lift actuators, yet must be lifted and transported, the item can be lifted to a working height and moved. Therefore, the greatest lifting force is available when it is most needed -- in contrast to many prior art designs that generate the greatest lift force at less useful positions, such as near the top of the maximum bucket height.

[0035] By attaching the first links 202 to the frame 100 at pivot points A and to the joining plates 204 at pivot points B, the second links 206 to the frame at pivot points D and to the joining plates 204 at pivot points C, and the lift actuators 208 to the frame, proximate the operator compartment 300, at pivot points E and to the joining plates at pivot point F, the operator's field of vision is enhanced. As all the pivot points A, B, C, D, E and F are positioned proximate a rear wall or back surface 302 of the operator compartment, behind where the operator sits in the operator compartment 300, the first links 202, the second links 206, the lift actuators 208 and the joining plates 204 are all positioned behind the operator and out of the critical line of sight of the operator. The critical line of sight of the operator is in front of and to the left and right sides of the operator. As shown in FIGS. 1 and 3, the critical line of sight of the operator is not impeded when the links 202, 206, lift actuators 208 and joining plates 204 of the lift assemblies are lowered or raised or in any position therebetween. Consequently, the operator will have an unobstructed view of his work area and surroundings, thereby providing for ease of operation and increased safety.

[0036] It is typical in many skid steer loaders to have parts of the engine and other components mounted below the operator compartment 300. For ease of service, the operator compartment 300 can be opened or pivoted to allow access to the parts of the engine and other com-

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ponents. In previous skid steer loaders, the lift assemblies have been mounted to the operator compartment or designed in such a manner as to prevent easy access to the operator compartment and the components mounted under the operator compartment. However, in the embodiment shown, the attachment of the first links 202, the second links 206 and the lift actuators 208 is to the frame 100 and not to the operator compartment 300. This construction allows for the operator compartment 300 to be easily opened or pivoted to allow for better service access to parts of the engine and other components. In addition, since the first links 202, the second links 206 and the lift actuators 208 are all mounted at the rear of the skid steer loader 1, the operator compartment 300 can easily be pivoted forward whether the lift assemblies 600 are lowered or raised or in any position therebetween.

[0037] As shown in FIGS. 8 through 10, a skid steer loader 2, according to a second embodiment, includes a frame 500. An operator compartment 700 is attached to the top of the frame. The frame 500 includes a base 502, on which a plurality of wheels or a pair of tracks are rotatably mounted on front and rear axle 506, 508 or the like, and a rearward extending engine-mounting portion 504 that houses drive components such as those previously described, or additional drive components such as chains or hydraulic motors. The drive components provide motive power to the skid steer loader, in addition to driving hydraulic pumps to provide pressurized fluid for hydraulic implement actuators which move a bucket 800 and extend and retract lift assemblies 600.

[0038] The frame 500 includes a plurality of pivot points H, K, L. In the embodiment shown in FIG. 10, the pivots points H, K, L are generally disposed with pivot points L mounted on the frame 500 above the front axle 506 and pivot points H, K mounted on the frame 500 above the rear axle 508. Pivot points H are disposed above pivot points K and L. Holes may be formed through a wall of the frame 500, at each pivot point or through such other structure on the frame 500 that is sufficiently strong to withstand the loads placed on it during the course of use of the skid steer loader.

[0039] As shown in FIGS. 8 through 10, the lift assemblies 600 are attached to the frame 500 at the pivot points L, K, H such that the lift assemblies 600 are movable relative to the frame 500. The lift assemblies 600 have first links 602, second links 606, rear joining plates 604, lift actuators 608, and booms 610. Each boom 610 has a lift arm or top arm 612 and a front arm 616 joined by a pair of front joining plates 614, which may be integral with the front arm 616. As shown in FIGS. 8-10, a pair of joining plates 614 connects a respective top arm 612 and front arm 616, such as by welding. Likewise, the rear joining plates 604 connect the top arms 612.

[0040] The first links 602 are pivotally connected to the frame 500 at pivot points H and to the joining plates 604 at pivot points I, while the second links 606 are pivotally connected to the frame at pivot points K and to the joining plates 604 at pivot points J, and the lift actuators 608 are pivotally connected to the frame, proximate the operator compartment 700, at pivot points L and to the joining plates at pivot points M. Pivot points I, J and M may each be disposed near corners of the rear joining plates, with pivot points I and J being disposed near the rear of the joining plates when the lift assemblies are in the retracted position, pivot points J near the bottom and pivot points M near the front and just below where the booms and the joining plates are welded (or otherwise coupled) together.

[0041] As shown in FIGS. 8 through 10, the first links 602, the rear joining plates 604 between pivot points I and J, the second links 606 and the frame between pivot points K and H form a four-bar linkage. The lengths of the components making up the four-bar linkage are such that the first and second links are oscillating or rocking links. Nevertheless, it will be understood that the position of the pivot points can be altered to accommodate different lengths for the first links, the second links and the lift actuators. Moreover, although the rear joining plates are shown in FIGS. 8 through 10 as having a trapezoidal shape, it will be understood by one having ordinary skill in the art that the shape can be any number of shapes, such as polygons with more or fewer sides, a whole or part of a circle or ellipse, and the like. Regardless, the joining plates are shaped in one embodiment so that the first and second links are as short as possible while maintaining an acceptable maximum height for the bucket 800. Shorter links are less susceptible to collapsing under compressive loads and are more cost effective than longer links. In the embodiment shown, the links 602, 606 have a slightly arcuate configuration, but other configurations of the links can be used.

[0042] FIG. 9 shows the lift assemblies 600 in their fully raised position. In traversing the path from the retracted position shown in FIG. 8 to the raised position shown in FIG. 9, lower points on the front arms 616 travel in a generally flattened S-shape as shown in FIG. 10.

[0043] In operation, the lift assemblies 600 are extended by extending the lift actuators 608 so as to move pivot points M along a curve taking them further from pivot points L (which are fixed on the frame 500). As the lift actuators are extended, the first links 602 and the second links 606 rotate counter-clockwise about their respective pivot points H and K. Pivot points I and J travel about a circular arc with the center of the circle being pivot points H and K, respectively.

[0044] As shown in FIGS. 9 and 10, the skid steer loader has a pair of lift assemblies 600 joined by a rear cross member 620 and the bucket 800. The rear cross member 620 is welded or otherwise rigidly attached to the first links 602. Alternatively, the rear cross member 620 could be welded or otherwise rigidly attached to the rear joining plates 604 or in other positions, provided the rear cross member 620 provides rigidity. The bucket 800 is pivotally mounted or otherwise attached to the front arms 616 proximate the free ends thereof.

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[0045] As shown in FIGS. 8 and 9, the placement of the pivot points J, M in the rear joining plates and on the frame allows each hydraulic lift actuator 608 and respective second link 606 to move substantially in the same plane between the fully retracted and extended positions. The associated boom 610 also moves in this plane with the respective second link. As a result, each lift assembly 600 is not subjected to twisting moments about its longitudinal axis. In other words, the majority of moments and forces, including torsional forces, exerted on one side of the lift assembly as a result of lifting a heavy implement or bucket full of material act in a single plane substantially coinciding with the plane of the second link 606, the hydraulic lift actuator 608 and the boom 610.

[0046] By attaching the first links 602 to the frame 500 at pivot points H and to the joining plates 604 at pivot points I, the second links 606 to the frame at pivot points K and to the joining plates 604 at pivot points J, and the lift actuators 608 to the frame, proximate the operator compartment 700, at pivot points L and to the joining plates at pivot points M, the operator's field of vision is enhanced. As the pivot points H, I, J, and K are positioned proximate a rear wall or back surface 702 of the operator compartment, behind where the operator sits in the operator compartment 700, the first links 602, the second links 606, and the joining plates 604 are all positioned behind the operator and out of the critical line of sight of the operator. As shown in FIG. 8, the critical line of sight of the operator is not impeded when the lift assemblies 600 are lowered as the booms 610 are provided proximate the frame 500. In this position, the longitudinal axis of the top arms 612 of the booms 610 is positioned between pivot points H and K. When lift assemblies 600 are raised, as shown in FIG. 9, only the lift actuators 608 are positioned adjacent the operator compartment 700. Consequently, the operator will have a generally unobstructed field of view of the work area and surroundings when the links 602, 606, lift actuators 608 and joining plates 604 of the lift assemblies 600 are raised, and an unobstructed view of the work area and surroundings when the lift assemblies 600 are lowered, thereby providing for ease of operation and increased safety.

[0047] It is typical in many skid steer loaders to have parts of the engine and other components mounted below the operator compartment 700. For ease of service, the operator compartment 700 can be opened or pivoted to allow access to parts of the engine and other components. In previous skid steer loaders, the lift assemblies have been mounted to the operator compartment or designed in such a manner as to prevent easy access to the operator compartment and the components mounted under the operator compartment. However, in the embodiment shown, the attachment of the first links 602, the second links 606 and the lift actuators 608 are to the frame 500 and not to the operator compartment 700. This construction allows for the operator compartment 700 to be easily opened or pivoted to allow for better service access to parts of the engine and other components. In addition, as the first links 602, the second links 606 and the lift actuators 608 are all mounted at the rear of the skid steer loader 2, the operator compartment 700 can easily be pivoted forward whether the lift assemblies 600 are lowered or raised or in any position therebetween.

[0048] The positioning of the pivot points on the frame, where substantial structure must be provided to strengthen the base regardless of the presence of the pivot points, obviates the need to provide additional structure to support the lift assembly. In addition, the placement of the lift actuator is such that the full lift height of the bucket is achieved with a shorter actuator than is possible with some prior-art designs.

[0049] While the invention has been described with reference to a preferred embodiment, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof.

Claims

1. A skid steer loader comprising:

   - a frame (100, 500);
   - an operator compartment (300, 700) attached to said frame (100, 500);
   - lift assemblies (200, 600) movably mounted to said frame (100, 500), said lift assemblies (200, 600) being movable between a retracted position and an extended position;
   - joining plates (204, 604) rigidly coupled to said lift assemblies (200, 600);
   - first links (202, 602) pivotally coupled to said frame (100, 500) proximate a rear wall of the operator compartment (300, 700) and pivotally coupled to said joining plates (204, 604); and
   - second links (206, 606) pivotally coupled to said frame (100, 500) proximate said rear wall of the operator compartment and pivotally coupled to said joining plates (204, 604); and

   characterized in that as said lift assemblies (200, 600) are moved between said retracted position and said extended position, said joining plates (204, 604), said first links (202, 602) and said second links (206, 606) are positioned behind the rear wall of the operator compartment.

2. A skid steer loader according to claim 1 wherein lift actuators (208) are pivotally coupled to said frame (100) proximate said rear wall of the operator compartment and pivotally coupled to said joining plates (204), said lift actuators (208) being adapted to extend between a first position and a second position,

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whereby as said actuators (208) are moved to said second position, said lift assemblies (200) are moved to the extended position.

3. A skid steer loader according to claim 2 wherein said first links (202) are pivotally coupled to said joining plates (204) at or near a rear of the joining plate, said second links (206) being pivotally coupled to said joining plates (204) forward of and below said first link (202) when said lift actuator (208) is fully retracted, and said lift actuators (208) being pivotally coupled to said joining plates (204) above and forward of said second links (206) when said lift actuators (208) are fully retracted.

4. A skid steer loader according to claim 1 wherein the lift actuators (208, 608) are pivotally coupled to said frame (100, 500), proximate said operator compartment (300, 700).

5. A skid steer loader according to any of the preceding claims wherein said lift assemblies (200, 600) have top arms (212, 612) which are proximate the base (102, 502) when said lift assemblies (200, 600) are in the retracted position, so that when said lift assemblies (200, 600) are in the retracted position, the field of vision from the operator compartment to either side is unobstructed.

6. A skid steer loader according to any of the preceding claims wherein said operator compartment (300, 700) is movably disposed on top of said frame (100, 500), said operator compartment (300, 700) being movable independent of a position of said lift assemblies (200, 600).

7. A skid steer loader according to any of the preceding claims **characterized in that** said skid steer loader further comprises:

- said first link (202, 602) pivotally coupled to said frame (100, 500) at a first-link pivot (A, H);
- said second link (206, 606) pivotally coupled to said frame (100, 500) at a second-link pivot (D, K);
- a lift actuator (208, 608) adapted to extend and retract between fully retracted and fully extended positions, said lift actuator (208, 608) being pivotally coupled to said frame (100, 500) at a lift-actuator pivot (E, L);
- said joining plate (204, 604) pivotally coupled to said first link (202, 602), said second link (206, 606) and said lift actuator (208, 608) at a first-link-plate pivot (B, i), a second-link-plate pivot (C, J) and a lift-actuator-plate pivot (F, M), respectively; and
- a boom (210, 610) rigidly coupled to said joining plate (204, 604);
- said second link (206, 606) and said lift actuator (208, 608) being positioned so that in response to movement of said lift actuator (208, 608) from its retracted position to its fully extended position, said second link (206, 606) and said lift actuator (208, 608) remain coplanar such that the forces exerted on one side of the boom (210, 610) act in a plan which coincides with the plane of said second link (206, 606) and said lift actuator (208, 608).

8. A skid steer loader according to claim 7, **characterized in that** said first link (202, 602) is provided in the same plane as said second link (206, 606) and the lift actuator (208, 608) wherein as said lift actuator (208, 608) is moved from its retracted position to its fully extended position, said first link (202, 602), said second link (206, 606) and the lift actuator (208, 608) remain coplanar.

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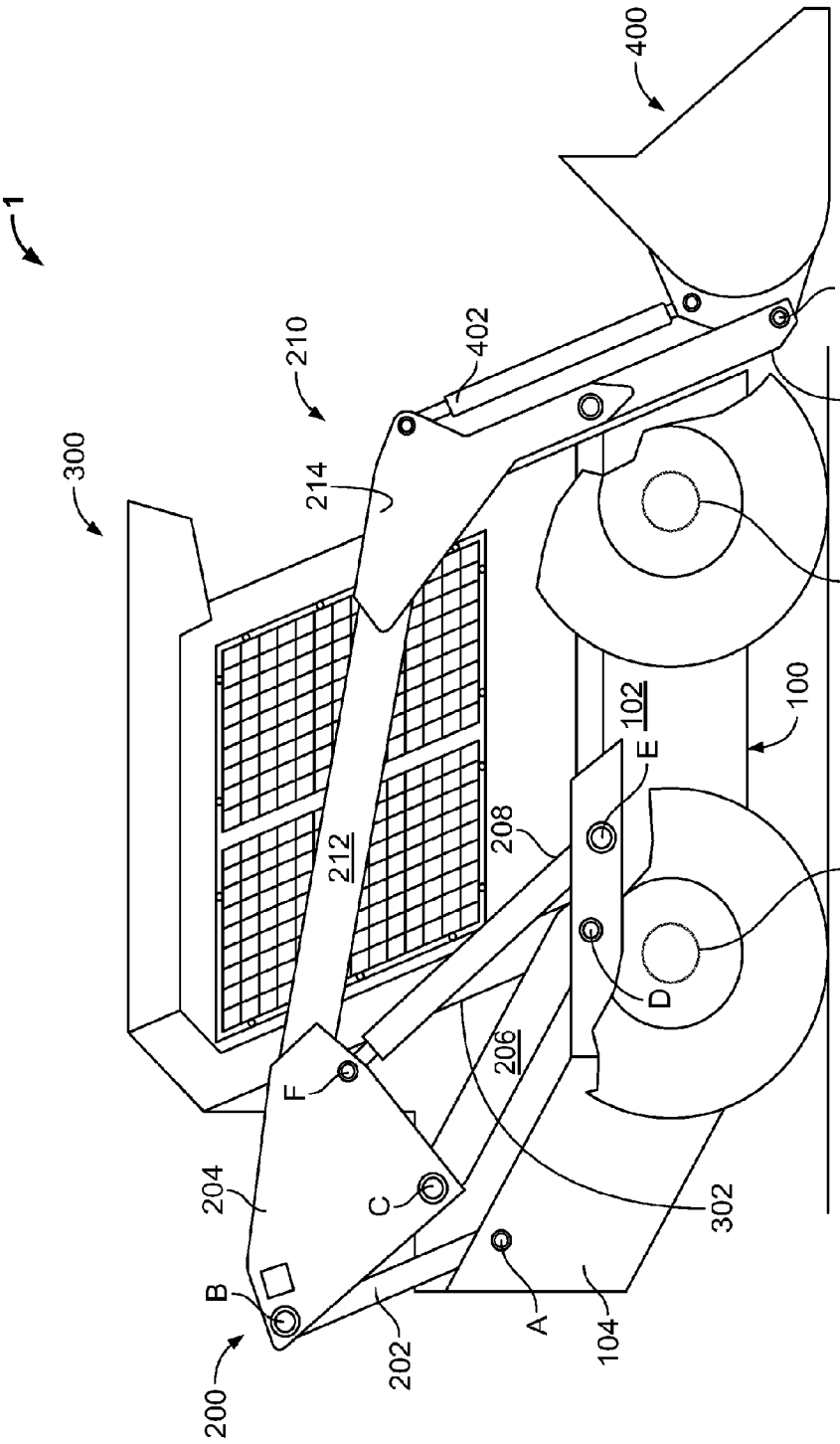


FIG. 1

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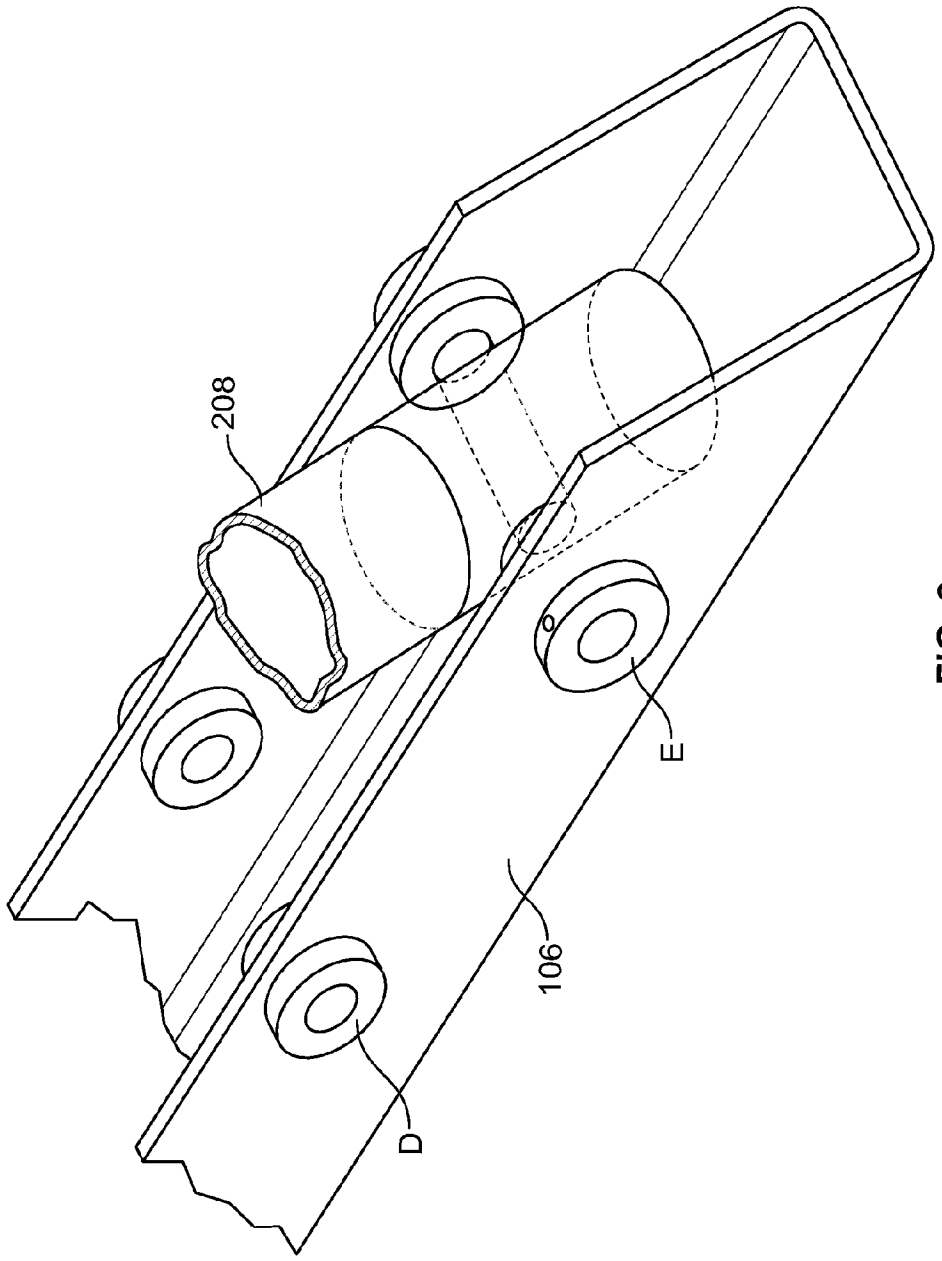


FIG. 2

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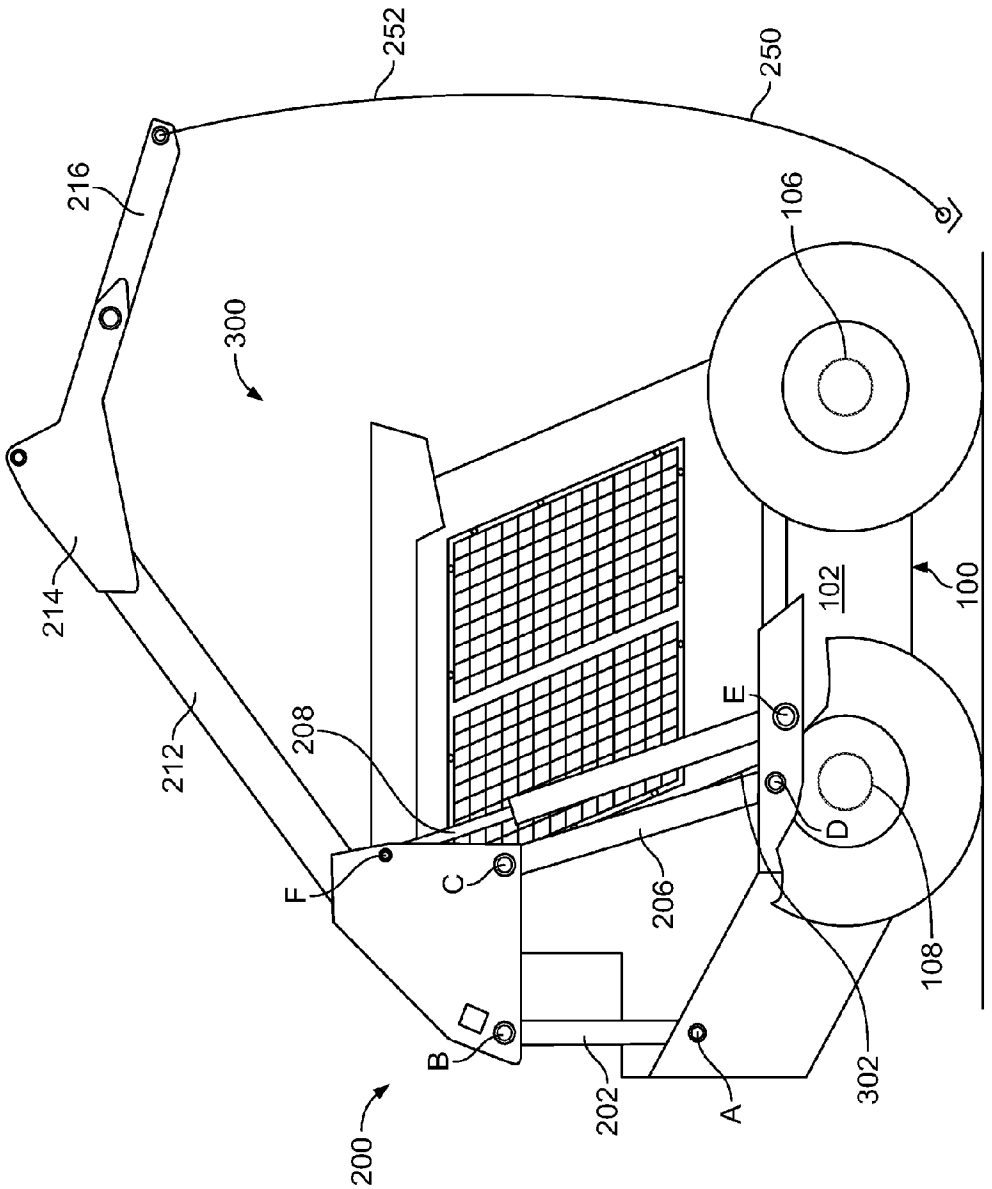


FIG. 3

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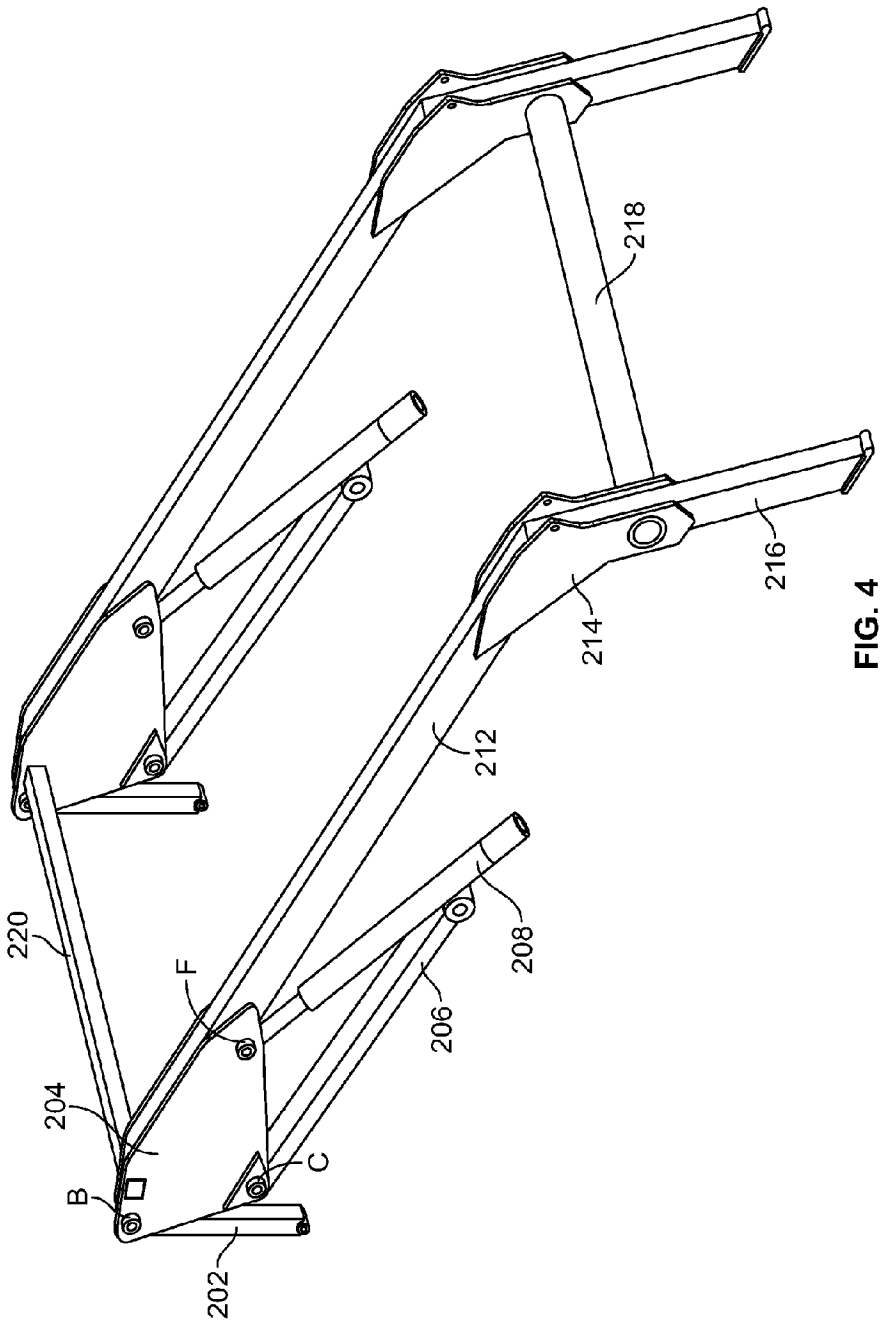


FIG. 4

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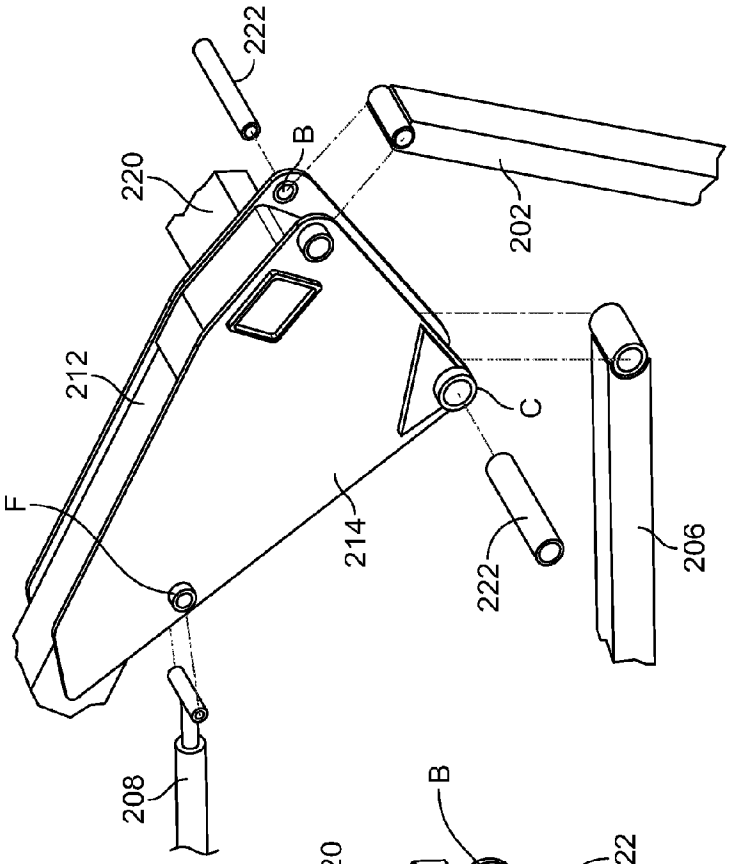


FIG. 6

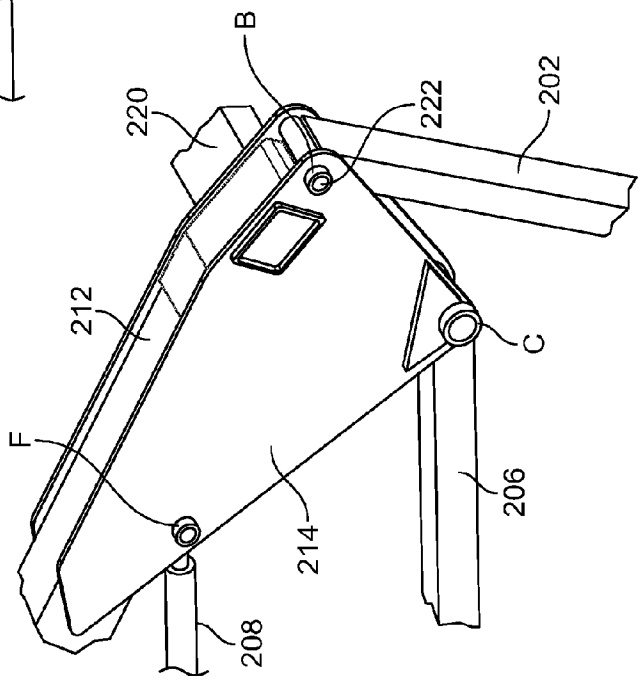


FIG. 5

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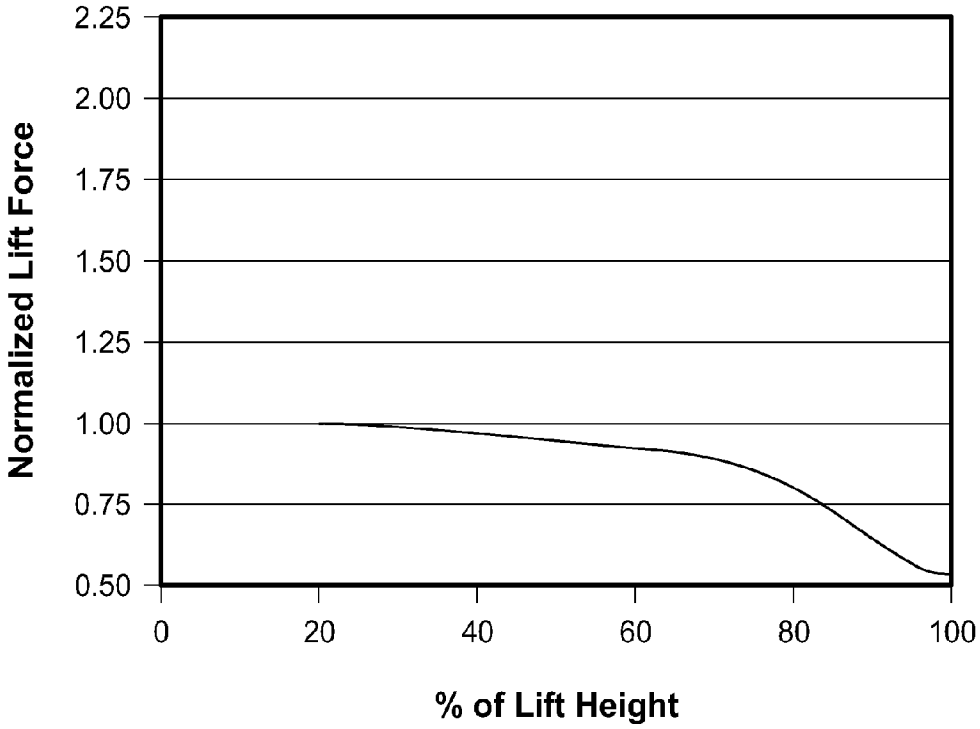


FIG. 7

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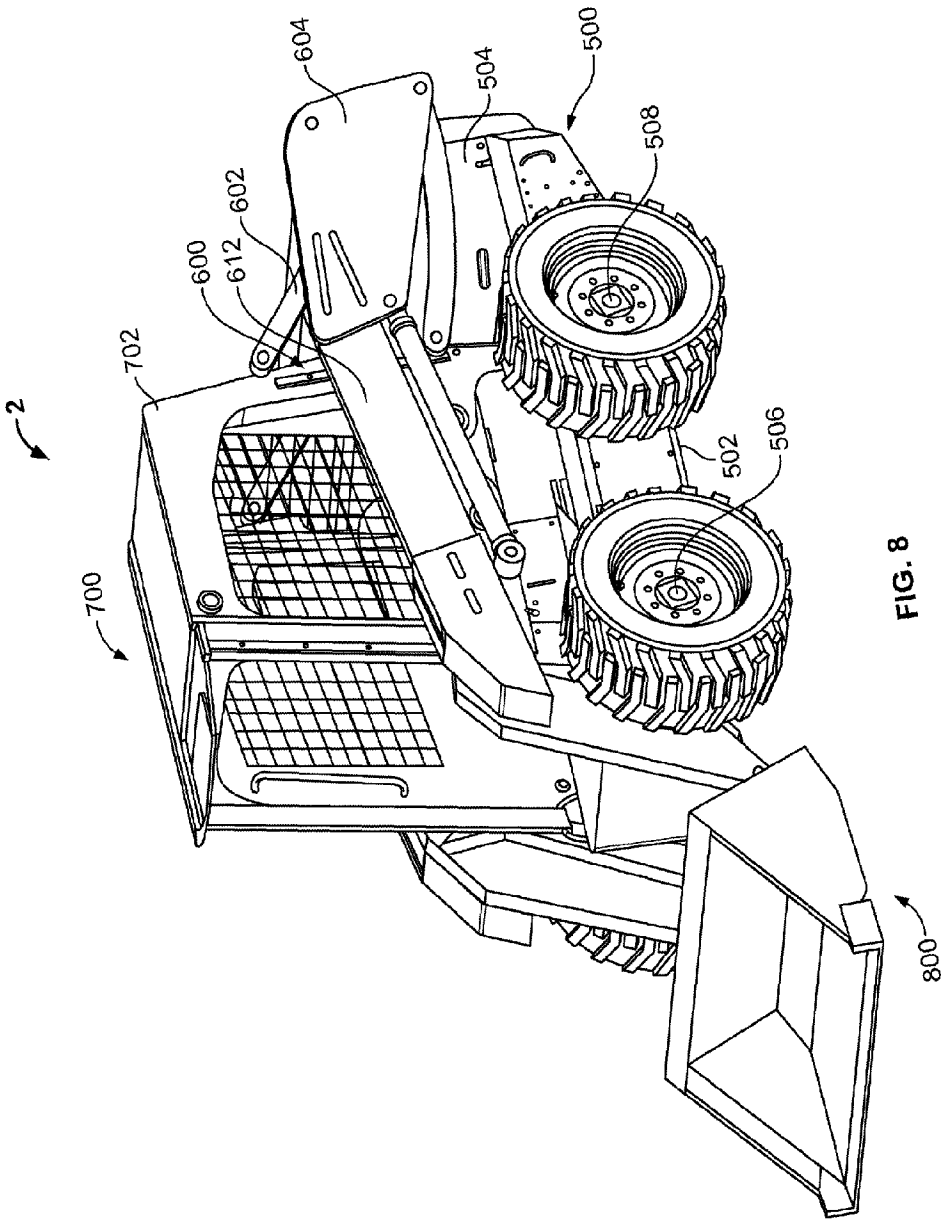


FIG. 8

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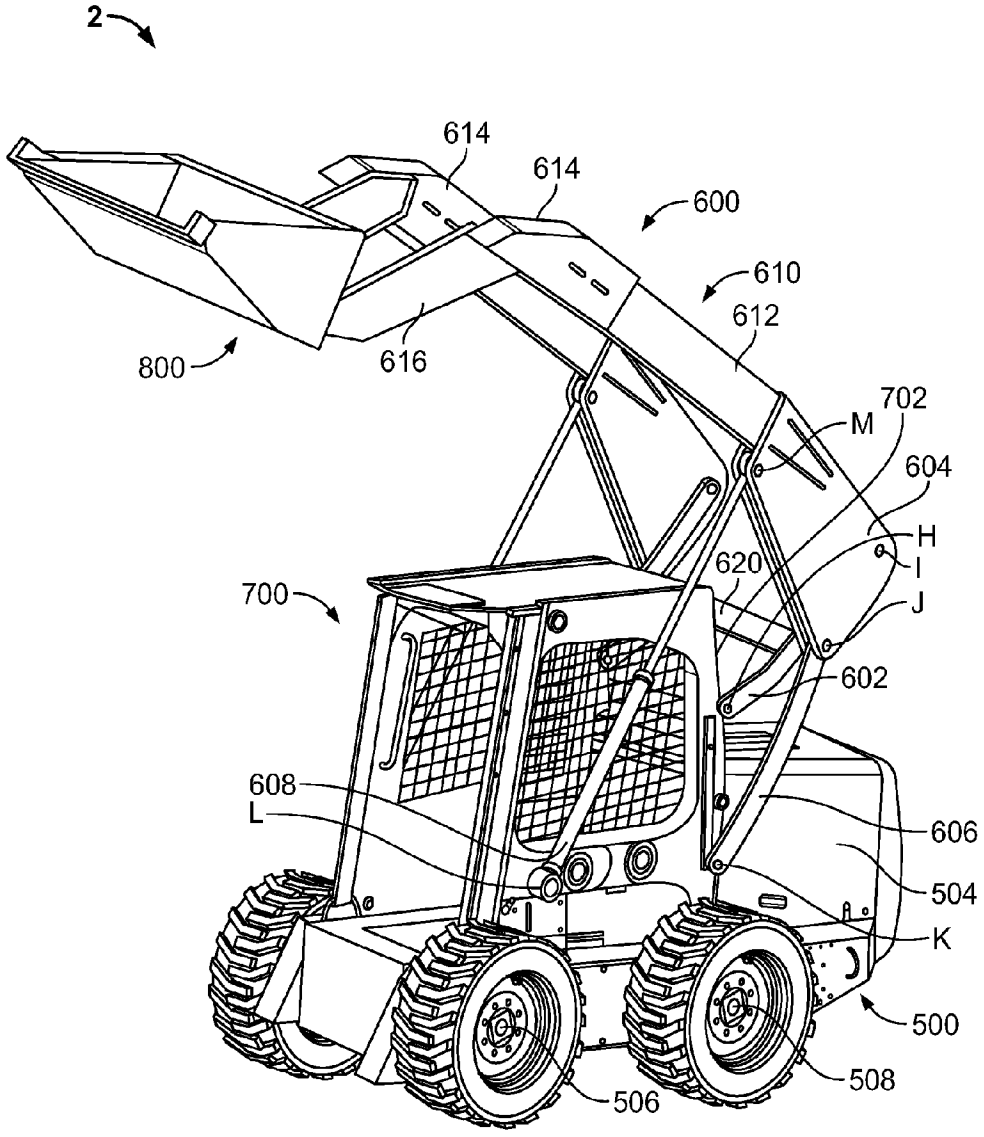


FIG. 9

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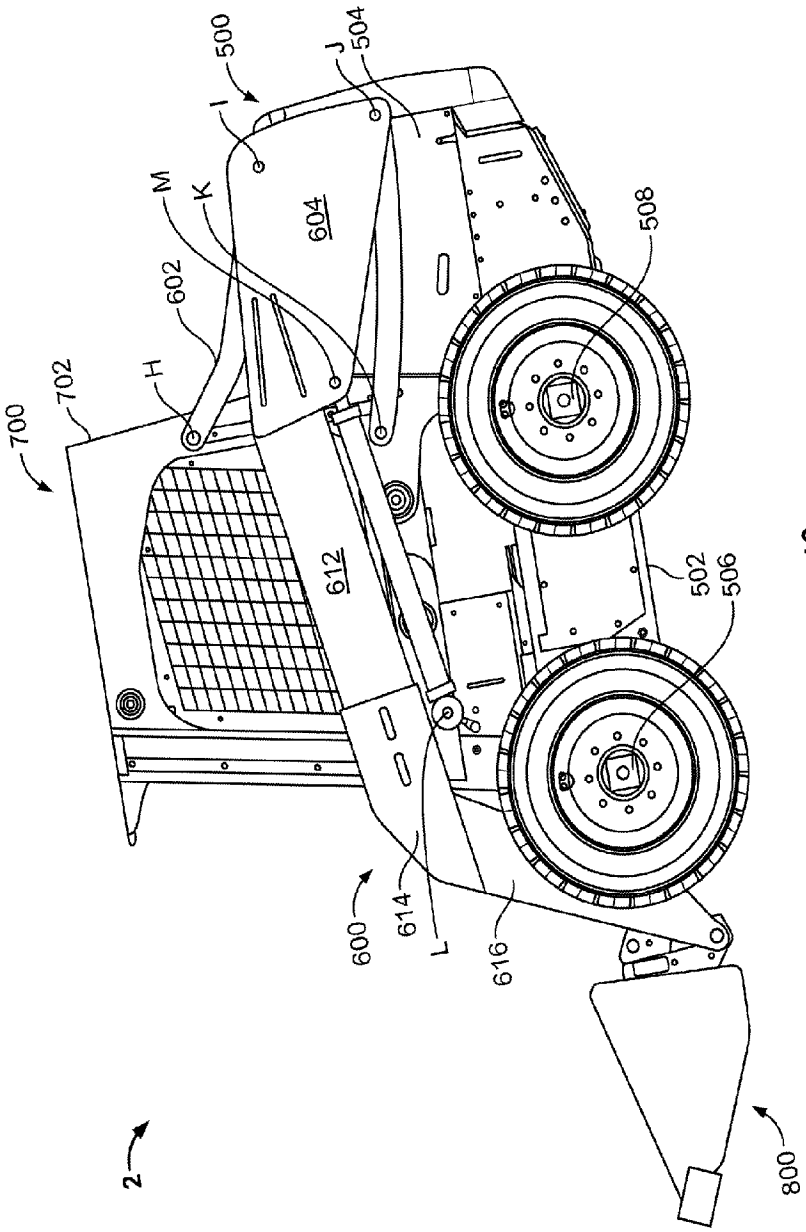


FIG. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 10 17 1189

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X A	US 2002/064445 A1 (DERSHEM BRIAN R [US] ET AL) 30 May 2002 (2002-05-30) * abstract; figures 1-4 * * paragraph [0014] - paragraph [0028] *	1,2,4-7 3,8	
X Y	US 5 609 464 A (MOFFITT JOHN M [US] ET AL) 11 March 1997 (1997-03-11) * abstract; figures 1-3 * * column 3, line 36 - column 6, line 67 *	1,4-6 2,3,7,8	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 November 2010	Bultot, Coralie

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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D : document cited in the application
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& : member of the same patent family, corresponding document

1

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 17 1189

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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09-11-2010

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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Espacenet

Bibliographic data: FR2209015 (A1) — 1974-06-28

No title available

Inventor(s):

Applicant(s): PRUNIER JEAN BERNARD [FR] ± (PRUNIER JEAN BERNARD,FR)

Classification: **- international:** ***A01D87/00; E02F3/34;*** (IPC1-7): A01C3/00; B65G67/00; E02F3/00
- cooperative: **A01D87/0069 (EP); E02F3/3405 (EP)**

Application number: FR19720035890 19721004

Priority number(s): FR19720035890 19721004

Also published as: FR2209015 (B1)

Abstract not available for FR2209015 (A1)

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DESCRIPTION FR2209015A1

[]

13 The invention relates to a front loader intended in particular for public works and more particularly for agricultural work.

15 This loader allows ri assery to transport and unload various materials in a skip or on a cart.

16 Double-girder lifting arms articulated on a fixed axis integral with a frame or a frame carried by a prime mover are already known.

18 The arm is rotated around this axis by the driving force of two jacks parallel to each other, the latter being mounted articulated, on the one hand, on the frame and, on the other hand, on each beam of the control arm. lifting.

21 During its lifting movement, the end of the arm carrying a bucket substantially describes an arc of a circle so that the projection of the bucket on the ground or the reach remains substantially constant.

24 Such devices give completely insufficient results for loading on high and wide trucks. Indeed, these do not allow to reach the opposite side of a bucket facing which they are.

26 First of all, the reach, bucket on the ground, is great and the significant breakout torque tends to make the rear wheels of the carrier vehicle take off from the ground when the load is removed. The latter, becoming unstable, no longer presents the desired security conditions for its normal use.

30 The reach in the high position is too low and does not allow it to move forward enough outwards to fill the body of a truck over its entire width.

32 It can be seen in a systematic manner on virtually all existing loaders on the market, that the reach decreases as the load rises above the level where the axis of the lifting arm is located.

34 The charger according to the invention overcomes these drawbacks.

35 Indeed, its particular constitution, the arrangement of its lever arms as well as the place of application of the driving force give it a range which increases throughout the rise of the load.

37 The reach, in the low position, that is to say the bucket on the ground, is very low and makes it

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possible to obtain a breakout force, at least three times greater with a tractor of the same capacity and of the same weight, while while keeping the same security conditions.

40 To this end, the invention relates to a front loader, in particular for public and agricultural works, characterized in that the lifting arm comprises two articulation points provided on each beam respectively in its rear half and at its rear end and is located connected to a frame with two wings mounted on the carrier vehicle by means of a lever arm and a connecting rod, said lever arm being articulated to pushing means pivoting on each of the wings of the frame.

45 The device, object of the invention, can be used for all loading, handling and earthworks of various materials and more particularly when, for various reasons, it is necessary to bring the load simultaneously high and far ahead.

48 Its application proves especially very interesting, in agriculture for the loading of manure on the spreading trailers with side walls in public works for the loading of large cannons with a tractor of small dimensions. In addition, it can be equipped with an automatic leveling device during lifting.

52 The invention will be well understood by referring to the following description and to the appended drawing in which - Figure I is a side view of an embodiment of the charger according to the invention - Figure 2 is a side view elevation of the loader according to the invention, the lifting arm in the low position and in the high position - figure 3 is a schematic plan view of an embodiment of the loader according to the invention and of the carrier vehicle - figure 4 is an elevational view of an alternative embodiment of the charger according to the invention.

58 The loader according to the invention will generally include a twin-girder lifting arm, therefore symmetry with respect to the axis of symmetry of the carrier vehicle.

60 Only the part of the loader located on the same side with respect to this axis will be described, the mazes members and the same mechanisms repeating themselves by symmetry on the other side.

63 It is understood that the loader according to the invention can also be produced in a single-beam version. This variant embodiment of the invention does not change its substance.

65 The device, object of the invention, firstly comprises a frame 1 consisting of two wings 2 and 3 joined by a front part 4.

67 This frame is fixed to the adaptation parts provided on the carrier vehicle for the rapid assembly and disassembly of the assembly or permanently fixed to the vehicle chassis.

69 Each wing of the frame comprises a substantially rectilinear body 5 and two flared extensions 6 and 7, respectively, front and rear.

71 Each extension has at least one point of articulation at its points.

72 The extension 6 has an upper articulation pot 8 and the extension 7 has two articulation points 9 and 10 respectively lower and upper.

74 The articulation point 8 carries an axis 11 connecting at this level the two wings 2 and 3 to each other. Each articulation point such as 8 further communicates via a lever arm 12 with a lifting arm 13. The connection between these last two parts is effected by a joint 14 located in the second rear part of the lifting arm.

78 The lever arm 12 is connected to a jack 15, the head 15a of which is mounted on an articulation axis 16, located in the vicinity of or at the level of the articulation 14 and the body 15b integral

with the articulation point 9.

81 The lifting arm 13 has at its rear end an articulation 17 connected to the articulation point 10 by means of a connecting rod 18.

83 The lifting arm 13 also has at its upper end a bucket 19, for example with a fork, mounted to pivot on the lifting arm by means of one or two joints such as 20.

85 According to another embodiment of the invention, the axis 16 is located directly on the lifting arm at the level of the articulation 14 or 17.

87 We. provides a variant where the jack 15 will directly exert its force on the connecting rod 18.

88 Another variant is provided (Figure 4) where the jack 15 will be placed in the other direction and will exert its force by resting on its piston head 15a mounted on the joint 9.

90 Spacers or transverse axes 21 and 22 could be provided bringing together the homologous articulation points 16 and 17 together, thus ensuring a connection between the two beams of the lifting arm. This makes it possible to increase the rigidity of the arm, especially during lateral forces on the gripping bucket located at the end of the arm.

94 The realization exposed here in detail The was designed more specifically for a loader of the manure fork type carried by a medium power agricultural tractor.

96 The points of application of the forces have been chosen so as not to generate excessive forces in the various elements.

98 The static mechanical study of the assembly shows that if one decreases for example the center distance of the articulation points 14 and 17, the forces in the lever arm 12 and in the connecting rod 18 increase, the stroke of the cylinder decreases. , but more pushing force is needed to achieve equivalent results.

102 Although the invention has been described with reference to a particular embodiment, it is understood that it is in no way limited thereto and that various modifications of shapes and materials can be made to it, without for this s 'move away from the scope and spirit of the invention.

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CLAIMS FR2209015A1

10 Claims

1.

14 Front loader intended in particular for public and agricultural works comprising a lifting arm, preferably a twin beam, characterized in that the lifting arm comprises two articulation points 14 and 17 provided on each beam respectively in its rear half and at its rear end and is connected to a frame 1 with two wings mounted on the carrier vehicle by means of a lever arm 12 and a connecting rod 18, said lever arm being articulated to thrust means mounted to pivot on each of the wings of the frame .

2.

23 Loader according to Claim 1, characterized in that the lever arm 12 communicates with the pushing means by a hinge pin provided on the upper part of said lever arm 12 and in an alternative embodiment of the loader according to the invention by the joint 14 directly.

3.

29 Loader according to Claim -1, characterized in that each wing of the frame has spikes and in that the two upper spikes of each wing are provided with articulations 8 and 10 connecting said wings respectively to the lever arms 12 and to the connecting rods 18.

4.

35 Charger according to Claim 1, characterized in that the articulations -8 of each wing are joined by an axis 11.

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5.

40 Loader according to Claim 1, characterized in that the thrust means are a jack 15 mounted between the articulation points 16 and 9 indif ferently in one direction or another, the body of the jack 15b being mounted to pivot either on the articulation 16, or on joint 9.

6.

46 Loader according to Claim 1, characterized in that the connecting rods 18 and the lever arms 12 are joined transversely to one another, preferably at the high articulation points.

Drawing pages of FR2209015 A1

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DEMANDE DE BREVET D'INVENTION

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(73) Titulaire : *Idem* (71)

(74) Mandataire :

(54) **Chargeur de travaux publics et en particulier chargeur agricole.**

(72) Invention de :

(33) (32) (31) Priorité conventionnelle :

2209015

L'invention se rapporte à un chargeur frontal prévu notamment pour les travaux publics et plus particulièrement pour les travaux agricoles.

Ce chargeur permet de ramasser, transporter et déverser dans une benne ou sur un chariot divers matériaux.

On connaît déjà des bras de levage bipoutres articulés sur un axe fixe solidaire d'un châssis ou d'un bâti porté par un engin moteur. Le bras se trouve mis en rotation autour de cet axe par la force motrice de deux vérins parallèles entre-eux, ces derniers étant montés articulés, d'une part, sur le bâti et, d'autre part, sur chaque poutre du bras de levage.

Au cours de son mouvement de levage, l'extrémité du bras portant un godet décrit sensiblement un arc de cercle de telle sorte que la projection du godet sur le sol ou la portée reste sensiblement constante.

De tels dispositifs donnent des résultats parfaitement insuffisants pour le chargement sur des camions hauts et de grande largeur. En effet, ceux-ci ne permettent pas d'atteindre le côté opposé d'une benne face à laquelle ils se trouvent.

Tout d'abord, la portée, godet au sol, est grande et l'important couple d'arrachement a tendance de faire décoller du sol les roues arrières du véhicule porteur lors de l'arrachement de la charge. Celui-ci devenant instable ne présente plus les conditions de sécurité voulues pour son emploi normal.

La portée en position haute est trop faible et ne permet pas d'avancer suffisamment celui-ci vers l'extérieur pour remplir la benne d'un camion sur toute sa largeur.

On peut constater d'une manière systématique sur pratiquement tous les chargeurs existant dans le commerce, que la portée diminue au fur et à mesure de la montée de la charge au-dessus du niveau où se situe l'axe du bras de levage.

Le chargeur selon l'invention permet de remédier à ces inconvénients.

En effet, sa constitution particulière, la disposition de ses bras de levier ainsi que l'endroit d'application de la force motrice lui donnent une portée qui augmente tout au long de la montée de la charge.

La portée, en position basse, c'est-à-dire godet au sol, est très faible et permet d'obtenir une force d'arrachement, au moins trois fois plus importante avec un tracteur de même capacité et de même poids, tout en gardant les mêmes conditions de sécurité.

A cet effet, l'invention se rapporte à un chargeur frontal notamment pour travaux publics et agricoles caractérisé en ce que le bras de levage comporte deux points d'articulation prévus sur chaque poutre respectivement dans sa moitié arrière et à son extrémité arrière et se trouve relié à un bâti à deux ailes monté sur le véhicule porteur par l'intermédiaire d'un bras de levier et

d'une bielle, ledit bras de levier étant articulé à des moyens de poussée montés pivotant sur chacune des ailes du bâti.

Le dispositif, objet de l'invention, peut être utilisé pour tous les travaux de chargement, de manutention et de terrassement de divers matériaux et plus particulièrement lorsque, pour diverses raisons, il est nécessaire d'amener la charge simultanément haut et loin devant.

Son application s'avère surtout très intéressante, en agriculture pour le chargement du fumier sur les remorques épandeuses à ridelles en travaux publics pour le chargement de gros camions avec un tracteur de dimensions peu importantes. En outre, il peut être doté d'un dispositif de mise à niveau automatique pendant le levage.

L'invention sera bien comprise en se référant à la description suivante et au dessin annexé dans lequel :

- la figure 1 est une vue de profil d'un mode d'éxécution du chargeur selon l'invention
- la figure 2 est une vue en élévation du chargeur selon l'invention, le bras de levage en position basse et en position haute
- la figure 3 est une vue schématique en plan d'un mode d'éxécution du chargeur selon l'invention et du véhicule porteur
- la figure 4 est une vue en élévation d'une variante d'éxécution du chargeur selon l'invention.

Le chargeur selon l'invention comportera en général un bras de levage bipoutre donc une symétrie par rapport à l'axe de symétrie du véhicule porteur. On ne décrira que la partie du chargeur située du même côté par rapport à cet axe, les mêmes organes et les mêmes mécanismes se répétant par symétrie de l'autre côté.

Il est bien entendu que le chargeur selon l'invention pourra également être réalisé en version monopoutre. Cette variante d'éxécution de l'invention n'en change pas le fond.

Le dispositif, objet de l'invention, comporte tout d'abord un bâti 1 constitué de deux ailes 2 et 3 réunies par une pièce frontale 4.

Ce bâti se trouve fixé aux pièces d'adaptation prévues sur le véhicule porteur en vue du montage et du démontage rapide de l'ensemble ou fixé à demeure sur le châssis du véhicule.

Chaque aile du bâti comporte un corps sensiblement rectiligne 5 et deux prolongations évasées 6 et 7 respectivement avant et arrière.

Chaque prolongation comporte à ses pointes au moins un point d'articulation.

La prolongation 6 possède un pot d'articulation supérieur 8 et la prolongation 7 deux points d'articulation 9 et 10 respectivement inférieur et su-

périeur.

Le point d'articulation 8 porte un axe 11 reliant à ce niveau les deux ailes 2 et 3 entre-elles. Chaque point d'articulation tel que 8 communique en outre par l'intermédiaire d'un bras de levier 12 avec un bras de levage 13. La liaison entre ces deux dernières pièces s'effectue suivant une articulation 14 située dans la deuxième partie arrière du bras de levage.

Le bras de levier 12 se trouve relié à un vérin 15 dont la tête 15a se trouve montée sur un axe d'articulation 16, situé au voisinage ou au niveau de l'articulation 14 et le corps 15b solidaire du point d'articulation 9.

Le bras de levage 13 comporte à son extrémité arrière une articulation 17 reliée au point d'articulation 10 par l'intermédiaire d'une bielle 18.

Le bras de levage 13 possède en outre à son extrémité supérieure un godet 19 par exemple à fourche monté pivotant sur le bras de levage par l'intermédiaire d'une ou de deux articulations telles que 20.

Selon un autre mode de réalisation de l'invention, l'axe 16 est situé directement sur le bras de levage au niveau de l'articulation 14 ou 17.

On prévoit une variante où le vérin 15 exercera directement sa force sur la bielle 18.

On prévoit une autre variante (figure 4) où le vérin 15 sera placé dans l'autre sens et exercera sa force en prenant appui sur sa tête de piston 15a montée sur l'articulation 9.

On pourra prévoir des entretoises ou des axes transversaux 21 et 22 réunissant les points d'articulation homologues 16 et 17 entre-eux assurant ainsi une liaison entre les deux poutres du bras de levage. Ceci permet d'augmenter la rigidité du bras surtout lors d'efforts latéraux sur le godet de prise situé en extrémité de bras.

La réalisation exposée ici en détails a été conçue plus spécialement pour un chargeur du type fourche à fumier porté par un tracteur agricole de moyenne puissance.

Les points d'application des forces ont été choisis afin de ne pas engendrer des efforts trop importants dans les divers éléments.

L'étude mécanique statique de l'ensemble montre que si l'on diminue par exemple l'entraxe des points d'articulation 14 et 17, les efforts dans le bras de levier 12 et dans la bielle 18 augmentent, la course du vérin diminue, mais une force de poussée plus importante est nécessaire pour obtenir des résultats équivalents.

Bien que l'invention ait été décrite à propos d'une forme de réalisation particulière, il est bien entendu qu'elle n'y est nullement limitée et qu'on peut y apporter diverses modifications de formes et de matériaux, sans pour cela s'éloigner du cadre et de l'esprit de l'invention.

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Revendications

1. Chargeur frontal prévu notamment pour travaux publics et agricoles comprenant un bras de levage, de préférence bipoutre caractérisé en ce que le bras de levage comporte deux points d'articulation 14 et 17 prévus sur chaque poutre respectivement dans sa moitié arrière et à son extrémité arrière et se trouve relié à un bâti 1 à deux ailes monté sur le véhicule porteur par l'intermédiaire d'un bras de levier 12 et d'une bielle 18, ledit bras de levier étant articulé à des moyens de poussée montés pivotant sur chacune des ailes du bâti.

2. Chargeur selon la revendication 1 caractérisé en ce que le bras de levier 12 communique avec les moyens de poussée par un axe d'articulation 16 prévu sur la partie supérieure dudit bras de levier 12 et dans une variante de réalisation du chargeur selon l'invention par l'articulation 14 directement.

3. Chargeur selon la revendication 1 caractérisé en ce que chaque aile du châssis comporte des pointes et en ce que les deux pointes supérieures de chaque aile sont pourvues d'articulations 8 et 10 reliant lesdites ailes respectivement aux bras de levier 12 et aux bielles 18.

4. Chargeur selon la revendication 1 caractérisé en ce que les articulations 8 de chaque aile sont réunies par un axe 11.

5. Chargeur selon la revendication 1 caractérisé en ce que les moyens de poussée sont un vérin 15 monté entre les points d'articulation 16 et 9 indifféremment dans un sens ou dans un autre, le corps du vérin 15b étant monté pivotant soit sur l'articulation 16, soit sur l'articulation 9.

6. Chargeur selon la revendication 1 caractérisé en ce que les bielles 18 et les bras de levier 12 sont réunis transversalement entre-eux de préférence aux points d'articulation hauts.

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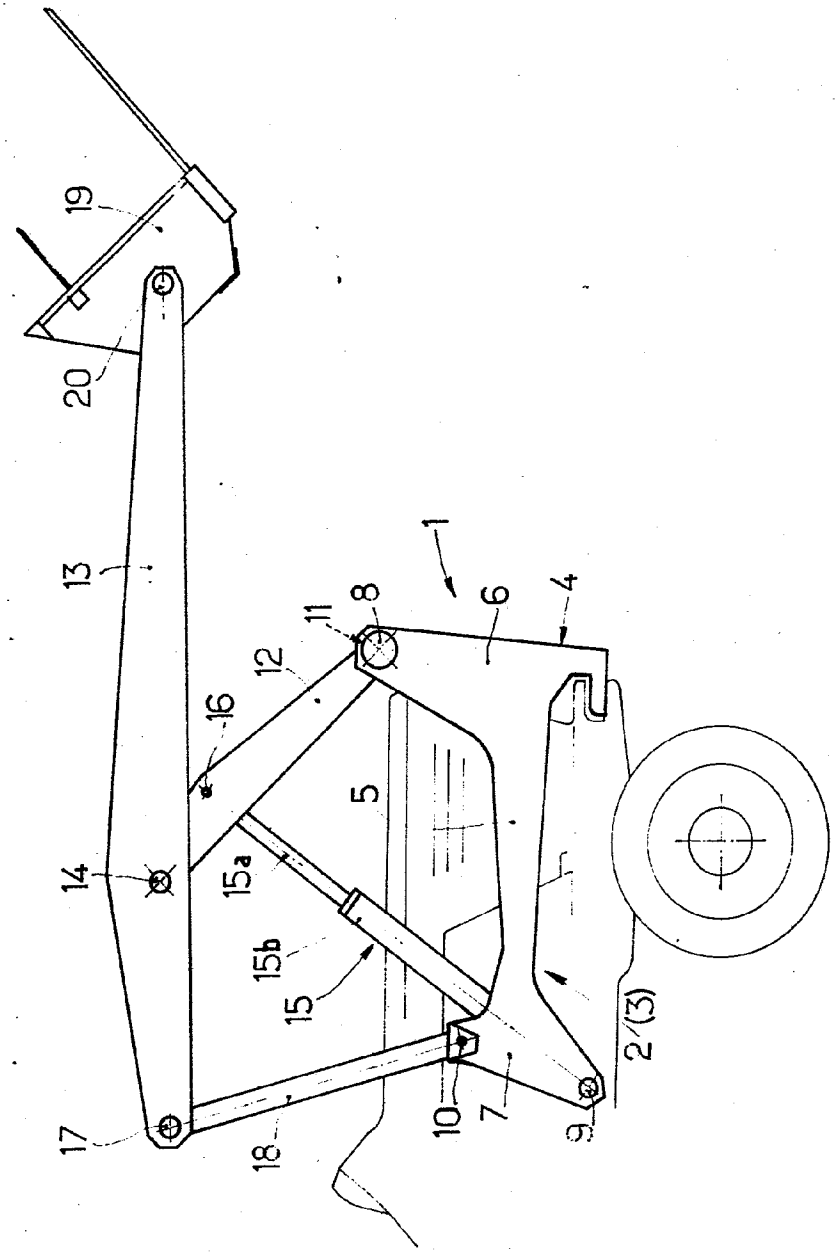


FIG.1

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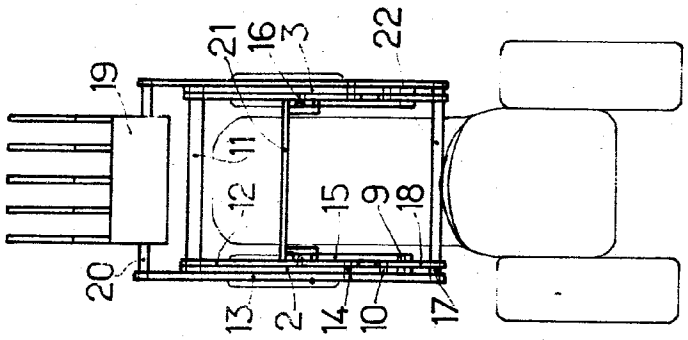


FIG.3

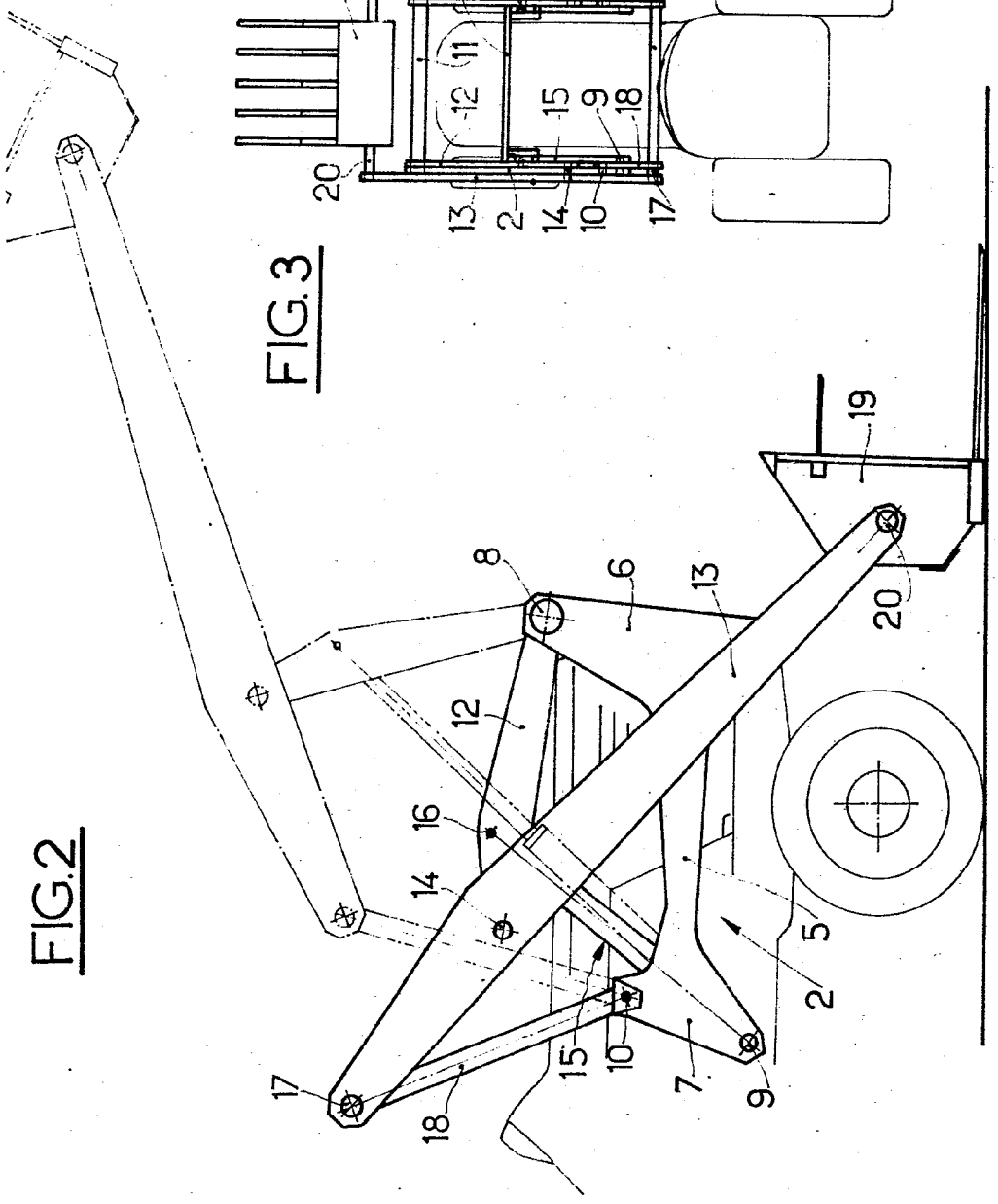


FIG.2

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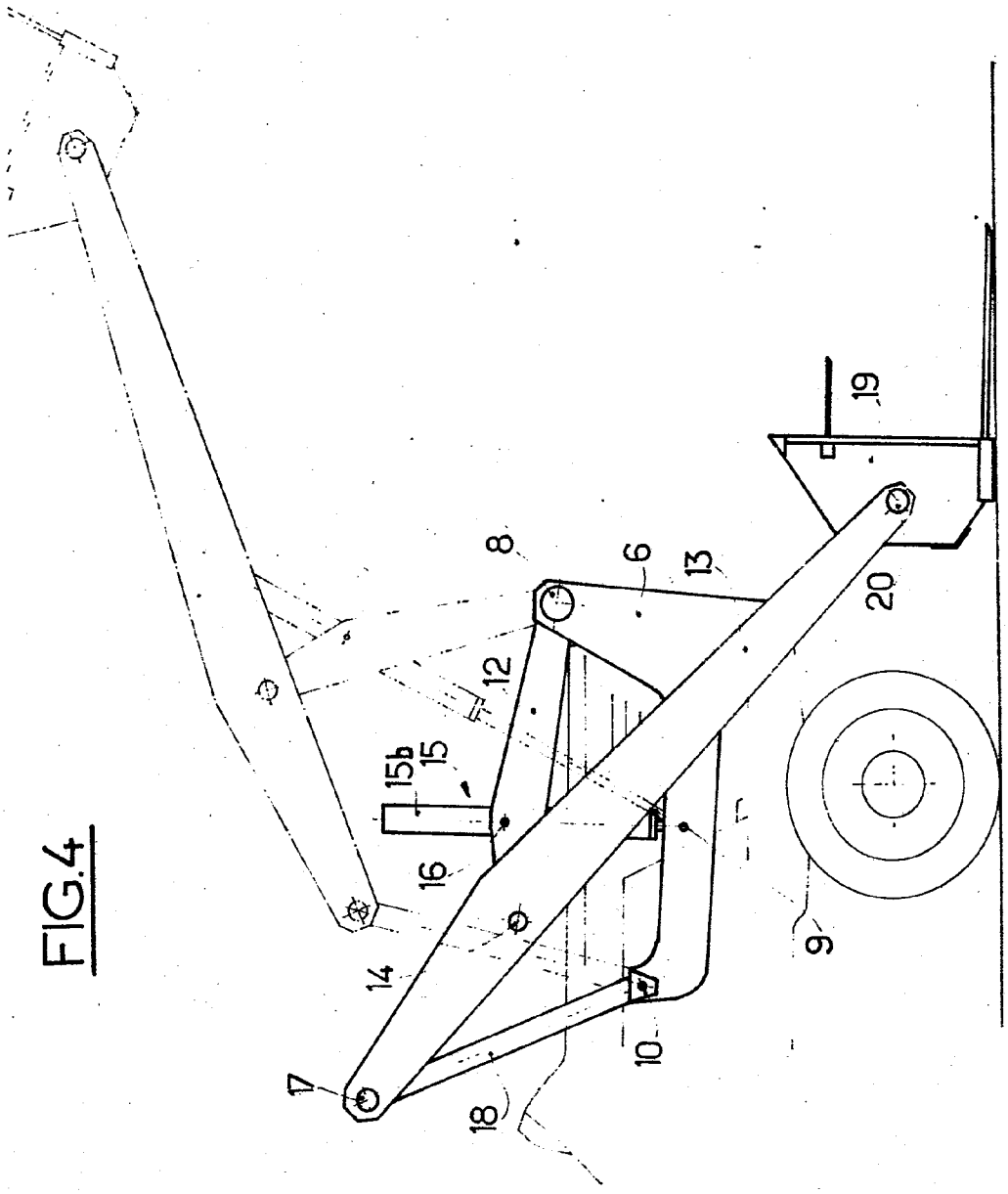


FIG.4

947,803

PATENT SPECIFICATION

DRAWINGS ATTACHED

947,803

Date of Application and filing Complete Specification March 22, 1961.

No. 10445/61.

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Index at acceptance:—**E1** F(10, 18); **B8** H(4, 5, 16)

International Classification:—**E 21 c** (B 66 f)

COMPLETE SPECIFICATION

Improvements in or relating to Lifting or Loading Apparatus

I, PIERRE DERRUPPE, a French Citizen, of 375, Avenue de Tivoli, Le Bouscat-Bordeaux (Gironde) France, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to lifting or loading apparatus and has for an object decreasing the bulk of the raising mechanism thereof, compared with previously known apparatus.

According to the invention, there is provided a lifting or loading apparatus comprising one or two lifting arms connected to a chassis, in which the means connecting the or one of the lifting arms to the chassis comprise a first connecting arm articulated to the lifting arm and to the chassis, a second connecting arm articulated to the lifting arm, a third connecting arm articulated to the second connecting arm and to the chassis, a fourth connecting arm articulated to the second connecting arm, and a jack having two members which are respectively mounted upon the chassis and the lifting arm.

Due to these means of connection the curve described by the lifting arm during the extension of the jack is relatively flattened; this effect could, no doubt, be obtained by mounting the arm pivotably on the chassis, but in this case the chassis would have to be much longer and much higher.

In one embodiment the fourth connecting arm is directly articulated to the chassis and to the second arm at a point distant from the pivot connecting the third connecting arm to the second arm, this latter thus forming a rocking lever.

In a second embodiment, the fourth connecting arm is articulated to the second arm at a common point with the pivot connecting the third connecting arm to the second arm, and apart from this is articulated to the first arm which thus forms a balance beam.

In order that the invention may be more clearly understood, reference will now be made to the accompanying drawings which show two specific embodiments thereof, and in which:—

Figure 1 shows a diagrammatic view in elevation of a first embodiment, the arms of which are in the low position,

Figure 2 shows a view similar to Figure 1, the arms being in their high position,

Figure 3 shows a diagrammatic view in elevation of a second embodiment of the apparatus, the arms being in the high position, and

Figure 4 shows a similar view to Figure 3, the arms being in their low position.

As is shown in the drawings, an apparatus according to the invention comprises a chassis 1 supported by wheels 2 and upon which are mounted lifting arms, one of these being seen at 3. In the examples shown, the apparatus comprises two lifting arms arranged on either side of the chassis, but, since the mechanisms actuating these arms are the same for each side, only that relative to the arm 3 will hereafter be described.

In Figures 1 and 2, one of the ends of the arm 3 is connected to the chassis 1 by an arm or connecting rod 4 which is articulated at 5 to the arm and at 6 to the chassis. Two other connecting arms or connecting rods 7 and 8 are articulated on the one hand to the chassis 1, respectively at 9 and 6, and on the other hand to a connecting arm 10, forming a rocking arm.

The pivot 11 of the arm 8 is located at one of the ends of the rocking arm while the pivot 12 of the arm 7 is located at an intermediate point along the length of the said rocking arm. The rocking arm is also articulated at 13 to the arm 3.

Finally the lower portion of a jack 14 is articulated at 15 to the chassis or support

1 while its upper portion is articulated at pivot 13.

During the extension of the jack, the pivot 13 follows the path shown by the line 16 (Figure 1). At the same time the pivot 5 is displaced along the arc 17. The pivot point 18, provided at the end of the arm 3 and on which is pivotably mounted a scoop for example, is displaced along the curve 19. It may be seen that this curve is very near to an arc of a circle, the centre of which would be at 20. If the arm had simply been articulated to the chassis at the point 20 the size of the chassis would clearly be greater both in length for an equivalent lifting capacity, and in height so as to include the point 20.

In Figures 3 and 4, the arm 3 and the chassis 1 may once more been seen, but in this case the two connecting rods 7 and 8 are articulated at the same point 21 to the arm 10. Apart from this, the connecting rod 8 is articulated not to the chassis but at 6' to the connecting rod 4, which now functions as a rocking arm; as in the embodiment in Figures 1 and 2, the connecting rod 4 is articulated at 6 to the chassis and at 5 to the arm 3.

The jack 14 is always articulated at 15 to the chassis and at 13 on the arm.

The reference 22 indicates a jack for employing the scoop 23, which is articulated at 18 to the arm 3.

The embodiment in Figures 3 and 4 has the advantage over that of Figures 1 and 2, that the travel of the scoop is not proportional to the travel of the jack 14; two-thirds of this latter correspond to about half the travel of the scoop. The result is that a greater power is exerted upon the scoop at the beginning of its travel, during shovelling, i.e. at the moment when the resistance which the scoop meets is greater. Apart from this the jack is situated outside the wheels and there are only two small rods articulated upon the chassis 1.

It will be clear that although reference has been made in the specific description to a scoop, devices other than scoops could be controlled by the mechanisms described, e.g., crane hooks or grabs.

WHAT I CLAIM IS:—

1. Lifting or loading apparatus comprising one or two lifting arms connected to a chassis, in which the means connecting the or one of the lifting arms to the chassis comprise a first connecting arm articulated to the lifting arm and to the chassis, a second connecting arm articulated to the lifting arm, a third connecting arm articulated to the second connecting arm and to the chassis, a fourth connecting arm articulated to the second connecting arm, and, a jack having two members which are respectively mounted upon the chassis and the lifting arm.

2. Lifting or loading apparatus as claimed in claim 1, in which the jack is articulated to the lifting arm by means of a pivot connecting the second connecting arm to the said lifting arm.

3. Lifting or loading apparatus as claimed in claim 1 or 2, in which the fourth connecting arm is directly articulated to the chassis and is articulated to the second arm at a point distant from the pivot connecting the third connecting arm to the second arm, this latter thus forming a rocking arm.

4. Lifting or loading apparatus as claimed in claim 3, in which the first and fourth connecting arms are connected to the chassis by the same pivot.

5. Lifting or loading apparatus as claimed in claim 1 or 2, in which the fourth connecting arm is articulated to the second arm at a common point with the pivot connecting the third connecting arm to the second arm, and is furthermore articulated to the first arm, which thus forms a rocking arm.

6. Lifting or loading apparatus substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings.

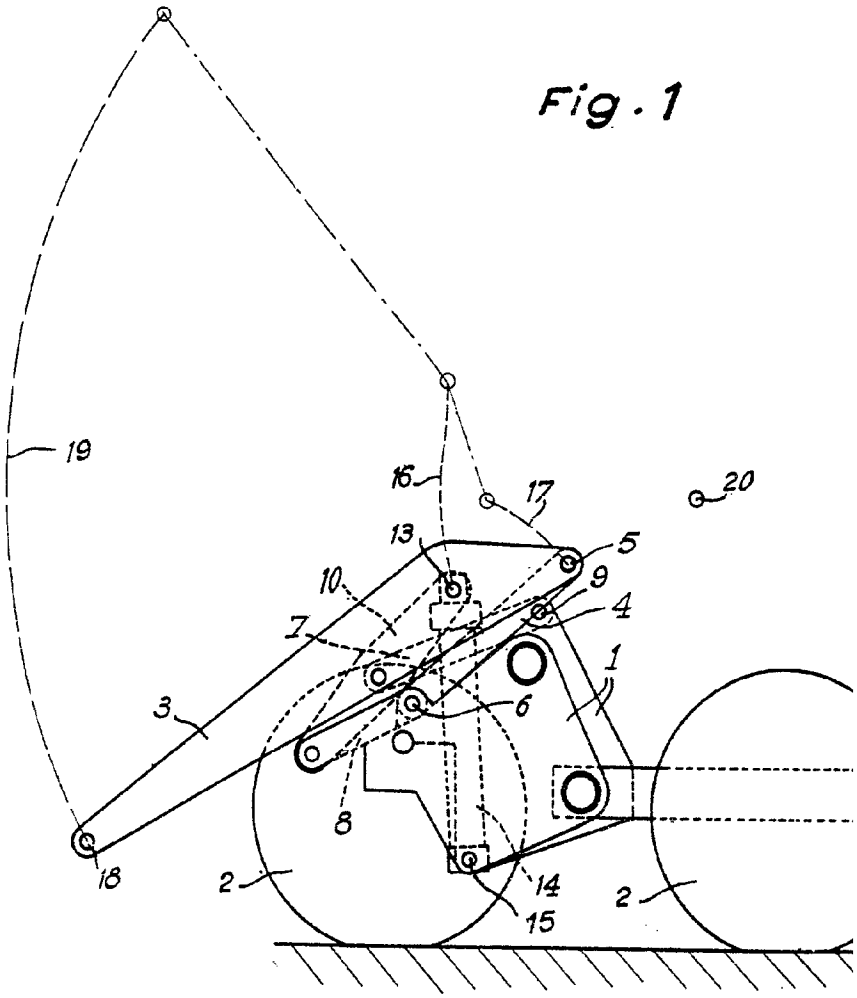
7. Lifting or loading apparatus, substantially as hereinbefore described with reference to Figures 3 and 4 of the accompanying drawings.

BARON & WARREN,
16, Kensington Square,
London, W.8,
Chartered Patent Agents.

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Fig. 1



947,803 COMPLETE SPECIFICATION
2 SHEETS

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SHEET 1

Fig. 1

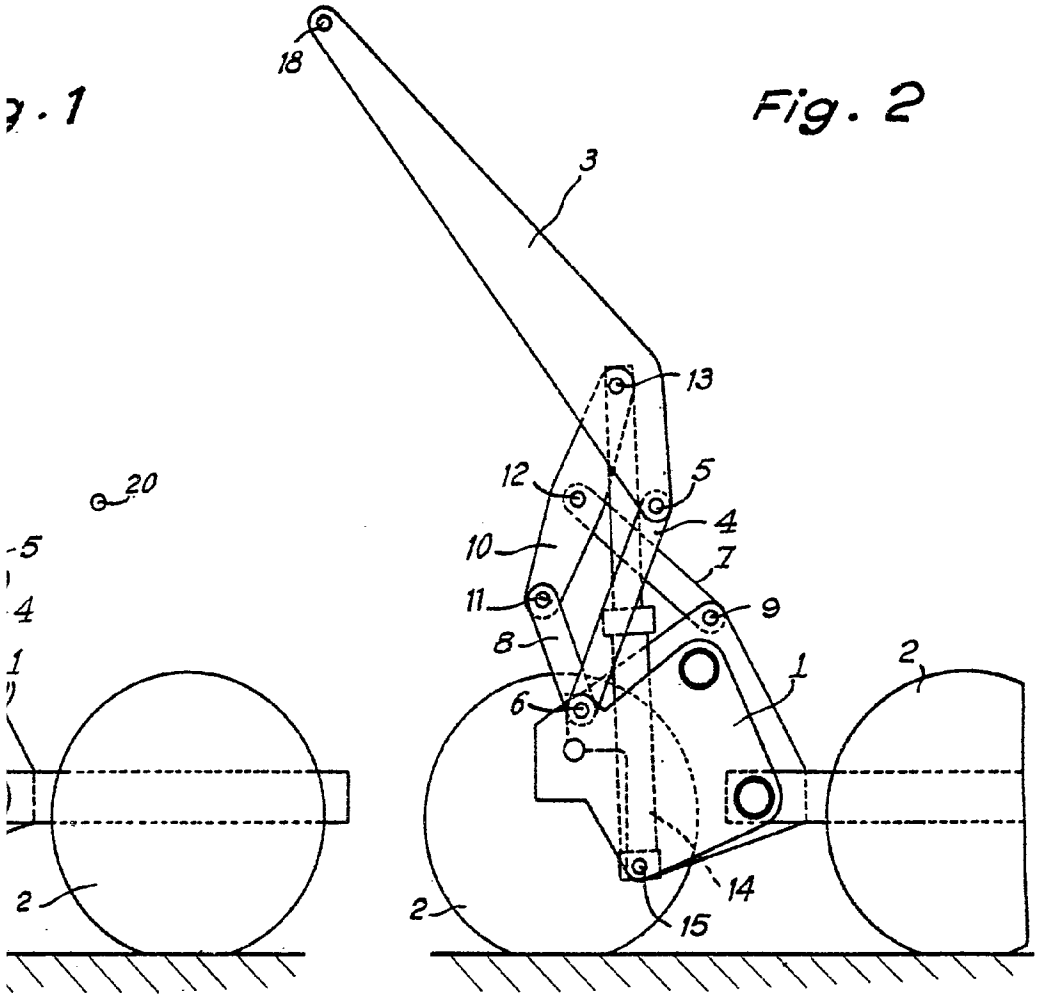


Fig. 2

947,803 COMPLETE SPECIFICATION

2 SHEETS

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SHEET 1

Fig. 1

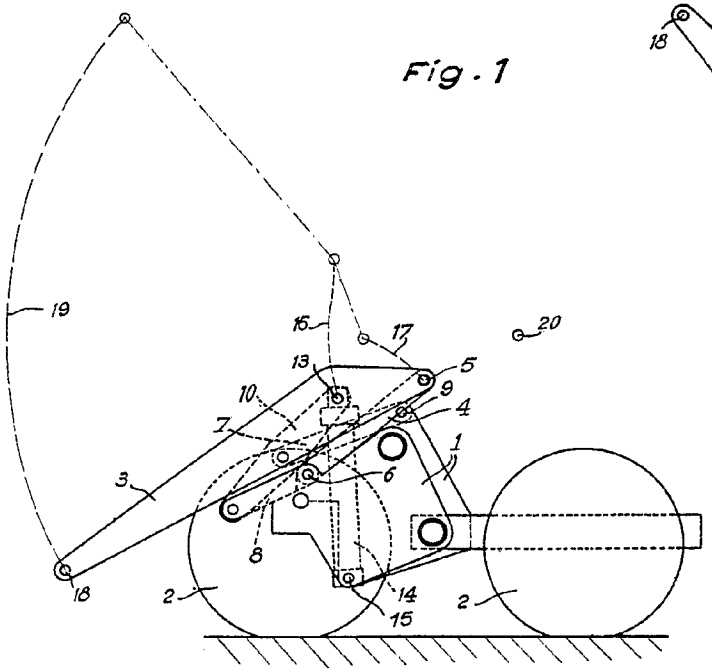
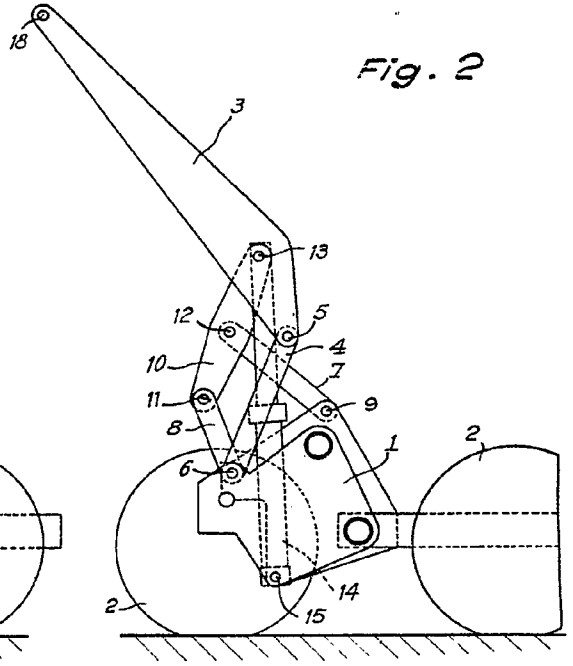


Fig. 2



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FIG. 3

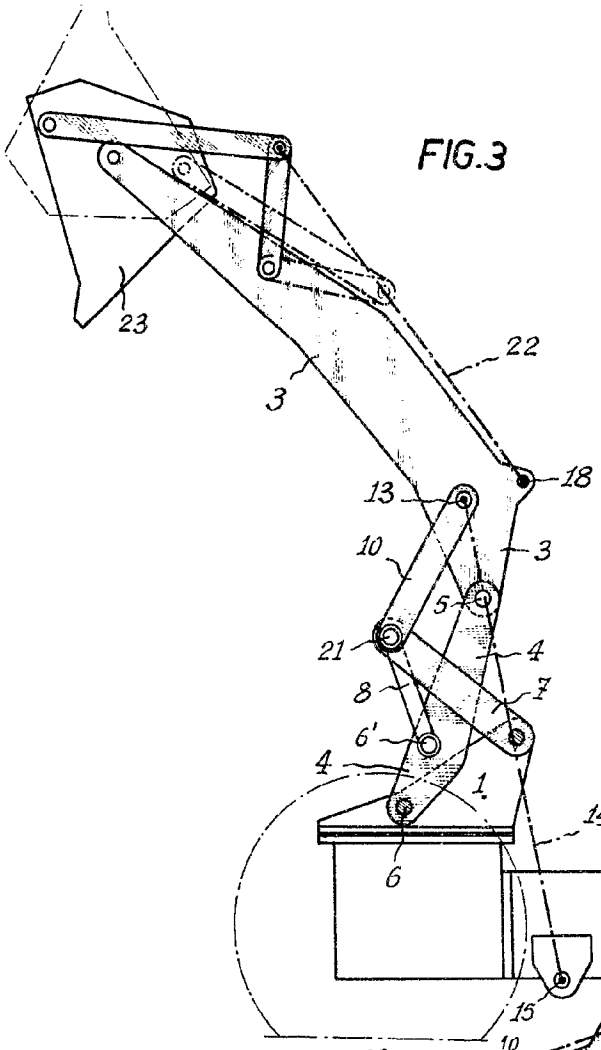
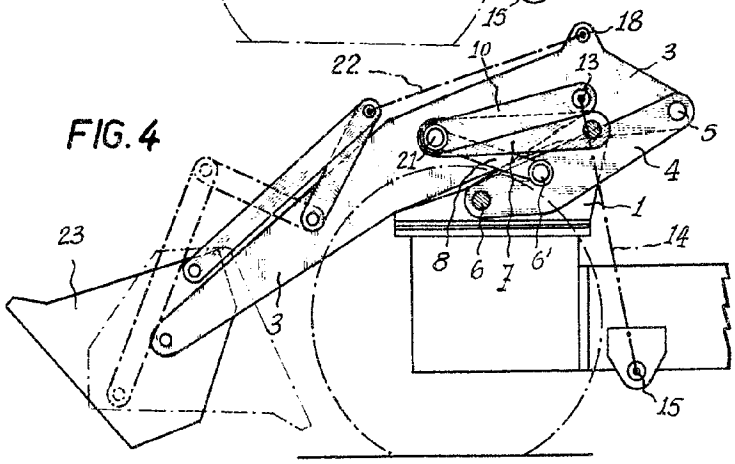

23
22
3
18
13
10
3
5
21
4
8
7
6'
4
1
14
6
15

FIG. 4


18
22
10
13
3
5
21
4
1
14
23
8
6
7
6'
3
15

PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventor: LOUIS JOHN STEPHENSON

832,800

Date of filing Complete Specification: Feb. 17, 1958.

Application Date: Feb. 21, 1957. *No. 5936/57.*

Complete Specification Published: April 13, 1960.

Index at acceptance:—Class 68(1), F10.

International Classification:—E21c.

COMPLETE SPECIFICATION

Mechanical Appliances for Earth Moving

We, ANTHONY HOISTS LIMITED, a Company registered under the Laws of Great Britain, of 170, Piccadilly, London, W.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to mechanical appliances for earth moving operations of the kind comprising a jib arm pivotally attached at one end to a supporting structure such as the chassis of a vehicle, and a bucket or other mechanical tool pivotally attached to the other end of the arm. The invention is particularly although not exclusively applicable to so-called overloader bucket attachments where the jib arm can swing the bucket from the front, over the top of the vehicle, and load a wagon behind.

In such mechanical appliances it is necessary to provide means for controlling the angular position of the bucket relatively to the jib arm since otherwise of course earth will be spilt from the bucket as the jib arm is swung over the vehicle. It is an object of the invention to provide an improved control mechanism for adjusting the angular position of the bucket in space and in particular for maintaining it in a constant attitude in space.

Thus a mechanical appliance for earth moving operations of the kind referred to according to the present invention comprises a servo motor such as a hydraulic ram connected between the tool and the jib arm, to control the angular position of the tool relative to the arm, a servo control device arranged to control the movement of the servo motor, and a follow-up linkage responsive to angular movements of the tool relative to the supporting structure, and arranged to influence the servo control device so as to maintain the tool in a substantially constant attitude relative to the supporting structure, irrespective of the angular position of the jib arm.

Preferably the apparatus includes means for adjusting the datum setting of the servo control device, to adjust the attitude of the tool relative to the structure.

Moreover in a preferred arrangement the followup linkage includes a parallel-linkage system, with one link connected to a point on the tool, and lying parallel to the jib arm, and another link connection between the free end of this first link and the pivotal connection between the jib arm and the supporting structure, the servo control device being connected to this second link.

The invention may be performed in various ways, and one specific embodiment will now be described by way of example with reference to the accompanying drawing as applied to an overloader bucket tool mounted on an endless-track-supported tractor.

In this example the jib arm structure 10 and the bucket implement 11 are both of well known form, the jib arm comprising a pair of parallel girders pivotally attached at their lower ends on a common horizontal fixed axis 12 to part of the chassis or fixed structure of the tractor indicated generally at 13. The bucket has a flange 14 secured to its underside and this flange is pivotally connected on a horizontal axis 15 to the two upper ends of the jib girders 10. Hydraulic ram mechanism (not shown) is also provided in a manner known per se for controlling the angular movement of the jib arm structure relative to the tractor chassis and this movement preferably extends over an arc of approximately 180° from a position indicated in chain lines at A in front of the tractor where the bucket is on or close to the ground to a position B above and behind the tractor where the bucket can unload on to a wagon behind.

The mechanism for controlling the angular position of the bucket comprises a double-acting hydraulic ram 16 the cylinder of which is pivotally attached at 17 to a lug on the jib arm structure, while the free end of the ram piston is pivotally connected at 18 to a flange at the lip of the bucket at a point spaced appreciably from the pivotal connection 15 be-

tween the bucket and the jib arms.

Hydraulic fluid is supplied to opposite ends of the ram cylinder through two flexible pressure connections 19, 20, which run down the length of the jib arms 10 to a servo valve control device 21 mounted on the chassis of the tractor. This servo valve is in the form of a two-way reversing valve having a valve cylinder 22 with inlet and relief ports 23, 24 and two control ports 25, 26 connected respectively to the two flexible pressure lines 19, 20. Within this valve cylinder is arranged a valve spindle 27 arranged selectively to connect one or other of the control ports 25, 26 to the source of pressure fluid 23 and the other control port to relief 24.

A follow-up linkage is provided consisting of a first link 30 lying generally parallel to the jib arms 10 and having its outer end pivotally attached to the flange 14 on the bottom of the bucket 11, the inner end of this link being pivotally attached to a second link 31 which is in turn pivotally mounted on the common horizontal axis 12 about which the jib arm structure 10 pivots on the tractor chassis. The effective length of this second link 31 between pivotal centres is equal to the effective distance between the point of connection 32 between the first link 30 and the bucket, and the pivotal connection 15 between the bucket and the jib arm structure. This linkage 30, 31, 10, 14, thus constitutes a parallel linkage system and the attitude of the second link 31 relative to the tractor chassis will always correspond exactly to that of the bucket irrespective of movements of the jib arm 10 relative to the chassis.

A point 33 on the second link 31 is pivotally connected through an intermediate link 34 to one end of a differential mechanism comprising a floating link 35 the mix point of which is pivotally connected to the spindle 27 of the servo control valve 21, while the other end of the floating link 35 is pivotally connected through another intermediate link 36 to a bell crank lever 37 pivotally attached at 38 to a fixed part of the tractor chassis and constituting a manual control.

In operation therefore with the jib arm structure 10 stationary it will be seen that movement of the manual control lever 37 will tilt the floating link 35 and will move the valve spindle 27 to supply pressure fluid to one end or other of the hydraulic ram 16 controlling the angular position of the bucket 11. As the bucket swings about its pivotal connection 15 with the jib arm the second link 31 of the parallel linkage will act as a follow-up device to move the opposite end of the floating link progressively until the servo valve 27 returns to its closed position and the bucket will then be locked in this newly selected attitude relative to the tractor chassis.

If the jib arm structure is then swung on its axis 12 by its independent hydraulic ram, the consequent pivotal movement of the bucket 11 in space will be transferred directly to the second link 31 of the parallel linkage and this again will operate the servo valve 21 to control the ram 16 attached to the bucket so as to return the bucket to its original attitude.

It will be appreciated that both operations of moving the jib arm 10 and bucket 11 may be carried out simultaneously if desired. Normally however when the jib arms have been swing rearwardly to position B the control 37 is actuated to tilt the bucket to the position indicated at C.

It will be noted that when the jib arm is depressed as at position A, the geometry of the mechanism prevents the bucket from remaining horizontal. A bell crank lever 40 is therefore provided, pivoted at 41 to the chassis 13, and arranged to impose a limit to the movement of link 34 when the jib arm is so depressed.

WHAT WE CLAIM IS:—

1. A mechanical appliance for earth moving operations, comprising a jib arm pivotally attached at one end to a supporting structure such as the chassis of a vehicle, and a bucket or other mechanical tool pivotally attached to the other end of the arm, a servo motor such as a hydraulic ram connected between the tool and the jib arm to control the angular position of the tool relative to the arm, a servo control device arranged to control the movement of the servo motor, and a follow-up linkage responsive to angular movements of the tool relative to the structure, and arranged to influence the servo control device so as to maintain the tool in a substantially constant attitude relative to the supporting structure, irrespective of the angular position of the jib arm.

2. An appliance as claimed in Claim 1, including means for adjusting the setting of the servo control device, to adjust the attitude of the tool in space.

3. An appliance as claimed in Claim 1 or Claim 2, in which the follow-up linkage includes a parallel-linkage system, with one link connected to a point on the tool, and lying parallel to the jib arm, and another link connected between the free end of this first link and the pivotal connection between the arm and the supporting structure, the servo control device being connected to this second link.

4. An appliance as claimed in any of the preceding claims in which the angular position of the tool in relation to the structure is adjustable in intermediate positions of the jib arm.

5. An appliance as claimed in any of the preceding claims in which the servo motor comprises a single hydraulic ram.

6. A mechanical earth moving vehicle substantially as described with reference to the accompanying drawing.

KILBURN & STRODE,
Agents for the Applicants.

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PROVISIONAL SPECIFICATION

Mechanical Appliances for Earth Moving

We, ANTHONY HOISTS LIMITED, a Company registered under the Laws of Great Britain, of 170 Piccadilly, London, W.1, do hereby declare this invention to be described in the following statement:—

This invention relates to mechanical tools for earth moving or like operations comprising a jib arm pivotally attached at one end to a supporting structure such as the chassis of a vehicle, and a bucket or other implement pivotally attached to the other end of the arm. The invention is therefore particularly although not exclusively applicable to so called over-loader bucket attachments where the jib arm can swing the bucket from the front, over the top of the vehicle, and load a wagon behind.

In mechanical tools of this kind it is necessary to provide means for controlling the angular position of the bucket relatively to the jib arm since otherwise of course earth will be spilt from the bucket as the jib arm is swung over the vehicle. It is an object of the invention to provide an improved control mechanism for adjusting the angular position of the bucket and in particular for maintaining it in a constant attitude in space.

Thus a mechanical tool for earth moving or like operations of the kind referred to according to the present invention comprises a servo motor such as a hydraulic ram connected between the implement and the jib arm, to control the angular position of the implement relative to the arm, a servo control device arranged to control the movement of the servo motor, in response to angular movements of the arm relative to the supporting structure, and a follow-up linkage responsive to angular movements of the implement relative to the jib arm, and arranged to influence the servo control device so as to maintain the implement in a substantially constant attitude relative to the supporting structure, irrespective of the angular position of the jib arm.

Preferably the apparatus includes means for adjusting the setting of the servo control device, to adjust the attitude of the implement in space.

Moreover in a preferred arrangement the follow-up linkage includes a parallel-linkage system with one link connected to a point on the implement, and lying parallel to the jib arm, and another link connected between the free end of this first link and the pivotal connection between the jib arm and the supporting structure, the servo control device being connected to this second link.

The invention may be performed in various ways but one specific embodiment will now be described by way of example as applied to an overloader bucket tool mounted on an endless-track-supported tractor. In this example the jib arm structure and the bucket implement are both of well known form, the jib arm comprising a pair of parallel girders pivotally attached at their lower ends on a common horizontal fixed axis to part of the chassis or fixed structure of the tractor. The bucket has a flange secured to its underside and this flange is pivotally connected on a horizontal axis to the two upper ends of the jib girders. Hydraulic ram mechanism is also provided in a manner known per se for controlling the angular movement of the jib arm structure relative to the tractor chassis and this movement preferably extends over an arc of approximately 180° from a position in front of the tractor where the bucket is on the ground to a position above and behind the tractor where the bucket can unload on to a wagon behind.

The mechanism for controlling the angular position of the bucket comprises a double-acting hydraulic ram one end of which is pivotally attached to a lug on the jib arm structure, while the free end of the ram piston is pivotally connected to the flange on the bottom of the bucket at a point spaced appreciably from the pivotal connection between the bucket and the jib arms.

Hydraulic fluid is supplied to opposite ends of the ram cylinder through two flexible pressure connections which run down the length of the jib arms to a servo valve control device mounted on the chassis of the tractor. This servo valve is in the form of a two-way reversing valve having a valve cylinder with inlet and relief ports and two control ports connected respectively to the two flexible pressure lines. Within this valve cylinder is arranged a valve spindle having two spaced lands arranged selectively to connect one or other of the control ports to the source of pressure fluid and the other control port to relief.

A follow-up linkage is provided consisting of a first link lying generally parallel to the jib arms and having its outer end pivotally attached to the flange on the bottom of the bucket, the inner end of this link being pivotally attached to a second link which is in turn pivotally mounted on the common horizontal axis about which the jib arm structure pivots on the tractor chassis. The effective length of this second link between pivotal centres is equal to the effective distance between point of connection of the first link and the bucket and the pivotal connection between the bucket and the jib arm structure. This linkage thus constitutes a parallel linkage system and the attitude of the second link in space will always correspond exactly to that of the bucket irrespective of movements of the jib arm.

A point on the second link is pivotally connected through an intermediate link to one end of a differential mechanism comprising a floating link the mid point of which is pivot-

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ally connected to the spindle of the servo control valve referred to, while the other end of the floating link is pivotally connected through another intermediate link to a bell crank lever pivotally attached to a fixed part of the tractor chassis and constituting a manual control.

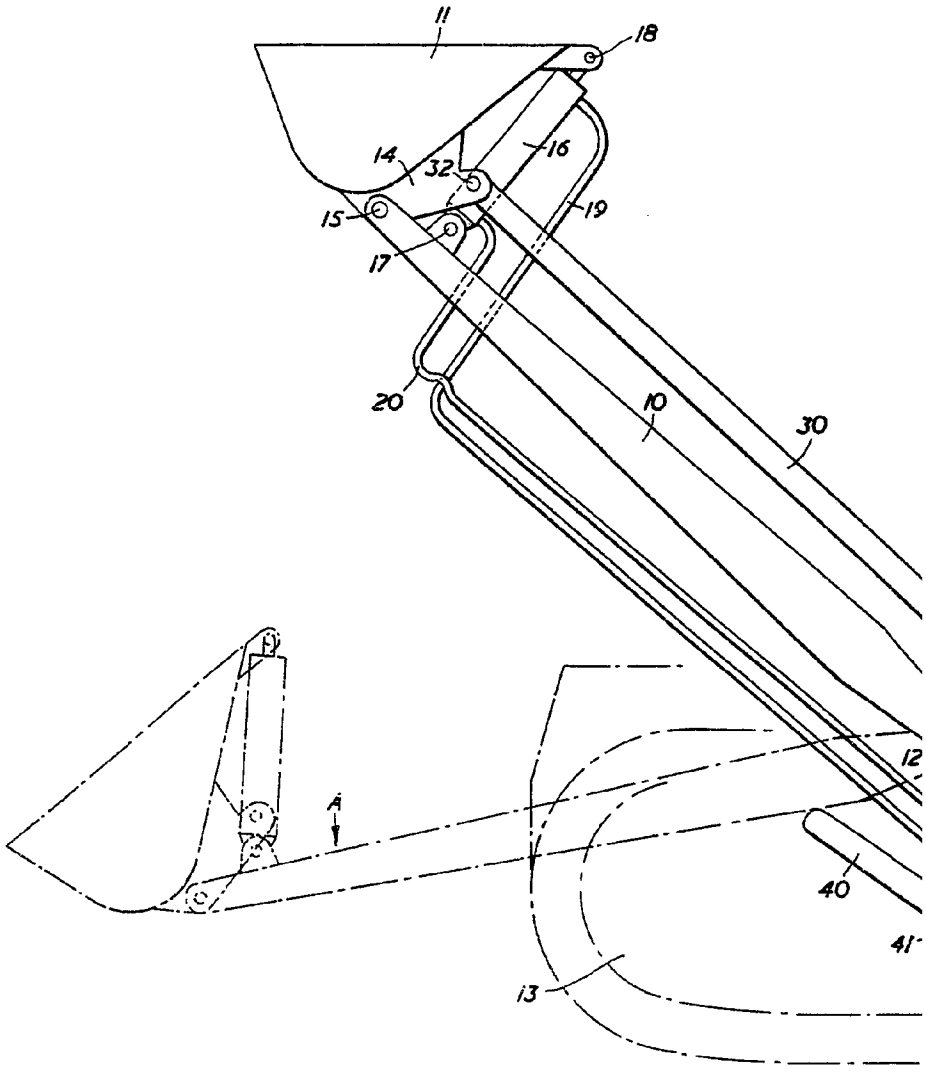
In operation therefore with the jib arm structure stationary it will be seen that movement of the manual control lever will tilt the floating link and will move the valve spindle to supply pressure fluid to one end or other of the hydraulic ram controlling the angular position of the bucket. As the bucket swings about its pivotal connection with the jib arm the second link of the parallel linkage will move the opposite end of the floating link progressively until the servo valve returns to its closed position and the bucket will then be locked in this newly selected attitude.

If the jib arm structure is then swung by its independent hydraulic ram, the consequent pivotal movement of the bucket in space will be transferred directly to the second link of the parallel linkage and this again will operate the servo valve to control the ram attached to the bucket so as to return the bucket to its original attitude.

It will be appreciated that both operations may be carried out simultaneously if desired.

KILBURN & STRODE,
Agents for the Applicants.

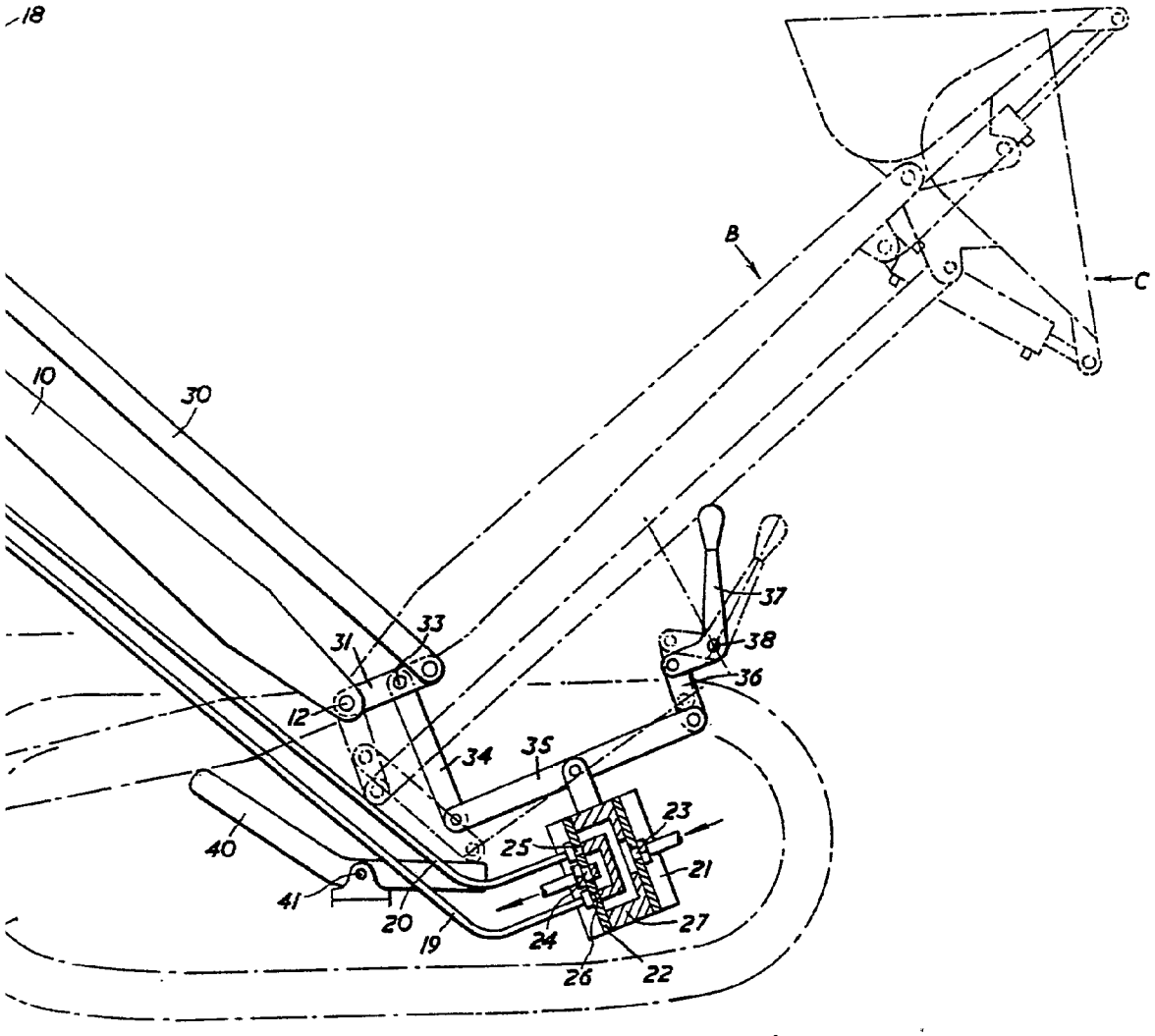
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832,800 COMPLETE SPECIFICATION

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Vertical Ascent And Descent Front Loader Equipment For Tractor And Front Loader Having The Same

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Abstract of KR20080003426 (U)

본 고안은 트랙터 장착용 프론트 로더 작업장치에 관한 것이다. 구체적으로는, 상기 트랙터의 측부에 설치된 브라켓에 하단이 고정결합되고 상기 하단의 측부에 돌기부가 형성되고 상단이 힌지 결합된 2개의 제 1 수직 프레임과; 상기 트랙터의 전방에 설치되는 전방 프레임에 하단이 고정결합되고 상단이 힌지 결합된 2개의 제 2 수직 프레임과; 차례로 절곡방향이 바뀌는 3개의 절곡부를 구비하고 전단이 버켓에 힌지 결합된 일체형으로 된 2개의 메인암과; 상기 메인암 각각의 후단에 힌지 결합되고 상기 제 1 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 연결암과; 상기 메인암 각각의 두번째 절곡부에 일단이 힌지 결합되고 타단이 상기 제 2 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 지지암과; 상기 버켓에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 첫번째 절곡부에 힌지 결합되어 신축가능한 2개의 버켓 실린더; 및 상기 제 1 수직 프레임 각각의 상기 돌출부에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 세번째 절곡부위에 힌지 결합되어 신축가능한 2개의 붐 실린더; 를 포함하여 수직승강이 가능하도록 구성되어 있다.

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ABSTRACT KR20080003426U

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14 The present invention relates to a tractor- mounted front loader working device. Specifically, the lower end is fixedly coupled to the bracket installed on the side of the tractor, the protrusion is formed on the side of the lower end, the upper end is hinged two first vertical frames; two second vertical frames having a lower end fixedly coupled to a front frame installed in front of the tractor and hinged at an upper end; two main arms having three bent parts in which the bending directions are sequentially changed and the front end is hinged to the bucket; two connecting arms hinged to the rear end of each of the main arms and hinged to the upper end of each of the first vertical frames; two support arms, one end of which is hinged to the second bent part of each of the main arms and the other end is hinged to the upper end of each of the second vertical frames; Two bucket cylinders, one end is hinged to the bucket and the other end is hinged to the first bent portion at the front end of each of the main arms, so as to be stretchable; and two boom cylinders, one end of which is hinged to the protrusion of each of the first vertical frames and the other end is hinged to the third bent portion at the front end of each of the main arms so as to be stretchable; It is configured to enable vertical elevation, including

30 Front loader, tractor, vertical lifting

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DESCRIPTION KR20080003426U

11 Vertical Ascent And Descent Front Loader Equipment For Tractor And Front Loader Having The Same

[1]

16 1 is a side view showing the maximum descending bucket of the vertical lifting front loader working device for mounting a tractor according to an embodiment of the present invention.

[2]

22 Figure 2 is a side view showing the maximum lifting of the bucket of the vertical lifting front loader working device for mounting a tractor according to an embodiment of the present invention.

[3]

28 Figure 3 is a side view showing a lifting state of the vertical lifting front loader working device for mounting a tractor according to an embodiment of the present invention.

[4]

34 Figure 4 is a perspective view of a tractor front loader having a vertical lifting front loader working device according to an embodiment of the present invention.

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[5]

39 <Simple description of the symbols for the main parts of the drawing>

[6]

43 1 : Vertical lifting front loader working device for tractor mounting according to the present invention

[7]

48 2 : Tractor front loader with vertical lifting front loader working device according to the present invention

[8]

53 10 : first vertical frame 12: protrusion 14, 24: bracket

[9]

57 20 : front frame 22: second vertical frame 26: support

[10]

61 30 : main arm 32: first bent part 34: second bent part

[11]

65 36 : Third bent part 40: Bucket 50: Connection arm

[12]

69 60 : support arm 70: bucket cylinder 80: boom cylinder

[]

73 The present invention relates to a tractor- mounted front loader working device and a tractor front loader having the same. More particularly, it relates to a front loader working device capable of vertical lifting and a tractor front loader having the same. The front loader working device mounted on the conventional tractor has a larger working radius because the bucket rises in an arc when working. There were also risk factors such as conductivity. In addition, since the inclined boom cylinder was extended in an inclined direction, the working height according to the extension was

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not efficient. Accordingly, an object of the present invention is to provide a front loader working device and a front loader using the same for solving the problems of the conventional tractor front loader. In the present invention, the vertical lifting of the bucket is made to reduce the working radius of the tractor front loader, and also to solve the problem of moving the center of gravity while drawing an arc when the bucket is raised. In addition, in the present invention, the boom cylinder expands and contracts in and out of the vertical direction to increase the efficiency of the working height according to the elongation.

88 The present invention is to achieve the above object, in a front loader working device for mounting a tractor, the lower end is fixedly coupled to the bracket installed on the side of the tractor, the protrusion is formed on the side of the lower end, and the upper end is hinged. a first vertical frame; two second vertical frames having a lower end fixedly coupled to a front frame installed in front of the tractor and hinged at an upper end; two main arms having three bent parts in which the bending directions are sequentially changed and the front end is hinged to the bucket; two connecting arms hinged to the rear end of each of the main arms and hinged to the upper end of each of the first vertical frames; two support arms, one end of which is hinged to the second bent portion of each of the main arms and the other end is hinged to the upper end of each of the second vertical frames; Two bucket cylinders, one end is hinged to the bucket and the other end is hinged to the first bent portion at the front end of each of the main arms, so as to be stretchable; and two boom cylinders, one end of which is hinged to the protrusion of each of the first vertical frames and the other end is hinged to the third bent portion at the front end of each of the main arms so as to be stretchable; It is configured to enable vertical elevation, including In addition, in the present invention, the front frame has a lower end fixedly coupled to a bracket installed on the front and front sides of the tractor, and an upper end is fixedly coupled to the second vertical frame, and the boom cylinder according to its elongation In the vertical state, the protrusion of the first vertical frame is moved forward after angular movement is retracted, and when the maximum extension is extended, it is inclined forward than the vertical state, and when the boom cylinder is extended, the support arm in a horizontal state is the second vertical It is characterized in that the vertical rise of the bucket is made while the connecting arm moves backward and then advances by angular movement about the upper end of the first vertical frame as the other end coupled to the frame rises in an angular motion as an axis. The present invention is also characterized in that, in the above designs, the second bent part of the main arm is bent at a right angle, the first and third bent parts are bent at an obtuse angle, and the third bent part is bent at an angle greater than that of the first bent part. is doing

118 On the other hand, the present invention is a tractor front loader, and is provided with the vertical lifting front loader working devices for mounting the tractor. <Embodiment> Hereinafter, a preferred embodiment according to the present invention will be described in detail in conjunction with the accompanying drawings.

1 is a side view showing the maximum descending bucket of the vertical lifting front loader working device for mounting a tractor according to an embodiment of the present invention, Figure 2 is a vertical lifting front loader for mounting a tractor according to an embodiment of the present invention It is a side view showing the maximum lifting of the bucket of the working device. 1 and 2, the vertical elevating front loader working device 1 for mounting a tractor, which is an embodiment of the present invention, has the lower end of the first vertical frame 10 fixedly coupled to the bracket 14 installed on the side of the tractor, and the second A protrusion 12 is formed on the lower side of the first vertical frame 10 , and the upper end of the first vertical frame 10 is hinge- coupled to the connecting arm 50 . The lower end of the second vertical frame 22 is fixedly coupled to the front frame 20 installed in the front of the tractor, and the upper end is hinged to one end of the support arm 60 . The main arm 30 is provided with three bent portions 32, 34, 36 in which the bending direction is sequentially changed, the front end is hinged to the bucket 40, and is a single piece, and the main arm 30 is hinged at the rear end of each There are two connecting arms 50 that are coupled and hinged to the top of each of the first vertical frames 10 . In addition, one end is hinged to the second bent portion 34 of each of the main arms 30 and the other end is hinged to the upper end of each of the second vertical frames 22 and one end to the two support arms 60 and the bucket 40 This is hinged and the other end is hinged to the first bent part 32 at the front end of each main arm 30, so that the two bucket cylinders 70 and the first vertical frame 10 are each hinged to the protrusion 12 of each of the first vertical frame 10. This is hinged and the other end is hinged near the third bent part 36 at the front end of each of the main arm 30, and is composed of two boom cylinders 80 that are expandable and vertical, and the bucket 40 part is configured to be vertically lifted. .

148 A support for fixing and connecting the two main arms may be provided at the lower end of the distal end of the main arm 30 , and wiring for controlling the cylinder may be installed into the support. The main arm 30 includes three bent portions 32, 34, and 36, the bending directions of which are sequentially changed, and the bending angle of the second bent portion 34 is almost a right angle, and the remaining bent portions 32, The bending angle of 36) is larger than that of the second bent portion 34 and forms an obtuse angle. In addition, the third bend 36 may have a greater obtuse angle than the first bend 32 . The integrally formed main arm 30 can more firmly withstand the load caused by the lifting of the bucket 40 containing the load. The boom cylinder 80 is inclined forward more at the time of the maximum ascent of the bucket 40 than at the time of the maximum descending of the bucket 40 . As the bucket rises, the boom cylinder 80 retracts by angular movement about the hinge axis of the protrusion 12 of the first vertical frame 10, and then moves forward again. 3 is a side view showing a lifting state of a vertical lifting front loader working device for mounting a tractor according to an embodiment of the present invention. In FIG. 3, looking at the elevation state of the vertical elevation front loader working

device for mounting a tractor according to an embodiment of the present invention, the support arm 60 is positioned in parallel with the main arm 30 during the maximum descending, and the main arm (30) is entered inside the opening. The support arm 60 moves angularly about the upper hinge axis of the second vertical frame 22 as the bucket 40 rises and stands up. According to the rise of the bucket 40 due to the extension of the boom cylinder 80, the connecting arm 50 and the boom cylinder 80 are connected to the upper hinge axis of the first vertical frame 10 and the first vertical frame 10, respectively. The protrusion 12 is angularly moved in a counterclockwise direction as viewed in FIG. 3 around the hinge axis and retreated, and after maximum retraction, it moves forward with an angular motion in a clockwise direction when viewed in FIG. 3 around the same axis again. When the boom cylinder 80 is extended, the boom cylinder 80 is extended while moving little by little from side to side in an almost vertical state, so that the height of the bucket 40 rises according to the elongation is more efficient.

178 As shown in FIG. 3 , the position of the boom cylinder 80 at the time of the maximum ascent is more inclined in the clockwise direction than the position at the time of the maximum descending. In addition, as shown in FIG. 3, the support arm 60 rises up with an angular motion in the clockwise direction, and as the boom cylinder 80 and the connecting arm 50 move backward and forward, the main arm 30 moves forward. and the connection part of the bucket 40 rises to an almost vertical state. (See line C) Fig. 4 shows a tractor front loader 2 having a vertically elevating front loader working device according to an embodiment of the present invention. It shows a state in which the vertical elevating front loader working device for tractor mounting according to one embodiment of the present invention as described above is mounted on the tractor. A description of the parts previously described in FIG. 4 will be omitted. 4, the front frame 20 is fixedly coupled to a bracket (not shown) fixed to the front of the tractor and may be formed obliquely, and a second vertical frame 22 is fixedly coupled to the upper end thereof. In addition, one end is fixedly coupled to the upper end of the front frame 20 and the other end is provided with a support 26 fixedly connected to a protrusion or bracket installed on the upper end side of the first vertical frame 10 . Although not shown, the front bracket to which the front frame 20 is coupled may be fixed to the front wheel axle support of the tractor. In addition, although not shown, a connecting portion of the wiring for controlling the bucket cylinder and the wiring for controlling the boom cylinder may be installed at the lower rear end of the first vertical frame. The tractor front loader 2 having a vertical elevating front loader working device may have any form of a tractor-mounted vertical elevating front loader working device shown in FIGS. 1 to 3 and the claims of the present invention. Although preferred embodiments of the present invention have been described in conjunction with the accompanying drawings, the scope of the present invention is not limited thereto, and should be interpreted according to the appended claims. It will be said that the scope of the present invention includes all modifications, alternatives, and equivalents of the preferred

embodiments of the present invention within the scope of the appended claims.

207 As described above, by providing a front loader working device according to the present invention and a front loader using the same, vertical elevation of the bucket is possible. By enabling vertical lifting of the bucket according to the present invention, it was possible to reduce the working radius of the tractor front loader, and also to solve the problem of moving the center of gravity while drawing an arc when the bucket is raised. In addition, according to the present invention, as the boom cylinder expands and contracts in and out of the vertical direction, the efficiency of the working height according to the elongation is improved.

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CLAIMS KR20080003426U

1.

14 In the tractor mounting front loader working device,

15 two first vertical frames having a lower end fixedly coupled to a bracket installed on the side of the tractor, a protrusion formed on a side of the lower end, and hinged at the upper end;

18 Two second vertical frames having a lower end fixedly coupled to a front frame installed in front of the tractor and hinged at an upper end;

20 Two main arms having three bent parts in which the bending direction is sequentially changed and the front end is hinged to the bucket;

22 two connecting arms hinged to the rear end of each of the main arms and hinged to the upper end of each of the first vertical frames;

24 two support arms, one end of which is hinged to the second bent part of each of the main arms and the other end is hinged to the upper end of each of the second vertical frames;

27 Two bucket cylinders, one end is hinged to the bucket and the other end is hinged to the first bent portion at the front end of each of the main arms, so as to be stretchable; and

30 two boom cylinders, one end hinged to the protrusion of each of the first vertical frames and the other end hinged to the third bent portion at the front end of each of the main arms, so as to be stretchable; Vertical lifting front loader working device for tractor mounting, characterized in that it comprises a.

2.

37 The method of claim 1,

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38 The front frame has a lower end fixedly coupled to a bracket installed on the front and front sides of the tractor, and an upper end fixedly coupled to the second vertical frame,

41 The boom cylinder moves forward after retracting the angular motion of the projection of the first vertical frame in the vertical state according to its elongation and is inclined forward than the vertical state at the maximum extension, and

44 When the boom cylinder is extended, as the support arm in a horizontal state rises by angular motion about the other end coupled to the second vertical frame as an axis, the connecting arm moves backward after angular motion with respect to the upper end of the first vertical frame as an axis and then moves forward. A vertical lifting front loader working device for tractor mounting, characterized in that the vertical rise of the bucket is made.

3.

53 The method of claim 1 or 2,

54 The second bent part of the main arm is bent at a right angle, the first and third bent parts are bent at an obtuse angle, and the third bent part is bent at a larger angle than the first bent part. Device.

4.

60 A tractor front loader comprising the vertical lifting front loader working device for mounting the tractor according to claim 1 or 2.

5.

65 A tractor front loader comprising the vertical lifting front loader working device for mounting the tractor of claim 3 .

Drawing pages of KR20000003426 U

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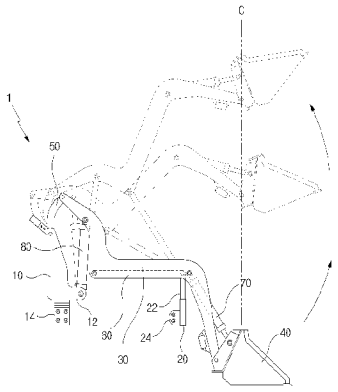
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(54) 트랙터 장착용 수직승강 프론트 로더 작업장치 및 그것을구비한 프론트 로더

(57) 요 약

본 고안은 트랙터 장착용 프론트 로더 작업장치에 관한 것이다. 구체적으로는, 상기 트랙터의 측부에 설치된 브라켓에 하단이 고정결합되고 상기 하단의 측부에 돌기부가 형성되고 상단이 힌지 결합된 2개의 제 1 수직 프레임과; 상기 트랙터의 전방에 설치되는 전방 프레임에 하단이 고정결합되고 상단이 힌지 결합된 2개의 제 2 수직 프레임과; 차례로 절곡방향이 바뀌는 3개의 절곡부를 구비하고 전단이 버켓에 힌지 결합된 일체형으로 된 2개의 메인암과; 상기 메인암 각각의 후단에 힌지 결합되고 상기 제 1 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 연결암과; 상기 메인암 각각의 두번째 절곡부에 일단이 힌지 결합되고 타단이 상기 제 2 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 지지암과; 상기 버켓에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 첫번째 절곡부에 힌지 결합되어 신축가능한 2개의 버켓 실린더; 및 상기 제 1 수직 프레임 각각의 상기 돌출부에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 세번째 절곡부위에 힌지 결합되어 신축가능한 2개의 붐 실린더; 를 포함하여 수직승강이 가능하도록 구성되어 있다.

대표도 - 도3



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실용신안 등록청구의 범위

청구항 1

트랙터 장착용 프론트 로더 작업장치에 있어서,

상기 트랙터의 측부에 설치된 브라켓에 하단이 고정결합되고 상기 하단의 측부에 돌기부가 형성되고 상단이 힌지 결합된 2개의 제 1 수직 프레임;

상기 트랙터의 전방에 설치되는 전방 프레임에 하단이 고정결합되고 상단이 힌지 결합된 2개의 제 2 수직 프레임;

차례로 절곡방향이 바뀌는 3개의 절곡부를 구비하고 전단이 버켓에 힌지 결합된 일체형으로 된 2개의 메인암;

상기 메인암 각각의 후단에 힌지 결합되고 상기 제 1 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 연결암;

상기 메인암 각각의 두번째 절곡부에 일단이 힌지 결합되고 타단이 상기 제 2 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 지지암;

상기 버켓에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 첫번째 절곡부에 힌지 결합되어 신축가능한 2개의 버켓 실린더; 및

상기 제 1 수직 프레임 각각의 상기 돌출부에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 세번째 절곡부위에 힌지 결합되어 신축가능한 2개의 붐 실린더; 를 포함하는 것을 특징으로 하는 트랙터 장착용 수직승강 프론트 로더 작업장치.

청구항 2

제 1 항에 있어서,

상기 전방 프레임은 상기 트랙터의 전방 및 전방 측부에 설치되는 브라켓에 하단이 고정결합되며 상단은 상기 제 2 수직 프레임과 고정결합되고,

상기 붐 실린더는 그의 신장에 따라 수직상태에서 상기 제 1 수직 프레임의 상기 돌출부를 축으로 각운동 후퇴 후 전진하고 최대 신장시 상기 수직상태보다 전방으로 기울어지고, 그리고

상기 붐 실린더의 신장시 수평상태의 상기 지지암이 상기 제 2 수직 프레임에 결합된 상기 타단을 축으로 각운동 상승함에 따라 상기 연결암이 상기 제 1 수직 프레임 상단을 축으로 각운동 후퇴 후 전진하면서 상기 버켓의 수직상승이 이루어지는 것을 특징으로 하는 트랙터 장착용 수직승강 프론트 로더 작업장치.

청구항 3

제 1 항 또는 제 2 항에 있어서,

상기 메인암의 상기 두번째 절곡부는 직각으로 절곡되고 상기 첫번째 및 세번째 절곡부는 둔각으로 절곡되고 상기 세번째 절곡부는 상기 첫번째 절곡부보다 보다 큰 각으로 절곡되어 있는 것을 특징으로 하는 트랙터 장착용 수직승강 프론트 로더 작업장치.

청구항 4

제 1 항 또는 제 2 항의 트랙터 장착용 수직승강 프론트 로더 작업장치를 구비한 것을 특징으로 하는 트랙터 프론트 로더.

청구항 5

제 3 항의 트랙터 장착용 수직승강 프론트 로더 작업장치를 구비한 것을 특징으로 하는 트랙터 프론트 로더.

명 세 서

고안의 상세한 설명

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고안의 목적

고안이 속하는 기술 및 그 분야의 종래기술

<13> 본 고안은 트랙터 장착용 프론트 로더 작업장치 및 그것을 구비한 트랙터 프론트 로더에 관한 것이다. 더욱 상세하게는 수직승강이 가능한 프론트 로더 작업장치 및 그것을 구비한 트랙터 프론트 로더에 관한 것이다.

<14> 종래의 트랙터에 장착되는 프론트 로더 작업장치는 작업시 버켓이 호를 그리며 상승하도록 되어 있었기 때문에 작업반경이 커지고, 버켓이 그 호에 따라 최대 수평 방향에 있을 때에는 로더의 무게중심이 버켓쪽으로 이동하게 되므로 전도가능성 등의 위험요소도 있었다.

<15> 또한 경사진 붐 실린더가 경사방향으로 신장됨으로써 그 신장에 따른 작업높이가 효율적이지 못하였다.

고안이 이루고자 하는 기술적 과제

<16> 따라서 본 고안은 상기의 종래의 트랙터 프론트 로더의 문제를 해결하기 위한 프론트 로더 작업장치 및 그를 이용한 프론트 로더를 제공하기 위한 것이다.

<17> 본 고안에서는 버켓의 수직승강이 이루어지도록 하여 트랙터 프론트 로더의 작업반경을 줄이고, 또한 버켓의 상승시 원호를 그리면서 무게중심이 이동하던 문제를 해결하고자 한다.

<18> 또한 본 고안에서는 붐 실린더가 연직방향 내외에서 신축하도록 하여 그 신장에 따른 작업높이의 효율을 높이고자 한다.

고안의 구성 및 작용

<19> 본 고안은 상기 목적을 달성하기 위한 것으로, 트랙터 장착용 프론트 로더 작업장치에 있어서, 상기 트랙터의 측부에 설치된 브라켓에 하단이 고정결합되고 상기 하단의 측부에 돌기부가 형성되고 상단이 힌지 결합된 2개의 제 1 수직 프레임과; 상기 트랙터의 전방에 설치되는 전방 프레임에 하단이 고정결합되고 상단이 힌지 결합된 2개의 제 2 수직 프레임과; 차례로 절곡방향이 바뀌는 3개의 절곡부를 구비하고 전단이 버켓에 힌지 결합된 일체형으로 된 2개의 메인암과; 상기 메인암 각각의 후단에 힌지 결합되고 상기 제 1 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 연결암과; 상기 메인암 각각의 두번째 절곡부에 일단이 힌지 결합되고 타단이 상기 제 2 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 지지암과; 상기 버켓에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 첫번째 절곡부에 힌지 결합되어 신축가능한 2개의 버켓 실린더; 및 상기 제 1 수직 프레임 각각의 상기 돌출부에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 세번째 절곡부위에 힌지 결합되어 신축가능한 2개의 붐 실린더; 를 포함하여 수직승강이 가능하도록 구성되어 있다.

<20> 또한 본 고안은 상기 고안에 있어서, 상기 전방 프레임은 상기 트랙터의 전방 및 전방 측부에 설치되는 브라켓에 하단이 고정결합되며 상단은 상기 제 2 수직 프레임과 고정결합되고, 상기 붐 실린더는 그의 신장에 따라 수직상태에서 상기 제 1 수직 프레임의 상기 돌출부를 축으로 각운동 후퇴 후 전진하고 최대 신장시 상기 수직상태보다 전방으로 기울어지고, 그리고 상기 붐 실린더의 신장시 수평상태의 상기 지지암이 상기 제 2 수직 프레임에 결합된 상기 타단을 축으로 각운동 상승함에 따라 상기 연결암이 상기 제 1 수직 프레임 상단을 축으로 각운동 후퇴 후 전진하면서 상기 버켓의 수직상승이 이루어지는 것을 특징으로 하고 있다.

<21> 본 고안은 또한 상기 고안들에 있어서, 상기 메인암의 상기 두번째 절곡부는 직각으로 절곡되고 상기 첫번째 및 세번째 절곡부는 둔각으로 절곡되고 상기 세번째 절곡부는 상기 첫번째 절곡부보다 보다 큰 각으로 절곡되어 있는 것을 특징으로 하고 있다.

<22> 한편, 본 고안은 트랙터 프론트 로더로서, 상기의 트랙터 장착용 수직승강 프론트 로더 작업장치들을 구비하고 있다.

<23> < 실시예 >

<24> 이하에서, 첨부된 도면과 함께 본 고안에 따른 바람직한 실시예를 구체적으로 설명하기로 한다.

<25> 도 1은 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 버켓 최대 하강시를 나타내는 측면도이고, 도 2는 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 버켓 최대 상승시를 나타내는 측면도이다.

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<26> 도 1 및 2에서, 본 고안의 하나의 실시예인 트랙터 장착용 수직승강 프론트 로더 작업장치(1)는 트랙터의 측부에 설치된 브라켓(14)에 제 1 수직 프레임(10)의 하단이 고정결합되고 제 1 수직 프레임(10)의 하단 측부에 돌기부(12)가 형성되고 제 1 수직 프레임(10)의 상단은 연결암(50)과 힌지 결합되어 있다. 제 2 수직 프레임(22)은 트랙터의 전방에 설치되는 전방 프레임(20)에 하단이 고정결합되고 상단은 지지암(60)의 일단에 힌지 결합되어 있다. 메인암(30)은 차례로 절곡방향이 바뀌는 3개의 절곡부(32, 34, 36)를 구비하고 전단이 버켓(40)에 힌지 결합된 일체형으로 되어 있고, 메인암(30) 각각의 후단에 힌지 결합되고 제 1 수직 프레임(10) 각각의 상단에 힌지 결합된 2개의 연결암(50)이 있다. 또 메인암(30) 각각의 두번째 절곡부(34)에 일단이 힌지 결합되고 타단이 제 2 수직 프레임(22) 각각의 상단에 힌지 결합된 2개의 지지암(60)과 버켓(40)에 일단이 힌지 결합되고 타단이 메인암(30) 각각의 전단에서 첫번째 절곡부(32)에 힌지 결합되어 신축가능한 2개의 버켓 실린더(70) 및 제 1 수직 프레임(10) 각각의 돌출부(12)에 일단이 힌지 결합되고 타단이 메인암(30) 각각의 전단에서 세번째 절곡부(36) 부근에 힌지 결합되어 신축가능한 2개의 붐 실린더(80)로 구성되어 버켓(40)부의 수직승강이 가능하도록 구성되어 있다.

<27> 메인암(30)의 선단부 하단에 두 메인암을 고정연결하는 지지대를 구비할 수 있고, 이 지지대 속으로 실린더의 제어를 위한 배선을 설치할 수 있다.

<28> 메인암(30)은 3개의 절곡부(32, 34, 36)를 포함하고 있는데, 차례로 절곡방향이 바뀌고, 두 번째 절곡부(34)의 절곡각은 거의 직각에 가깝고, 나머지 절곡부(32, 36)의 절곡각은 두 번째 절곡부(34)보다 크고 둔각을 이루고 있다. 게다가 세 번째 절곡부(36)는 첫 번째 절곡부(32)보다 더 큰 둔각을 이루도록 할 수 있다. 일체형으로 형성된 메인암(30)은 적재물을 담은 버켓(40)의 승강에 따른 하중에도 더 견고하게 견딜 수 있다.

<29> 붐 실린더(80)는 버켓(40)의 최대 하강시보다 최대상승시에 더 전방으로 기울어져 있다. 버켓의 상승에 따라 붐 실린더(80)는 제 1 수직 프레임(10)의 돌출부(12)의 힌지 축을 중심으로 각운동하여 후퇴하였다가 다시 전진하게 된다.

<30> 도 3은 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 승강상태를 나타내는 측면도이다.

<31> 도 3에 있어서, 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 승강상태를 살펴보면, 최대 하강시 지지암(60)은 메인암(30)과 평행하게 위치하며 메인암(30)의 개구부 내부에 들어가게 된다. 지지암(60)은 버켓(40)의 상승에 따라 제 2 수직 프레임(22)의 상단 힌지 축을 중심으로 각운동하며 일어서게 된다.

<32> 붐 실린더(80)의 신장으로 인한 버켓(40)의 상승에 따라 연결암(50) 및 붐 실린더(80)는 각각 제 1 수직 프레임(10)의 상단 힌지 축과 제 1 수직 프레임(10)의 돌출부(12) 힌지 축을 중심으로 도 3에서 볼 때 반시계 방향으로 각운동하며 후퇴하게 되고, 최대 후퇴 후에는 다시 동일 축을 중심으로 도 3에서 볼 때 시계방향으로 각운동하며 전진하게 된다. 붐 실린더(80)의 신장시 붐 실린더(80)는 거의 수직상태에서 좌우로 조금씩 각운동하면서 신장하므로 그 신장에 따른 버켓(40)의 상승 높이가 더 효율적이게 된다.

<33> 도 3에서 나타난 바와 같이 최대 상승시의 붐 실린더(80)의 위치는 최대 하강시의 위치보다 시계방향으로 더 기울어져 있다.

<34> 게다가 도 3에 나타난 바와 같이 상승할 때 지지암(60)이 시계방향으로 각운동하며 일어서게 되고, 붐 실린더(80) 및 연결암(50)의 각운동하며 후퇴 및 전진함에 따라 메인암(30)과 버켓(40)의 연결부가 거의 수직상태로 상승하게 된다.(선 C 참조)

<35>

<36> 도 4는 본 고안의 하나의 실시예에 따른 수직승강 프론트 로더 작업장치를 구비한 트랙터 프론트 로더(2)를 나타내고 있다.

<37> 상기에서 살펴본 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치를 트랙터에 장착시킨 모습을 나타내고 있다. 도 4에서 앞서 설명한 부분에 대해서는 설명을 생략한다.

<38> 도 4에 있어서, 전방 프레임(20)은 트랙터 전방에 고정되는 브라켓(도시되지 않음)에 고정결합되고 비스듬하게 형성될 수 있고, 그 상단에 제 2 수직 프레임(22)이 고정결합되어 있다. 또 전방프레임(20)의 상단부근에 일단이 고정결합되고 타단이 제 1 수직 프레임(10)의 상단부 측부에 설치된 돌출부 또는 브라켓에 고정연결된 지지대(26)를 구비하고 있다. 도시되지 않았으나, 전방 프레임(20)이 결합된 전방 브라켓은 트랙터의 전륜축 지지대

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에 고정될 수도 있다. 또한, 도시되지 않았으나, 버켓 실린더를 제어하는 배선과 붐 실린더를 제어하는 배선의 연결 집속부를 제 1 수직 프레임의 후방 하단에 설치할 수도 있다.

<39> 수직승강 프론트 로더 작업장치를 구비한 트랙터 프론트 로더(2)는 도 1 내지 3 및 본 고안의 청구항에 나타난 트랙터 장착용 수직승강 프론트 로더 작업장치의 어떤 형태도 구비할 수 있다.

<40> 이상에서 본 고안은 첨부된 도면과 함께 바람직한 실시예를 설명하였지만 본 고안의 범위는 이에 한정되지 않고, 첨부된 청구항에 따라 해석되어야 할 것이다. 본 고안의 범위는 첨부된 청구항의 범위 내에서 본 고안의 바람직한 실시예들의 변경들, 대안들, 균등물들은 모두 포함한다고 할 것이다.

고안의 효과

<41> 상기에서 살펴본 바와 같이 본 고안에 따른 프론트 로더 작업장치 및 그를 이용한 프론트 로더를 제공함으로써 상기의 버켓의 수직상승이 가능하게 되었다.

<42> 본 고안에 따라 버켓의 수직승강이 가능하게 됨으로써, 트랙터 프론트 로더의 작업반경을 줄일 수 있게 되었고, 또한 버켓의 상승시 원호를 그리면서 무게중심이 이동하던 문제를 해결하게 되었다.

<43> 또한 본 고안에 따라 붐 실린더가 연직방향 내외에서 신축함으로써 그 신장에 따른 작업높이의 효율이 향상되었다.

도면의 간단한 설명

<1> 도 1은 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 버켓 최대 하강시를 나타내는 측면도.

<2> 도 2는 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 버켓 최대 상승시를 나타내는 측면도.

<3> 도 3은 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 승강상태를 나타내는 측면도.

<4> 도 4는 본 고안의 하나의 실시예에 따른 수직승강 프론트 로더 작업장치를 구비한 트랙터 프론트 로더의 사시도.

<5> < 도면의 주요부분에 대한 부호의 간단한 설명 >

<6> 1 : 본 고안에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치

<7> 2 : 본 고안에 따른 수직승강 프론트 로더 작업장치를 구비한 트랙터 프론트 로더

<8> 10 : 제 1 수직 프레임 12 : 돌출부 14, 24 : 브라켓

<9> 20 : 전방 프레임 22 : 제 2 수직 프레임 26 : 지지대

<10> 30 : 데인암 32 : 첫번째 절곡부 34 : 두번째 절곡부

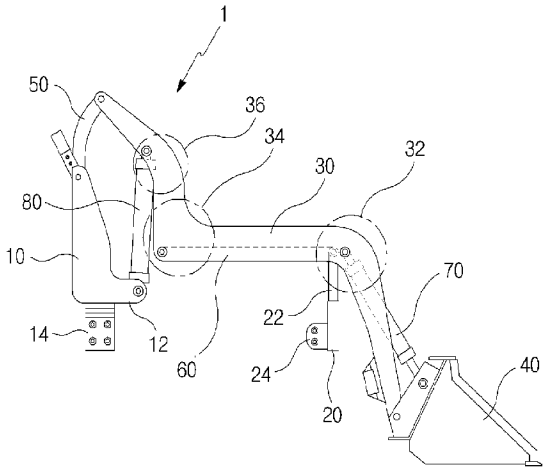
<11> 36 : 세번째 절곡부 40 : 버켓 50 : 연결암

<12> 60 : 지지암 70 : 버켓실린더 80 : 붐 실린더

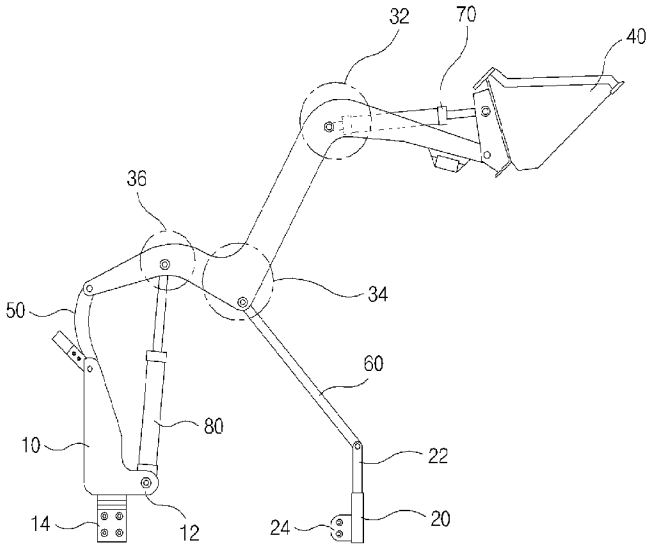
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도면

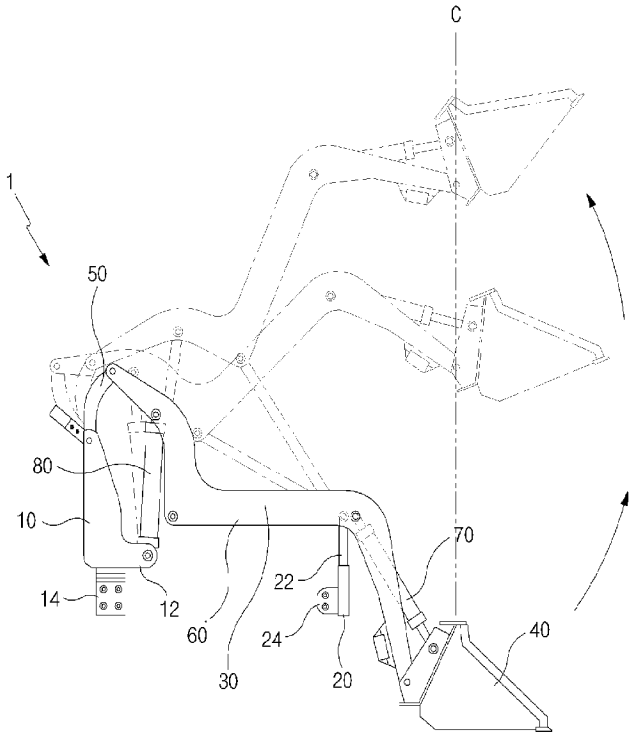
도면1


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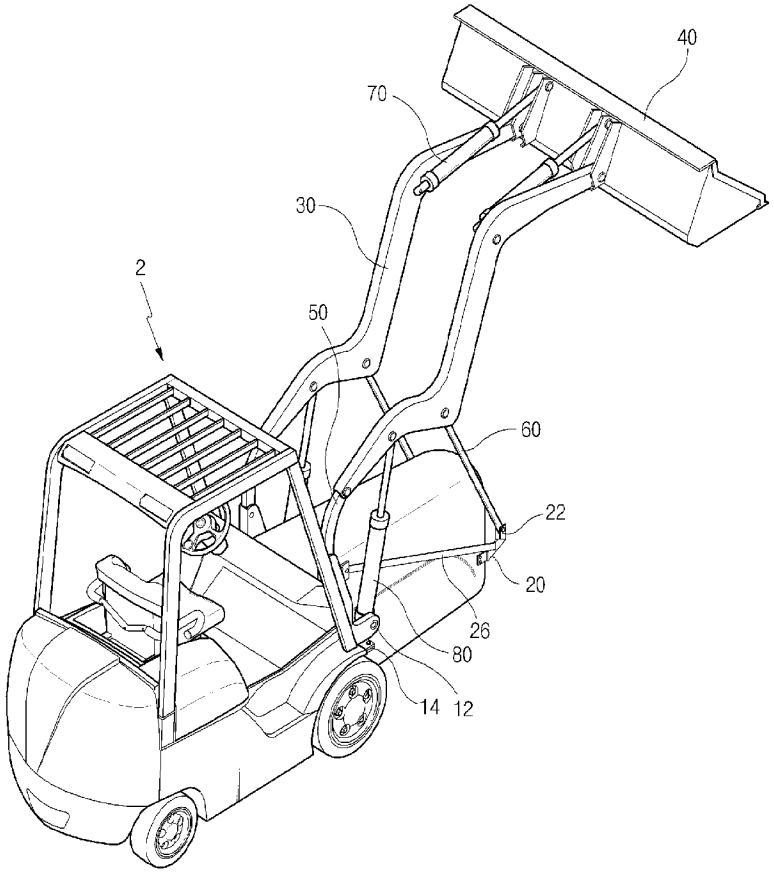
도면2


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도면3



도면4



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Bibliographic data: KR200443753 (Y1) — 2009-03-11

Vertical Ascent And Descent Front Loader Equipment For Tractor And Front Loader Having The Same

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Abstract of KR20080003426 (U)

본 고안은 트랙터 장착용 프론트 로더 작업장치에 관한 것이다. 구체적으로는, 상기 트랙터의 측부에 설치된 브라켓에 하단이 고정결합되고 상기 하단의 측부에 돌기부가 형성되고 상단이 힌지 결합된 2개의 제 1 수직 프레임과; 상기 트랙터의 전방에 설치되는 전방 프레임에 하단이 고정결합되고 상단이 힌지 결합된 2개의 제 2 수직 프레임과; 차례로 절곡방향이 바뀌는 3개의 절곡부를 구비하고 전단이 버켓에 힌지 결합된 일체형으로 된 2개의 메인암과; 상기 메인암 각각의 후단에 힌지 결합되고 상기 제 1 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 연결암과; 상기 메인암 각각의 두번째 절곡부에 일단이 힌지 결합되고 타단이 상기 제 2 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 지지암과; 상기 버켓에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 첫번째 절곡부에 힌지 결합되어 신축가능한 2개의 버켓 실린더; 및 상기 제 1 수직 프레임 각각의 상기 돌출부에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 세번째 절곡부위에 힌지 결합되어 신축가능한 2개의 붐 실린더; 를 포함하여 수직승강이 가능하도록 구성되어 있다.

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ABSTRACT KR20080003426U

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14 The present invention relates to a tractor- mounted front loader working device. Specifically, the lower end is fixedly coupled to the bracket installed on the side of the tractor, the protrusion is formed on the side of the lower end, the upper end is hinged two first vertical frames; two second vertical frames having a lower end fixedly coupled to a front frame installed in front of the tractor and hinged at an upper end; two main arms having three bent parts in which the bending directions are sequentially changed and the front end is hinged to the bucket; two connecting arms hinged to the rear end of each of the main arms and hinged to the upper end of each of the first vertical frames; two support arms, one end of which is hinged to the second bent part of each of the main arms and the other end is hinged to the upper end of each of the second vertical frames; Two bucket cylinders, one end is hinged to the bucket and the other end is hinged to the first bent portion at the front end of each of the main arms, so as to be stretchable; and two boom cylinders, one end of which is hinged to the protrusion of each of the first vertical frames and the other end is hinged to the third bent portion at the front end of each of the main arms so as to be stretchable; It is configured to enable vertical elevation, including

30 Front loader, tractor, vertical lifting

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Description: KR200443753 (Y1) — 2009-03-11

Vertical Ascent And Descent Front Loader Equipment For Tractor And Front Loader Having The Same

Description of KR200443753 (Y1)

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트랙터 장착용 수직승강 프론트 로더 작업장치 및 그것을 구비한 프론트 로더(Vertical Ascent And Descent Front Loader Equipment For Tractor And Front Loader Having The Same)

도 1은 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 버켓 최대 하강시를 나타내는 측면도.

도 2는 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 버켓 최대 상승시를 나타내는 측면도.

도 3은 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 승강상태를 나타내는 측면도.

도 4는 본 고안의 하나의 실시예에 따른 수직승강 프론트 로더 작업장치를 구비한 트랙터 프론트 로더의 사시도.

< 도면의 주요부분에 대한 부호의 간단한 설명 >

1 : 본 고안에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치

2 : 본 고안에 따른 수직승강 프론트 로더 작업장치를 구비한 트랙터 프론트 로더

10 : 제 1 수직 프레임 12 : 돌기부 14, 24 : 브라켓

20 : 전방 프레임 22 : 제 2 수직 프레임 26 : 지지대

30 : 메인암 32 : 첫번째 절곡부 34 : 두번째 절곡부

36 : 세번째 절곡부 40 : 버켓 50 : 연결암

60 : 지지암 70 : 버켓실린더 80 : 붐 실린더

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본 고안은 트랙터 장착용 프론트 로더 작업장치 및 그것을 구비한 트랙터 프론트 로더에 관한 것이다. 더욱 상세하게는 수직승강이 가능한 프론트 로더 작업장치 및 그것을 구비한 트랙터 프론트 로더에 관한 것이다.종래의 트랙터에 장착되는 프론트 로더 작업장치는 작업시 버켓이 호를 그리며 상승하도록 되어 있었기 때문에 작업반경이 커지고, 버켓이 그 호에 따라 최대 수평 방향에 있을 때에는 로더의 무게중심이 버켓쪽으로 이동하게 되므로 전도가능성 등의 위험요소도 있었다.또한 경사진 붐 실린더가 경사방향으로 신장됨으로써 그 신장에 따른 작업높이가 효율적이지 못하였다.따라서 본 고안은 상기의 종래의 트랙터 프론트 로더의 문제를 해결하기 위한 프론트 로더 작업장치 및 그를 이용한 프론트 로더를 제공하기 위한 것이다.본 고안에서는 버켓의 수직승강이 이루어지도록 하여 트랙터 프론트 로더의 작업반경을 줄이고, 또한 버켓의 상승시 원호를 그리면서 무게중심이 이동하던 문제를 해결하고자 한다.또한 본 고안에서는 붐 실린더가 연직방향 내외에서 신축하도록 하여 그 신장에 따른 작업높이의 효율을 높이고자 한다.

본 고안은 상기 목적을 달성하기 위한 것으로, 트랙터 장착용 프론트 로더 작업장치에 있어서, 상기 트랙터의 측부에 설치된 브라켓에 하단이 고정결합되고 상기 하단의 측부에 돌기부가 형성되고 상단이 힌지 결합된 2개의 제 1 수직 프레임과; 상기 트랙터의 전방에 설치되는 전방 프레임에 하단이 고정결합되고 상단이 힌지 결합된 2개의 제 2 수직 프레임과; 차례로 절곡방향이 바뀌는 3개의 절곡부를 구비하고 전단이 버켓에 힌지 결합된 일체형으로 된 2개의 메인암과; 상기 메인암 각각의 후단에 힌지 결합되고 상기 제 1 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 연결암과; 상기 메인암 각각의 두번째 절곡부에 일단이 힌지 결합되고 타단이 상기 제 2 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 지지암과; 상기 버켓에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 첫번째 절곡부에 힌지 결합되어 신축가능한 2개의 버켓 실린더; 및 상기 제 1 수직 프레임 각각의 상기 돌기부에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 세번째 절곡부위에 힌지 결합되어 신축가능한 2개의 붐 실린더; 를 포함하여 수직승강이 가능하도록 구성되어 있다.또한 본 고안은 상기 고안에 있어서, 상기 전방 프레임은 상기 트랙터의 전방 및 전방 측부에 설치되는 브라켓에 하단이 고정결합되며 상단은 상기 제 2 수직 프레임과 고정결합되고, 상기 붐 실린더는 그의 신장에 따라 수직상태에서 상기 제 1 수직 프레임의 상기 돌기부를 축으로 각운동 후퇴 후 전진하고 최대 신장시 상기 수직상태보다 전방으로 기울어지고, 그리고 상기 붐 실린더의 신장시 수평상태의 상기 지지암이 상기 제 2 수직 프레임에 결합된 상기 타단을 축으로 각운동 상승함에 따라 상기 연결암이 상기 제 1 수직 프레임 상단을 축으로 각운동 후퇴 후 전진하면서 상기 버켓의 수직상승이 이루어지는 것을 특징으로 하고 있다.본 고안은 또한 상기 고안들에 있어서, 상기 메인암의 상기 두번째 절곡부는 직각으로 절곡되고 상기 첫번째 및 세번째 절곡부는 둔각으로 절곡되고 상기 세번째 절곡부는 상기 첫번째 절곡부보다 보다 큰 각으로 절곡되어 있는 것을 특징으로 하고 있다.한편, 본 고안은 트랙터 프론트 로더로서, 상기의 트랙터 장착용 수직승강 프론트 로더 작업장치들을 구비하고 있다.< 실시예 >이하에서, 첨부된 도면과 함께 본 고안에 따른 바람직한 실시예를 구체적으로 설명하기로 한다.도 1은 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 버켓 최대 하강시를 나타내는 측면도이고, 도 2는 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 버켓 최대 상승시를 나타내는 측면도이다.도 1 및 2에서, 본 고안의 하나의 실시예인 트랙터 장착용 수직승강 프론트 로더 작업장치(1)는 트랙터의 측부에 설치된 브라켓(14)에 제 1 수직 프레임(10)의 하단이 고정결합되고 제 1 수직 프레임(10)의 하단 측부에 돌기부(12)가 형성되고 제 1 수직 프레임(10)의 상단은 연결암(50)과 힌지 결합되어 있다. 제 2 수직 프레임(22)은 트랙

터의 전방에 설치되는 전방 프레임(20)에 하단이 고정결합되고 상단은 지지암(60)의 일단에 힌지 결합되어 있다. 메인암(30)은 차례로 절곡방향이 바뀌는 3개의 절곡부(32, 34, 36)를 구비하고 전단이 버켓(40)에 힌지 결합된 일체형으로 되어 있고, 메인암(30) 각각의 후단에 힌지 결합되고 제 1 수직 프레임(10) 각각의 상단에 힌지 결합된 2개의 연결암(50)이 있다. 또 메인암(30) 각각의 두번째 절곡부(34)에 일단이 힌지 결합되고 타단이 제 2 수직 프레임(22) 각각의 상단에 힌지 결합된 2개의 지지암(60)과 버켓(40)에 일단이 힌지 결합되고 타단이 메인암(30) 각각의 전단에서 첫번째 절곡부(32)에 힌지 결합되어 신축가능한 2개의 버켓 실린더(70) 및 제 1 수직 프레임(10) 각각의 돌기부(12)에 일단이 힌지 결합되고 타단이 메인암(30) 각각의 전단에서 세번째 절곡부(36) 부근에 힌지 결합되어 신축가능한 2개의 붐 실린더(80)로 구성되어 버켓(40)부의 수직승강이 가능하도록 구성되어 있다.메인암(30)의 선단부 하단에 두 메인암을 고정연결하는 지지대를 구비할 수 있고, 이 지지대 속으로 실린더의 제어를 위한 배선을 설치할 수 있다.메인암(30)은 3개의 절곡부(32, 34, 36)를 포함하고 있는데, 차례로 절곡방향이 바뀌고, 두 번째 절곡부(34)의 절곡각은 거의 직각에 가깝고, 나머지 절곡부(32, 36)의 절곡각은 두 번째 절곡부(34)보다 크고 둔각을 이루고 있다. 게다가 세 번째 절곡부(36)는 첫 번째 절곡부(32)보다 더 큰 둔각을 이루도록 할 수 있다. 일체형으로 형성된 메인암(30)은 적재물을 담은 버켓(40)의 승강에 따른 하중에도 더 견고하게 견딜 수 있다.붐 실린더(80)는 버켓(40)의 최대 하강시보다 최대상승시에 더 전방으로 기울어져 있다. 버켓의 상승에 따라 붐 실린더(80)는 제 1 수직 프레임(10)의 돌기부(12)의 힌지 축을 중심으로 각운동하여 후퇴하였다가 다시 전진하게 된다.도 3은 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 승강상태를 나타내는 측면도이다.도 3에 있어서, 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 승강상태를 살펴보면, 최대 하강시 지지암(60)은 메인암(30)과 평행하게 위치하며 메인암(30)의 개구부 내부에 들어가게 된다. 지지암(60)은 버켓(40)의 상승에 따라 제 2 수직 프레임(22)의 상단 힌지 축을 중심으로 각운동하며 일어서게 된다.붐 실린더(80)의 신장으로 인한 버켓(40)의 상승에 따라 연결암(50) 및 붐 실린더(80)는 각각 제 1 수직 프레임(10)의 상단 힌지 축과 제 1 수직 프레임(10)의 돌기부(12) 힌지 축을 중심으로 도 3에서 볼 때 반시계방향으로 각운동하며 후퇴하게 되고, 최대 후퇴 후에는 다시 동일 축을 중심으로 도 3에서 볼 때 시계방향으로 각운동하며 전진하게 된다. 붐 실린더(80)의 신장시 붐 실린더(80)는 거의 수직상태에서 좌우로 조금씩 각운동하면서 신장하므로 그 신장에 따른 버켓(40)의 상승 높이가 더 효율적이게 된다.도 3에서 나타난 바와 같이 최대 상승시의 붐 실린더(80)의 위치는 최대 하강시의 위치보다 시계방향으로 더 기울어져 있다.게다가 도 3에 나타난 바와 같이 상승할 때 지지암(60)이 시계방향으로 각운동하며 일어서게 되고, 붐 실린더(80) 및 연결암(50)의 각운동하며 후퇴 및 전진함에 따라 메인암(30)과 버켓(40)의 연결부가 거의 수직상태로 상승하게 된다.(선 C 참조)도 4는 본 고안의 하나의 실시예에 따른 수직승강 프론트 로더 작업장치를 구비한 트랙터 프론트 로더(2)를 나타내고 있다.상기에서 살펴본 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치를 트랙터에 장착시킨 모습을 나타내고 있다. 도 4에서 앞서 설명한 부분에 대해서는 설명을 생략한다.도 4에 있어서, 전방 프레임(20)은 트랙터 전방에 고정되는 브라켓(도시되지 않음)에 고정결합되고 비스듬하게 형성될 수 있고, 그 상단에 제 2 수직 프레임(22)이 고정결합되어 있다. 또 전방프레임(20)의 상단부근에 일단이 고정결합되고 타단이 제 1 수직 프레임(10)의 상단부 측부에 설치된 돌기부 또는 브라켓에 고정연결된 지지대(26)를 구비하고 있다. 도시되지 않았으나, 전방 프레임(20)이 결합된 전방 브라켓은 트랙터의 전륜축 지지대에 고정될 수도 있다. 또한, 도시되지 않았으나, 버켓 실린더를 제어하는 배선과 붐 실린더를 제어하는 배선의 연결 집속부를 제 1 수직 프레임의 후방 하단에 설치할 수도 있다.수직승강 프론트 로더 작업장치를 구비한 트랙터 프

론트 로더(2)는 도 1 내지 3 및 본 고안의 청구항에 나타난 트랙터 장착용 수직승강 프론트 로더 작업장치의 어떤 형태도 구비할 수 있다.이상에서 본 고안은 첨부된 도면과 함께 바람직한 실시예를 설명하였지만 본 고안의 범위는 이에 한정되지 않고, 첨부된 청구항에 따라 해석되어야 할 것이다. 본 고안의 범위는 첨부된 청구항의 범위 내에서 본 고안의 바람직한 실시예들의 변경들, 대안들, 균등물들은 모두 포함한다고 할 것이다.

상기에서 살펴본 바와 같이 본 고안에 따른 프론트 로더 작업장치 및 그를 이용한 프론트 로더를 제공함으로써 상기의 버켓의 수직상승이 가능하게 되었다.본 고안에 따라 버켓의 수직승강이 가능하게 됨으로써, 트랙터 프론트 로더의 작업반경을 줄일 수 있게 되었고, 또한 버켓의 상승시 원호를 그리면서 무게중심이 이동하던 문제를 해결하게 되었다. 또한 본 고안에 따라 붐 실린더가 연직방향 내외에서 신축함으로써 그 신장에 따른 작업높이의 효율이 향상되었다.

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CLAIMS KR200443753Y1

1.

14 In the tractor mounting front loader working device,

15 two first vertical frames having a lower end fixedly coupled to a bracket installed on the side of the tractor, a protrusion formed on a side of the lower end, and hinged at the upper end;

18 Two second vertical frames having a lower end fixedly coupled to a front frame installed in front of the tractor and hinged at an upper end;

20 Two main arms having three bent parts in which the bending direction is sequentially changed and the front end is hinged to the bucket;

22 two connecting arms hinged to the rear end of each of the main arms and hinged to the upper end of each of the first vertical frames;

24 two support arms, one end of which is hinged to the second bent part of each of the main arms and the other end is hinged to the upper end of each of the second vertical frames;

27 Two bucket cylinders, one end is hinged to the bucket and the other end is hinged to the first bent portion at the front end of each of the main arms, so as to be stretchable; and

30 Two boom cylinders, one end hinged to the protrusion of each of the first vertical frames and the other end hinged to the third bent portion at the front end of each of the main arms, so as to be stretchable; Vertical lifting front loader working device for tractor mounting, characterized in that it comprises a.

2.

37 The method of claim 1,

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38 The front frame has a lower end fixedly coupled to a bracket installed on the front and front sides of the tractor, and an upper end fixedly coupled to the second vertical frame,

41 The boom cylinder moves forward after retracting the angular motion of the protrusion of the first vertical frame in the vertical state according to its elongation, and is inclined forward than the vertical state at the maximum extension, and

44 When the boom cylinder is extended, as the support arm in a horizontal state rises by angular motion about the other end coupled to the second vertical frame as an axis, the connecting arm moves backward after angular motion with respect to the upper end of the first vertical frame as an axis and then moves forward. A vertical lifting front loader working device for tractor mounting, characterized in that the vertical rise of the bucket is made.

3.

53 The method of claim 1 or 2,

54 The second bent part of the main arm is bent at a right angle, the first and third bent parts are bent at an obtuse angle, and the third bent part is bent at a larger angle than the first bent part. Device.

4.

60 A tractor front loader comprising the vertical lifting front loader working device for mounting the tractor according to claim 1 or 2.

5.

65 A tractor front loader comprising the vertical lifting front loader working device for mounting the tractor of claim 3 .

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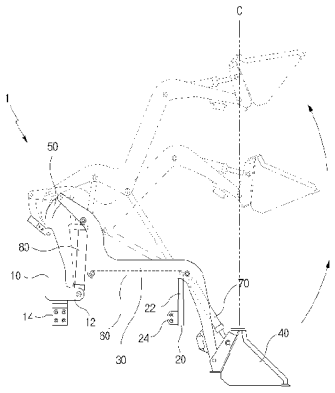
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(54) 트랙터 장착용 수직승강 프론트 로더 작업장치 및 그것을구비한 프론트 로더

(57) 요 약

본 고안은 트랙터 장착용 프론트 로더 작업장치에 관한 것이다. 구체적으로는, 상기 트랙터의 측부에 설치된 브라켓에 하단이 고정결합되고 상기 하단의 측부에 돌기부가 형성되고 상단이 힌지 결합된 2개의 제 1 수직 프레임과; 상기 트랙터의 전방에 설치되는 전방 프레임에 하단이 고정결합되고 상단이 힌지 결합된 2개의 제 2 수직 프레임과; 차례로 절곡방향이 바뀌는 3개의 절곡부를 구비하고 전단이 버켓에 힌지 결합된 일체형으로 된 2개의 메인암과; 상기 메인암 각각의 후단에 힌지 결합되고 상기 제 1 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 연결암과; 상기 메인암 각각의 두번째 절곡부에 일단이 힌지 결합되고 타단이 상기 제 2 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 지지암과; 상기 버켓에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 첫번째 절곡부에 힌지 결합되어 신축가능한 2개의 버켓 실린더; 및 상기 제 1 수직 프레임 각각의 상기 돌기부에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 세번째 절곡부위에 힌지 결합되어 신축가능한 2개의 붐 실린더; 를 포함하여 수직승강이 가능하도록 구성되어 있다.

대 표 도 - 도3



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실용신안 등록청구의 범위

청구항 1

트랙터 장착용 프론트 로더 작업장치에 있어서,

상기 트랙터의 측부에 설치된 브라켓에 하단이 고정결합되고 상기 하단의 측부에 돌기부가 형성되고 상단이 힌지 결합된 2개의 제 1 수직 프레임;

상기 트랙터의 전방에 설치되는 전방 프레임에 하단이 고정결합되고 상단이 힌지 결합된 2개의 제 2 수직 프레임;

차례로 절곡방향이 바뀌는 3개의 절곡부를 구비하고 전단이 버켓에 힌지 결합된 일체형으로 된 2개의 메인암;

상기 메인암 각각의 후단에 힌지 결합되고 상기 제 1 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 연결암;

상기 메인암 각각의 두번째 절곡부에 일단이 힌지 결합되고 타단이 상기 제 2 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 지지암;

상기 버켓에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 첫번째 절곡부에 힌지 결합되어 신축가능한 2개의 버켓 실린더; 및

상기 제 1 수직 프레임 각각의 상기 돌기부에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 세번째 절곡부위에 힌지 결합되어 신축가능한 2개의 붐 실린더; 를 포함하는 것을 특징으로 하는 트랙터 장착용 수직승강 프론트 로더 작업장치.

청구항 2

제 1 항에 있어서,

상기 전방 프레임은 상기 트랙터의 전방 및 전방 측부에 설치되는 브라켓에 하단이 고정결합되며 상단은 상기 제 2 수직 프레임과 고정결합되고,

상기 붐 실린더는 그의 신장에 따라 수직상태에서 상기 제 1 수직 프레임의 상기 돌기부를 축으로 각운동 후퇴 후 전진하고 최대 신장시 상기 수직상태보다 전방으로 기울어지고, 그리고

상기 붐 실린더의 신장시 수평상태의 상기 지지암이 상기 제 2 수직 프레임에 결합된 상기 타단을 축으로 각운동 상승함에 따라 상기 연결암이 상기 제 1 수직 프레임 상단을 축으로 각운동 후퇴 후 전진하면서 상기 버켓의 수직상승이 이루어지는 것을 특징으로 하는 트랙터 장착용 수직승강 프론트 로더 작업장치.

청구항 3

제 1 항 또는 제 2 항에 있어서,

상기 메인암의 상기 두번째 절곡부는 직각으로 절곡되고 상기 첫번째 및 세번째 절곡부는 둔각으로 절곡되고 상기 세번째 절곡부는 상기 첫번째 절곡부보다 보다 큰 각으로 절곡되어 있는 것을 특징으로 하는 트랙터 장착용 수직승강 프론트 로더 작업장치.

청구항 4

제 1 항 또는 제 2 항의 트랙터 장착용 수직승강 프론트 로더 작업장치를 구비한 것을 특징으로 하는 트랙터 프론트 로더.

청구항 5

제 3 항의 트랙터 장착용 수직승강 프론트 로더 작업장치를 구비한 것을 특징으로 하는 트랙터 프론트 로더.

명 세 서

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고안의 상세한 설명

고안의 목적

고안이 속하는 기술 및 그 분야의 종래기술

<13> 본 고안은 트랙터 장착용 프론트 로더 작업장치 및 그것을 구비한 트랙터 프론트 로더에 관한 것이다. 더욱 상세하게는 수직승강이 가능한 프론트 로더 작업장치 및 그것을 구비한 트랙터 프론트 로더에 관한 것이다.

<14> 종래의 트랙터에 장착되는 프론트 로더 작업장치는 작업시 버켓이 호를 그리며 상승하도록 되어 있었기 때문에 작업반경이 커지고, 버켓이 그 호에 따라 최대 수평 방향에 있을 때에는 로더의 무게중심이 버켓쪽으로 이동하게 되므로 전도가능성 등의 위험요소도 있었다.

<15> 또한 경사진 붐 실린더가 경사방향으로 신장됨으로써 그 신장에 따른 작업높이가 효율적이지 못하였다.

고안이 이루고자 하는 기술적 과제

<16> 따라서 본 고안은 상기의 종래의 트랙터 프론트 로더의 문제를 해결하기 위한 프론트 로더 작업장치 및 그를 이용한 프론트 로더를 제공하기 위한 것이다.

<17> 본 고안에서는 버켓의 수직승강이 이루어지도록 하여 트랙터 프론트 로더의 작업반경을 줄이고, 또한 버켓의 상승시 원호를 그리면서 무게중심이 이동하던 문제를 해결하고자 한다.

<18> 또한 본 고안에서는 붐 실린더가 연직방향 내외에서 신축하도록 하여 그 신장에 따른 작업높이의 효율을 높이고자 한다.

고안의 구성 및 작용

<19> 본 고안은 상기 목적을 달성하기 위한 것으로, 트랙터 장착용 프론트 로더 작업장치에 있어서, 상기 트랙터의 측부에 설치된 브라켓에 하단이 고정결합되고 상기 하단의 측부에 돌기부가 형성되고 상단이 힌지 결합된 2개의 제 1 수직 프레임과; 상기 트랙터의 전방에 설치되는 전방 프레임에 하단이 고정결합되고 상단이 힌지 결합된 2개의 제 2 수직 프레임과; 차례로 절곡방향이 바뀌는 3개의 절곡부를 구비하고 전단이 버켓에 힌지 결합된 일체형으로 된 2개의 메인암과; 상기 메인암 각각의 후단에 힌지 결합되고 상기 제 1 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 연결암과; 상기 메인암 각각의 두번째 절곡부에 일단이 힌지 결합되고 타단이 상기 제 2 수직 프레임 각각의 상기 상단에 힌지 결합된 2개의 지지암과; 상기 버켓에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 첫번째 절곡부에 힌지 결합되어 신축가능한 2개의 버켓 실린더; 및 상기 제 1 수직 프레임 각각의 상기 돌기부에 일단이 힌지 결합되고 타단이 상기 메인암 각각의 전단에서 세번째 절곡부위에 힌지 결합되어 신축가능한 2개의 붐 실린더; 를 포함하여 수직승강이 가능하도록 구성되어 있다.

<20> 또한 본 고안은 상기 고안에 있어서, 상기 전방 프레임은 상기 트랙터의 전방 및 전방 측부에 설치되는 브라켓에 하단이 고정결합되며 상단은 상기 제 2 수직 프레임과 고정결합되고, 상기 붐 실린더는 그의 신장에 따라 수직상태에서 상기 제 1 수직 프레임의 상기 돌기부를 축으로 각운동 후퇴 후 전진하고 최대 신장시 상기 수직상태보다 전방으로 기울어지고, 그리고 상기 붐 실린더의 신장시 수평상태의 상기 지지암이 상기 제 2 수직 프레임에 결합된 상기 타단을 축으로 각운동 상승함에 따라 상기 연결암이 상기 제 1 수직 프레임 상단을 축으로 각운동 후퇴 후 전진하면서 상기 버켓의 수직상승이 이루어지는 것을 특징으로 하고 있다.

<21> 본 고안은 또한 상기 고안들에 있어서, 상기 메인암의 상기 두번째 절곡부는 직각으로 절곡되고 상기 첫번째 및 세번째 절곡부는 둔각으로 절곡되고 상기 세번째 절곡부는 상기 첫번째 절곡부보다 보다 큰 각으로 절곡되어 있는 것을 특징으로 하고 있다.

<22> 한편, 본 고안은 트랙터 프론트 로더로서, 상기의 트랙터 장착용 수직승강 프론트 로더 작업장치들을 구비하고 있다.

<23> < 실시예 >

<24> 이하에서, 첨부된 도면과 함께 본 고안에 따른 바람직한 실시예를 구체적으로 설명하기로 한다.

<25> 도 1은 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 버켓 최대 하강시를 나타내는 측면도이고, 도 2는 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의

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버켓 최대 상승시를 나타내는 측면도이다.

<26> 도 1 및 2에서, 본 고안의 하나의 실시예인 트랙터 장착용 수직승강 프론트 로더 작업장치(1)는 트랙터의 측부에 설치된 브라켓(14)에 제 1 수직 프레임(10)의 하단이 고정결합되고 제 1 수직 프레임(10)의 하단 측부에 돌기부(12)가 형성되고 제 1 수직 프레임(10)의 상단은 연결암(50)과 힌지 결합되어 있다. 제 2 수직 프레임(22)은 트랙터의 전방에 설치되는 전방 프레임(20)에 하단이 고정결합되고 상단은 지지암(60)의 일단에 힌지 결합되어 있다. 메인암(30)은 차례로 절곡방향이 바뀌는 3개의 절곡부(32, 34, 36)를 구비하고 전단이 버켓(40)에 힌지 결합된 일체형으로 되어 있고, 메인암(30) 각각의 후단에 힌지 결합되고 제 1 수직 프레임(10) 각각의 상단에 힌지 결합된 2개의 연결암(50)이 있다. 또 메인암(30) 각각의 두번째 절곡부(34)에 일단이 힌지 결합되고 타단이 제 2 수직 프레임(22) 각각의 상단에 힌지 결합된 2개의 지지암(60)과 버켓(40)에 일단이 힌지 결합되고 타단이 메인암(30) 각각의 전단에서 첫번째 절곡부(32)에 힌지 결합되어 신축가능한 2개의 버켓 실린더(70) 및 제 1 수직 프레임(10) 각각의 돌기부(12)에 일단이 힌지 결합되고 타단이 메인암(30) 각각의 전단에서 세번째 절곡부(36) 부근에 힌지 결합되어 신축가능한 2개의 붐 실린더(80)로 구성되어 버켓(40)부의 수직승강이 가능하도록 구성되어 있다.

<27> 메인암(30)의 선단부 하단에 두 메인암을 고정연결하는 지지대를 구비할 수 있고, 이 지지대 속으로 실린더의 제어를 위한 배선을 설치할 수 있다.

<28> 메인암(30)은 3개의 절곡부(32, 34, 36)를 포함하고 있는데, 차례로 절곡방향이 바뀌고, 두 번째 절곡부(34)의 절곡각은 거의 직각에 가깝고, 나머지 절곡부(32, 36)의 절곡각은 두 번째 절곡부(34)보다 크고 둔각을 이루고 있다. 게다가 세 번째 절곡부(36)는 첫 번째 절곡부(32)보다 더 큰 둔각을 이루도록 할 수 있다. 일체형으로 형성된 메인암(30)은 적재물을 담은 버켓(40)의 승강에 따른 하중에도 더 견고하게 견딜 수 있다.

<29> 붐 실린더(80)는 버켓(40)의 최대 하강시보다 최대상승시에 더 전방으로 기울어져 있다. 버켓의 상승에 따라 붐 실린더(80)는 제 1 수직 프레임(10)의 돌기부(12)의 힌지 축을 중심으로 각운동하여 후퇴하였다가 다시 전진하게 된다.

<30> 도 3은 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 승강상태를 나타내는 측면도이다.

<31> 도 3에 있어서, 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 승강상태를 살펴보면, 최대 하강시 지지암(60)은 메인암(30)과 평행하게 위치하며 메인암(30)의 개구부 내부에 들어가게 된다. 지지암(60)은 버켓(40)의 상승에 따라 제 2 수직 프레임(22)의 상단 힌지 축을 중심으로 각운동하며 일어서게 된다.

<32> 붐 실린더(80)의 신장으로 인한 버켓(40)의 상승에 따라 연결암(50) 및 붐 실린더(80)는 각각 제 1 수직 프레임(10)의 상단 힌지 축과 제 1 수직 프레임(10)의 돌기부(12) 힌지 축을 중심으로 도 3에서 볼 때 반시계 방향으로 각운동하며 후퇴하게 되고, 최대 후퇴 후에는 다시 동일 축을 중심으로 도 3에서 볼 때 시계방향으로 각운동하며 전진하게 된다. 붐 실린더(80)의 신장시 붐 실린더(80)는 거의 수직상태에서 좌우로 조금씩 각운동하면서 신장하므로 그 신장에 따른 버켓(40)의 상승 높이가 더 효율적이게 된다.

<33> 도 3에서 나타난 바와 같이 최대 상승시의 붐 실린더(80)의 위치는 최대 하강시의 위치보다 시계방향으로 더 기울어져 있다.

<34> 게다가 도 3에 나타난 바와 같이 상승할 때 지지암(60)이 시계방향으로 각운동하며 일어서게 되고, 붐 실린더(80) 및 연결암(50)의 각운동하며 후퇴 및 전진함에 따라 메인암(30)과 버켓(40)의 연결부가 거의 수직상태로 상승하게 된다.(선 C 참조)

<35>

<36> 도 4는 본 고안의 하나의 실시예에 따른 수직승강 프론트 로더 작업장치를 구비한 트랙터 프론트 로더(2)를 나타내고 있다.

<37> 상기에서 살펴본 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치를 트랙터에 장착시킨 모습을 나타내고 있다. 도 4에서 앞서 설명한 부분에 대해서는 설명을 생략한다.

<38> 도 4에 있어서, 전방 프레임(20)은 트랙터 전방에 고정되는 브라켓(도시되지 않음)에 고정결합되고 비스듬하게 형성될 수 있고, 그 상단에 제 2 수직 프레임(22)이 고정결합되어 있다. 또 전방프레임(20)의 상단부근에 일단

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이 고정결합되고 타단이 제 1 수직 프레임(10)의 상단부 측부에 설치된 돌기부 또는 브라켓에 고정연결된 지지대(26)를 구비하고 있다. 도시되지 않았으나, 전방 프레임(20)이 결합된 전방 브라켓은 트랙터의 전륜축 지지대에 고정될 수도 있다. 또한, 도시되지 않았으나, 버켓 실린더를 제어하는 배선과 붐 실린더를 제어하는 배선의 연결 집속부를 제 1 수직 프레임의 후방 하단에 설치할 수도 있다.

<39> 수직승강 프론트 로더 작업장치를 구비한 트랙터 프론트 로더(2)는 도 1 내지 3 및 본 고안의 청구항에 나타난 트랙터 장착용 수직승강 프론트 로더 작업장치의 어떤 형태도 구비할 수 있다.

<40> 이상에서 본 고안은 첨부된 도면과 함께 바람직한 실시예를 설명하였지만 본 고안의 범위는 이에 한정되지 않고, 첨부된 청구항에 따라 해석되어야 할 것이다. 본 고안의 범위는 첨부된 청구항의 범위 내에서 본 고안의 바람직한 실시예들의 변경들, 대안들, 균등물들은 모두 포함한다고 할 것이다.

고안의 효과

<41> 상기에서 살펴본 바와 같이 본 고안에 따른 프론트 로더 작업장치 및 그를 이용한 프론트 로더를 제공함으로써 상기의 버켓의 수직상승이 가능하게 되었다.

<42> 본 고안에 따라 버켓의 수직승강이 가능하게 됨으로써, 트랙터 프론트 로더의 작업반경을 줄일 수 있게 되었고, 또한 버켓의 상승시 원호를 그리면서 무게중심이 이동하던 문제를 해결하게 되었다.

<43> 또한 본 고안에 따라 붐 실린더가 연직방향 내외에서 신축함으로써 그 신장에 따른 작업높이의 효율이 향상되었다.

도면의 간단한 설명

<1> 도 1은 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 버켓 최대 하강시를 나타내는 측면도.

<2> 도 2는 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 버켓 최대 상승시를 나타내는 측면도.

<3> 도 3은 본 고안의 하나의 실시예에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치의 승강상태를 나타내는 측면도.

<4> 도 4는 본 고안의 하나의 실시예에 따른 수직승강 프론트 로더 작업장치를 구비한 트랙터 프론트 로더의 사시도.

<5> < 도면의 주요부분에 대한 부호의 간단한 설명 >

<6> 1 : 본 고안에 따른 트랙터 장착용 수직승강 프론트 로더 작업장치

<7> 2 : 본 고안에 따른 수직승강 프론트 로더 작업장치를 구비한 트랙터 프론트 로더

<8> 10 : 제 1 수직 프레임 12 : 돌기부 14, 24 : 브라켓

<9> 20 : 전방 프레임 22 : 제 2 수직 프레임 26 : 지지대

<10> 30 : 데인암 32 : 첫번째 절곡부 34 : 두번째 절곡부

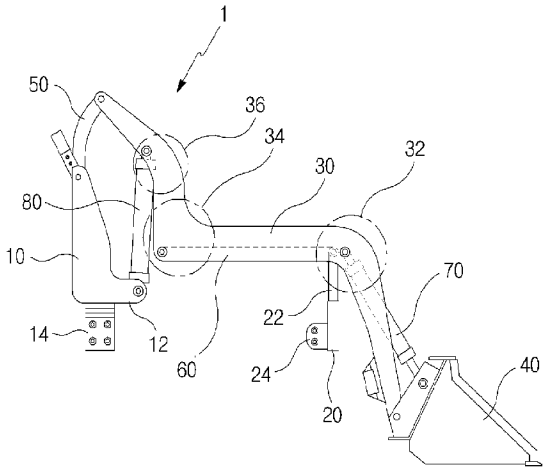
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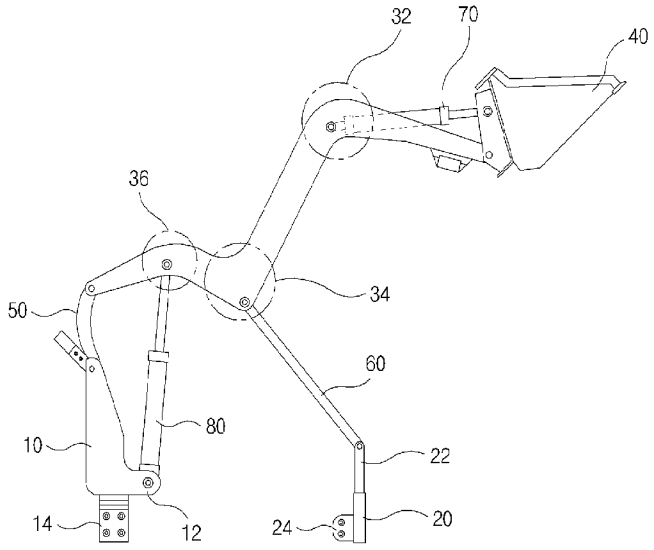
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도면

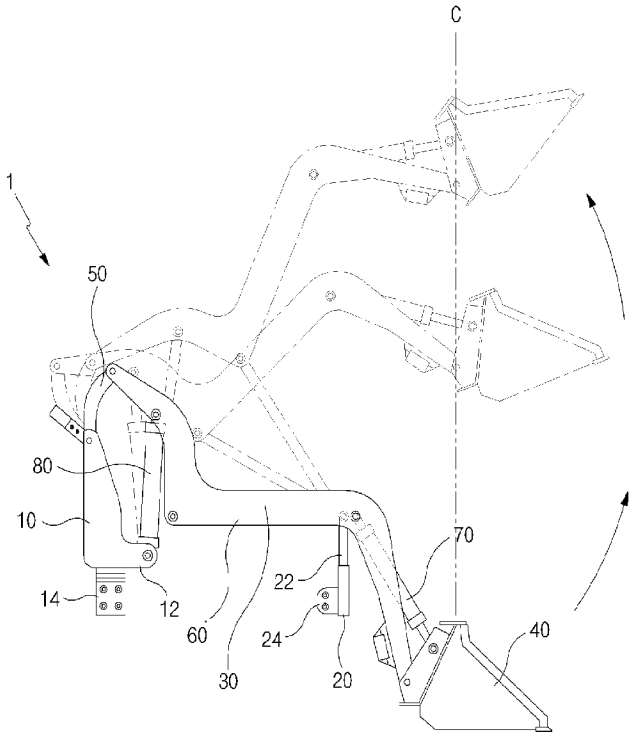
도면1


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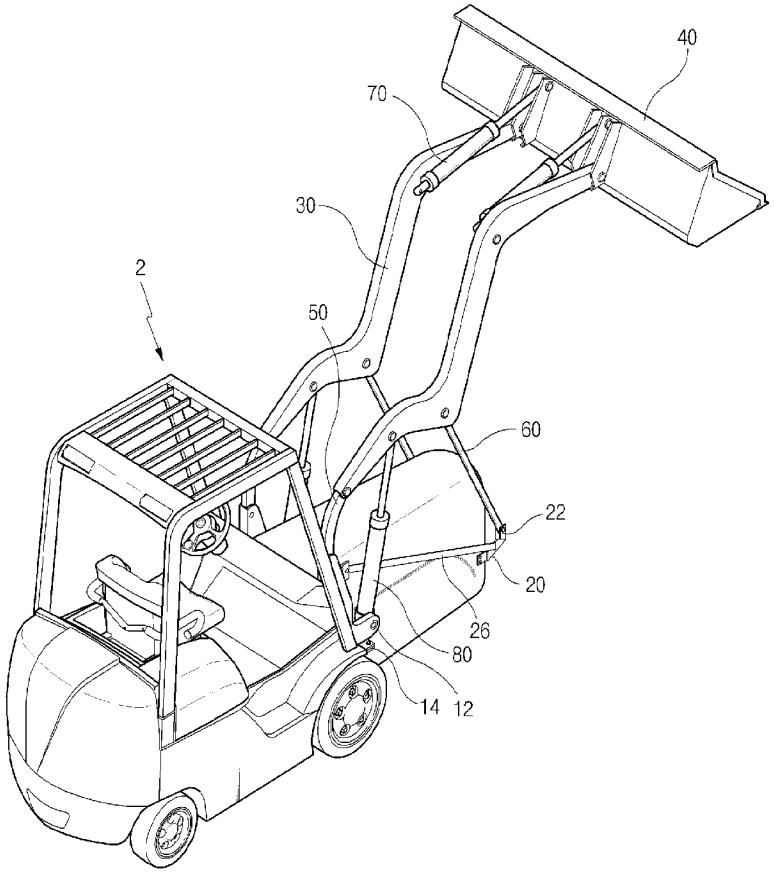
도면2


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도면3



도면4



PATENT SPECIFICATION

DRAWINGS ATTACHED

883953

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Index at Acceptance:- Class 68(1), F10.

International Classification:- E21c.

COMPLETE SPECIFICATION

Improvements in or relating to self propelled shovelling machines

I, ANGELO SIBILIA, an Italian citizen, of Viale della Stazione 1, Castelletto Ticino, (Novara) Italy, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:-

The invention relates to a self-propelled shovelling machine or skimmer and provides such a machine which comprises a mechanical drive for moving it over the ground and a hydraulic drive for moving the shovel relative to the chassis of the machine, wherein an internal combustion engine directly coupled with an oil pump communicating with an oil tank disposed above and to the rear of the engine is disposed on the wheeled chassis and wherein the drive for moving the said chassis comprises a geared transmission disposed, together with a gear shift mechanism and a differential, inside the wheeled chassis and driven by the engine through a transmission chain, and wherein the shovel drive comprises hydraulic motors operated by the oil pump and controlling the pivoting and tilting movements of the shovel support arm and of the shovel, two lever rods with hand grips being arranged to project from two side arms of a framework secured to the wheeled chassis on the side remote from the shovel, the said lever rods being combined with the compact construction formed by the engine, pump, oil tank and wheeled chassis with the devices therein in such manner that the driver can control the device as he walks behind it and can control the various control elements from the ground.

An arrangement of this kind is excellent for use in small earth-moving equipment having dimensions only slightly greater, for instance, than a wheelbarrow or dump car and adapted to be used, amongst other places, in areas where little space is available because of obstacles scattered about the ground which prevent, as often occurs in practice, the employment of conventional large earth-moving equipment. Small equipments of the kind specified can also be used with advantage where clearing work must be performed in large areas in which it is convenient to divide up the work by clearing a number of areas simultaneously. Small earth-moving equipment of this kind, of the size of a dump car or wheelbarrow, will probably be of considerable use to building undertakings and similar concerns of small or medium size where the relatively small amount of earth-moving work required would not justify the heavy first and maintenance costs of the large earth-moving equipment available heretofore.

In a preferred embodiment of the equipment according to the invention the running frame is disposed on two driving wheels and on a freely pivotable steerable wheel which is disposed on the hand lever side and by means of which the driver can steer the vehicle as required. This freely pivotable or orientable steerable wheel may be replaced by a steerable wheel with a steering and directing column, in which case the vehicle can be provided with a downwardly hinging seat which the driver can use if he does not want to walk behind the vehicle.

According to a further optional feature of the invention, concerning the mechanical drive for moving the equipment, the grip on one of two hand levers is rotatable around its axis and is so coupled through a transmission with the gear shift mechanism in the running

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frame that forward or reverse gear is engaged in accordance with the direction in which the grip is rotated from a neutral position.

A lever grip which is also fitted to the hand lever comprising the rotating grip serves to control the engine speed.

Advantageously, the transmission chain for driving the geared transmission in the running frame is driven by the motor through a hydraulic coupling fitted to an extension of the engine shaft.

The hydraulic drive for the shovel may with advantage be that forming the subject-matter of the Applicant's British patent application number 5605/58 (Serial No. 883,952.)

Two embodiments of the invention will now be described by way of example with reference to the accompanying drawings wherein:

Figure 1 is a right-hand side elevation of an embodiment of the invention comprising a freely orientable or steerable wheel, the lifting or skimming position of the shovel being shown in solid lines and the raised or unloading position of the shovel being shown in chain-dotted lines;

Figure 2 is a left-hand side elevation of the same equipment with the shovel in the skimming position;

Figure 3 is a plan view of the equipment;

Figure 4 is a sectional view, to an enlarged scale and taken along the line A - B of Figure 1, through the running frame comprising the geared transmission for transmitting the engine drive to the wheels and comprising the gear shift mechanism;

Figure 5 is a sectioned elevation of a hydraulic coupling and its arrangement on the engine shaft;

Figure 6 diagrammatically illustrates the transmission system for transmitting the engine movement to the wheels in forward gear;

Figure 7 diagrammatically illustrates a transmission for transmitting the engine movement to the wheels in reverse gear;

Figure 8 is a left-hand side elevation of another embodiment of the invention wherein the steerable wheel is provided with a steering column, the shovel again being shown in the skimming position, and

Figure 9 is a plan view of the embodiment shown in Figure 8.

Referring to Figures 1 to 7, two tubular steel arms 4 forming a kind of framework are secured to a chassis 1 borne by two running or driving front wheels 2 and a rear steerable wheel 3 (Figures 1 to 3, 8 and 9). Extending rearwardly from the ends of the arms 4 are two levers or bars 5, 5' with hand grips 6, 6' the equipment having roughly the appearance of a wheel-barrow. Two shovel support arms 8 are secured to the framework formed by the two arms 4 by means of a pivot pin 7, and a shovel 10 is articulated to the other ends of the arms 8, at 9 by means of pins.

The equipment is driven by an internal combustion engine 11 which is secured on the chassis 1 and coupled directly with an oil pump 12 supplied from an oil tank 13.

Gearing for driving a driving wheel axle 14, a gear shift mechanism and a differential 15 (Figure 4) is disposed inside the chassis 1. The drive from the engine to the gearing for the driving wheels 2 is transmitted through a transmission chain 16 driven by the engine shaft 17 through the agency of a hydraulic coupling 18 disposed thereon. As shown in Figure 5, the coupling 18 comprises an impeller 19 rigidly secured to a shaft 17, and a runner 20 freely rotatable around the shaft 17 and rigidly secured to a pinion 21 of the transmission chain. When the impeller 19 is rotated by the engine 11, the runner 20 is driven by the impeller through the agency of the oil contained in the coupling.

The gear shift is operated by the hand grip 6' of the bar 5', the grip 6' being rotatable around its axis and being connected through a suitable transmission to the gear shift mechanism. A lever grip 22 for controlling engine speed is also provided on the bar 5'. The operation of gear shifting will be apparent from Figures 4, 6 and 7. In neutral the two gear wheels 23 and 24 rotate on the shaft 25 which is formed with a splined central part, a coupling sleeve 26 being so adapted to slide axially on said central part as to be engageable at choice with the gear wheel 23 or with the gear wheel 24. If the wheel 23 is engaged, the motion imparted to the shaft 27 through the chain 16 is transmitted through the gearwheels 28 and 23 to the shaft 25 which, by way of the gearwheels 29 and 30, drives the shaft 31. The same drives the driving wheel shaft 14 forwards (Figure 6) through the agency of the gearwheels 32, 33 and differential 15. When the sleeve 26 is engaged with the gearwheel 24, the rotation of the shaft 27 is transmitted to the gearwheels 34, 35 and 24 to the shaft 25 and thence, through the transmission elements aforesaid but in the opposite

direction of rotation, to the driving wheel shaft 14 which is therefore driven in reverse (Figure 7).

The double arm 8 bearing the shovel 10 is raised and lowered by the piston-cylinder motor 36, while the shovel 10 is pivoted or tilted around the pin 9 by the piston-cylinder motors 38 and 37. The motor 36 is articulated to the running frame 1 at 39 and, by means of its piston rod 41, to the arm 8 at 40. The motors 37 and 38 are secured to the arm 8 through the agency of levers 42 and 43 articulated at one end to the motors 37, 38 respectively and at the other end to the arm 8. Also, the motor 37 is articulated by means of a bar 44 to the bearing element 45 borne by the frame 4, while the motor 38 is articulated by means of its piston rod 46 to the shovel 10. The three motors are arranged in series, the motor 36 being connected by way of its piston rod 41 and lever 42 to the motor 37 which is connected by way of its piston rod 47 to the motor 38.

The three hoisting mechanisms are controlled by two valve units 48 and 48' which are connected to the oil pump 12 and which can be operated by the driver through the agency of the lever grips 49 and 49'. The valve unit for supplying oil to the motors has been described in the aforesaid British Patent Application No.5605/58 (Serial No.883,952).

In the embodiment described in Figures 1 to 3 the steerable wheel 3 of the running frame 1 is freely pivotable, but in the embodiment illustrated in Figures 8 and 9 the steerable wheel 3 is controlled through the agency of a steering column 50. The two levers 5 and 5' with the hand grips 6 and 6' respectively serve as steering grip or steering rod. Another difference is that in the embodiment illustrated in Figures 1 to 3 gear shifting is operated by the rotary grip 6' through the agency of linkage 51, whereas in the embodiment illustrated in Figures 8 and 9 the gears are shifted through the agency of a flexible shaft 52.

WHAT I CLAIM IS:-

1. A self-propelled wheeled shovelling machine comprising a mechanical drive for moving it over the ground and a hydraulic drive for moving the shovel relative to the chassis of the machine, wherein an internal combustion engine directly coupled with an oil pump communicating with an oil tank disposed above and to the rear of the engine is disposed on the wheeled chassis and wherein the drive for moving the said chassis comprises a geared transmission disposed, together with a gear shift mechanism and a differential, inside the wheeled chassis and driven by the engine through a transmission chain, and wherein the shovel drive comprises hydraulic motors operated by the oil pump and controlling the pivoting and tilting movements of the shovel support arm and of the shovel, two lever rods with hand grips being arranged to project from two side arms of a framework secured to the wheeled chassis on the side remote from the shovel, the said lever rods being combined with the compact construction formed by the engine, pump, oil tank and wheeled chassis with the devices therein in such manner that the driver can control the device as he walks behind it and can control the various control elements from the ground.

2. A machine according to Claim 1, characterised in that the wheeled chassis is mounted on two driving wheels and a freely orientable steerable wheel disposed on the hand grip side of the device.

3. A machine according to Claim 1, characterised in that the wheeled chassis is provided with at least one steerable wheel combined with a steering device, on the steering column of which the two lever rods are so mounted as together to form a steering grip or steering rod arrangement.

4. A machine according to any one of Claims 1 to 3, characterised in that the handle of one of the two lever rods is rotatable around its axis and is so connected through a transmission to the gear shift mechanism in the wheeled chassis that forward or reverse gear is engaged in accordance with the direction in which the rotary grip is rotating from a neutral position.

5. A machine according to any one of Claims 1, 2 and 4, characterised in that the transmission connecting the rotary grip to the gear shift mechanism is a mechanical linkage.

6. A machine according to any one of Claims 1, 3 and 4, characterised in that the transmission connecting the rotary grip to the gear shift mechanism consists of a flexible shaft.

7. A machine according to any one of Claims 1 to 6, characterised in that the transmission chain in the wheeled chassis is driven by the engine through the agency of a hydraulic coupling disposed on an extension of the engine shaft.

8. A machine according to any one of Claims 1 to 7 characterised in that the motor system and the associated control means for moving the shovel relative to the chassis of the machine is the same as that which forms the

subject matter of British Patent Application No. 5605/58 (Serial No. 883,952).

9. A self-propelled wheeled shovelling machine substantially as described with reference to and as shown in Figures 1 to 7 of the accompanying drawings.

10. A self-propelled wheeled shovelling machine substantially as described with reference to and as shown in Figures 8 and 9 of the accompanying drawings.

Dated this 20th day of February 1958

REDDIE & GROSE

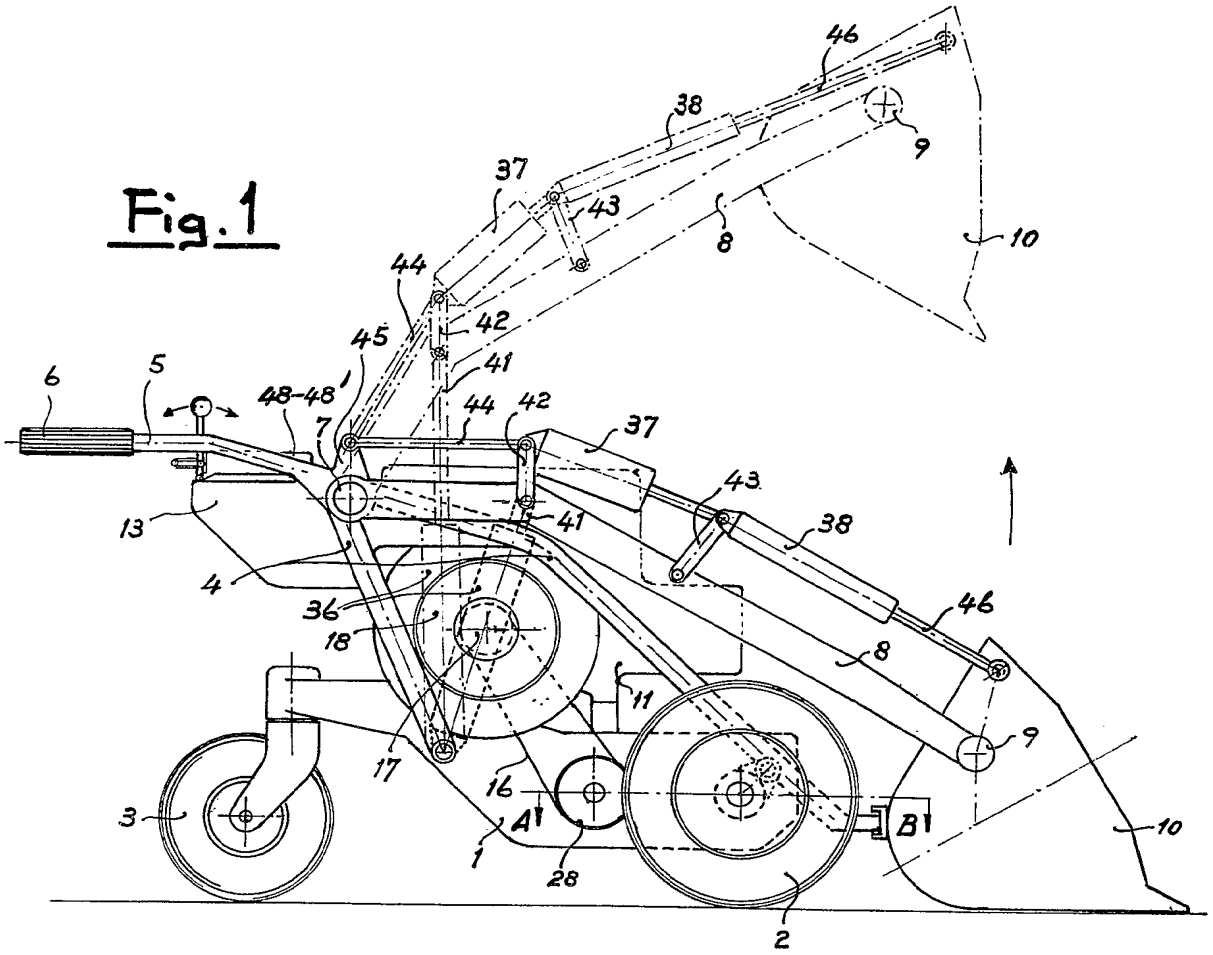
Agents for Applicant,
6 Breams Buildings,
London, E.C.4.

Printed in England by Her Majesty's Stationery Office - 1961.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2.
from which copies may be obtained.

883,953 COMPLETE SPECIFICATION

5 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEET 1

Fig. 1



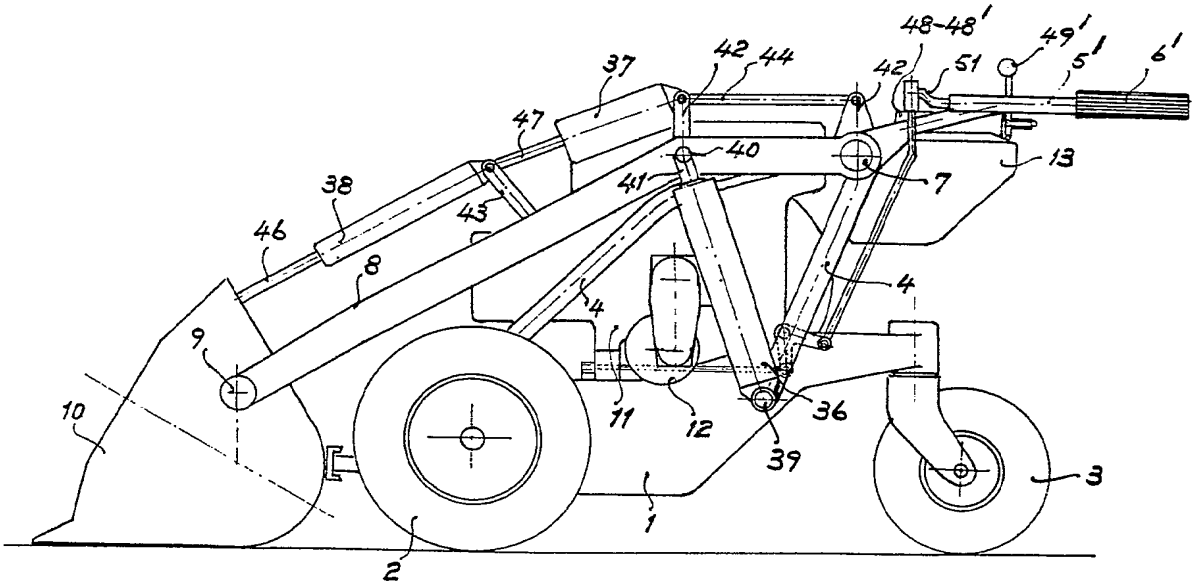

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Fig. 2

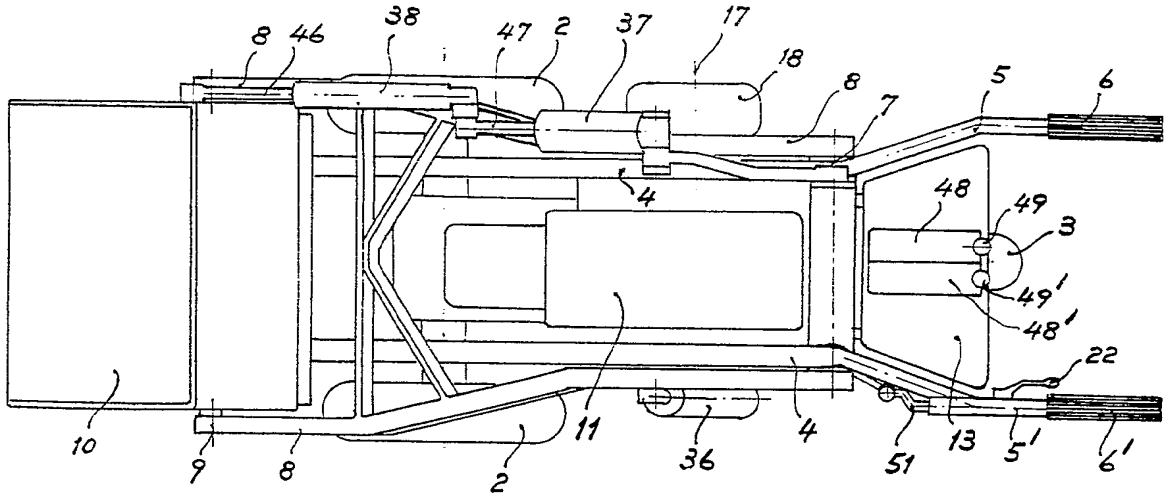
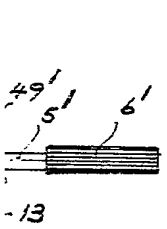

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22
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36
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51
13
5'
6'

Fig. 3

883,953 COMPLETE SPECIFICATION

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SHEETS 2 & 3



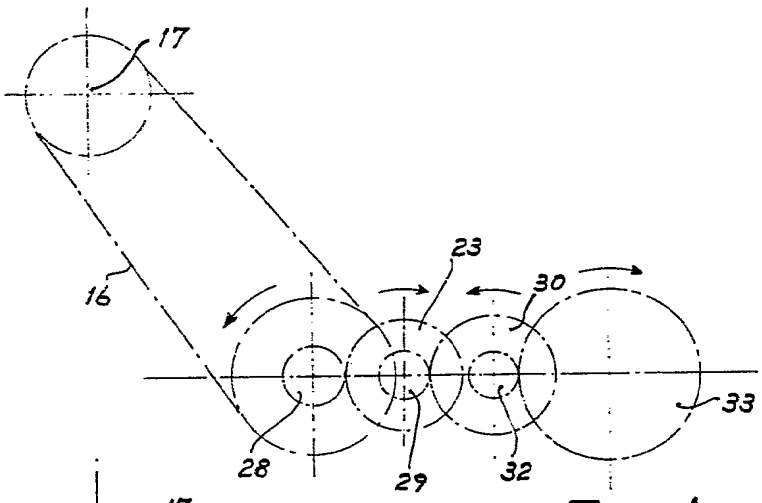
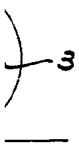


Fig. 6



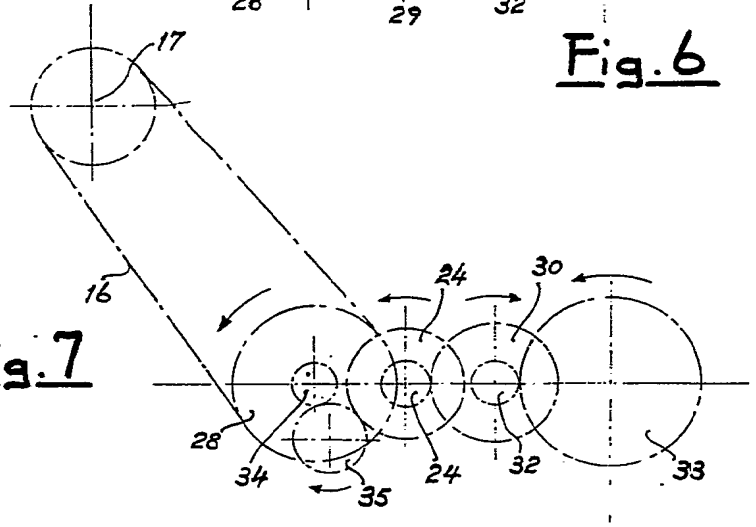
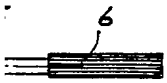


Fig. 7



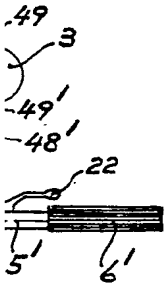
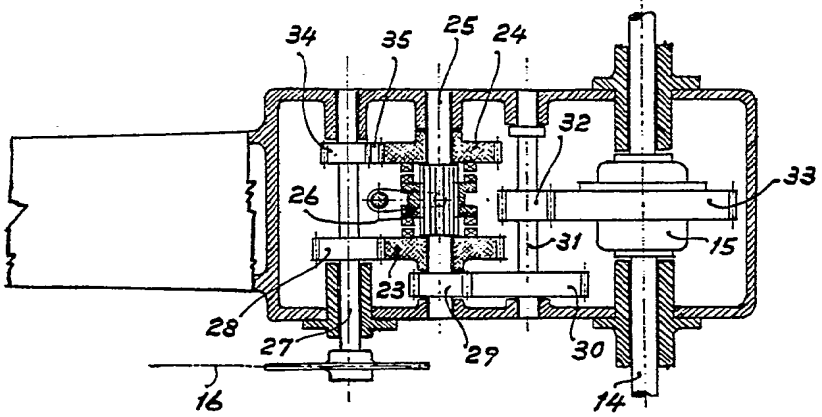


Fig. 4



883,953 COMPLETE SPECIFICATION

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SHEETS 2 & 3

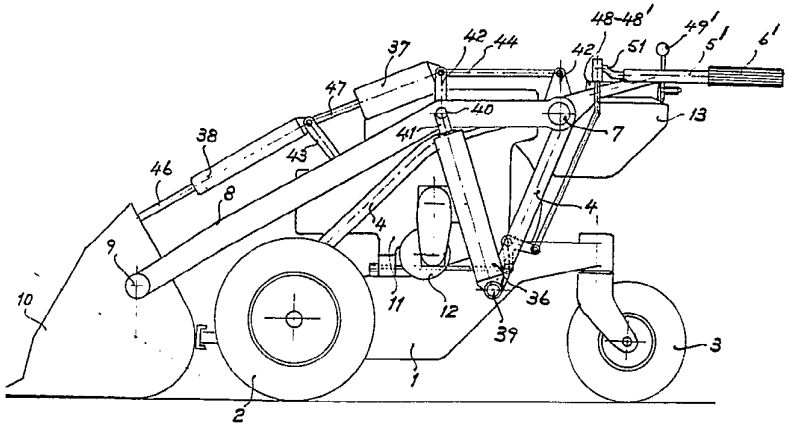


Fig.2

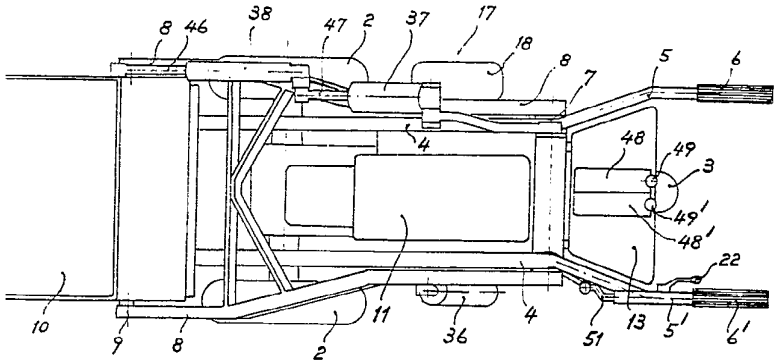


Fig.3

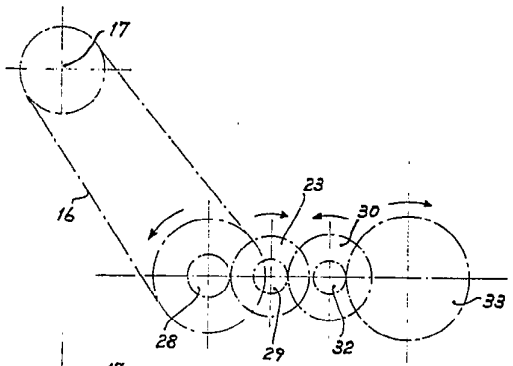


Fig.6

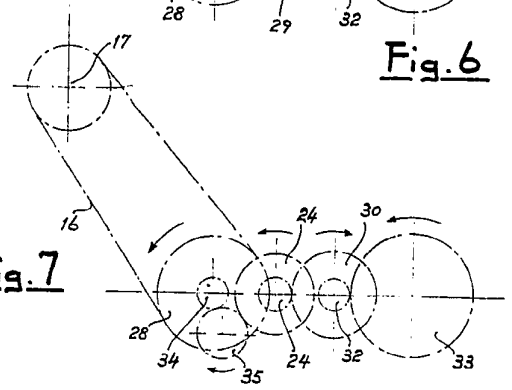


Fig.7

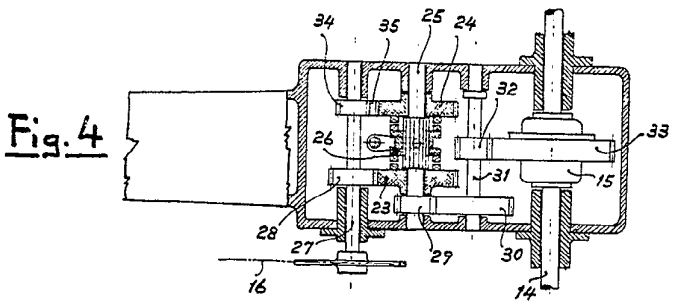
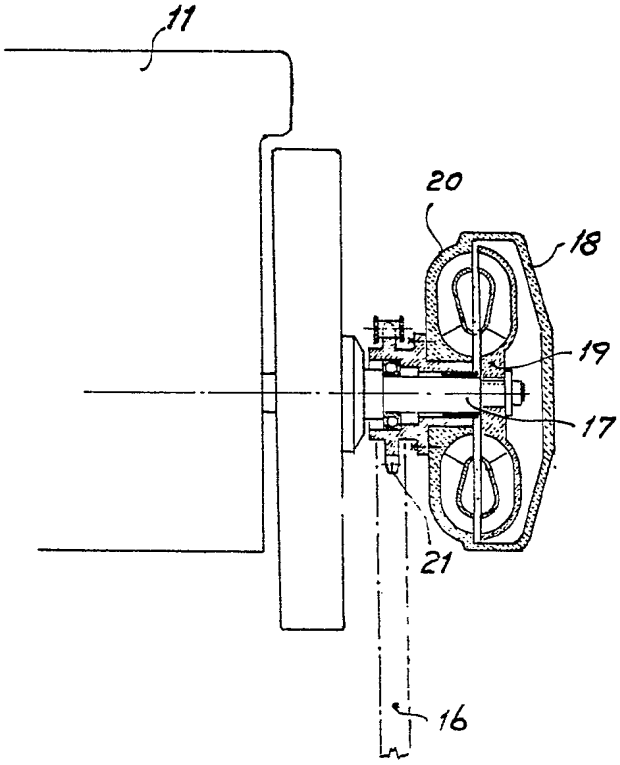


Fig.4

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Kubota North America Corporation et al



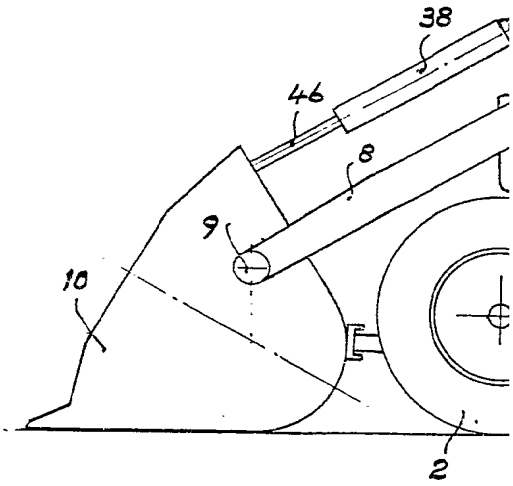
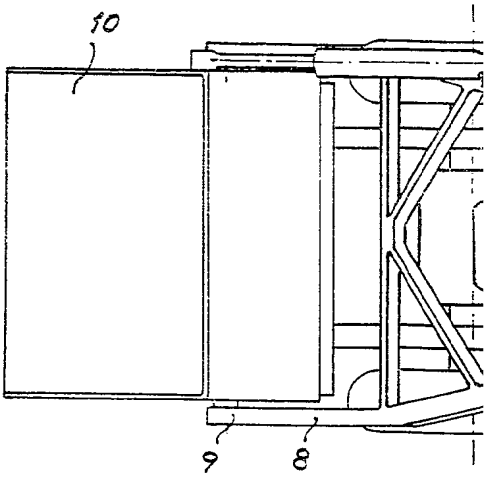


Fig. 5



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SHEETS 4 & 5

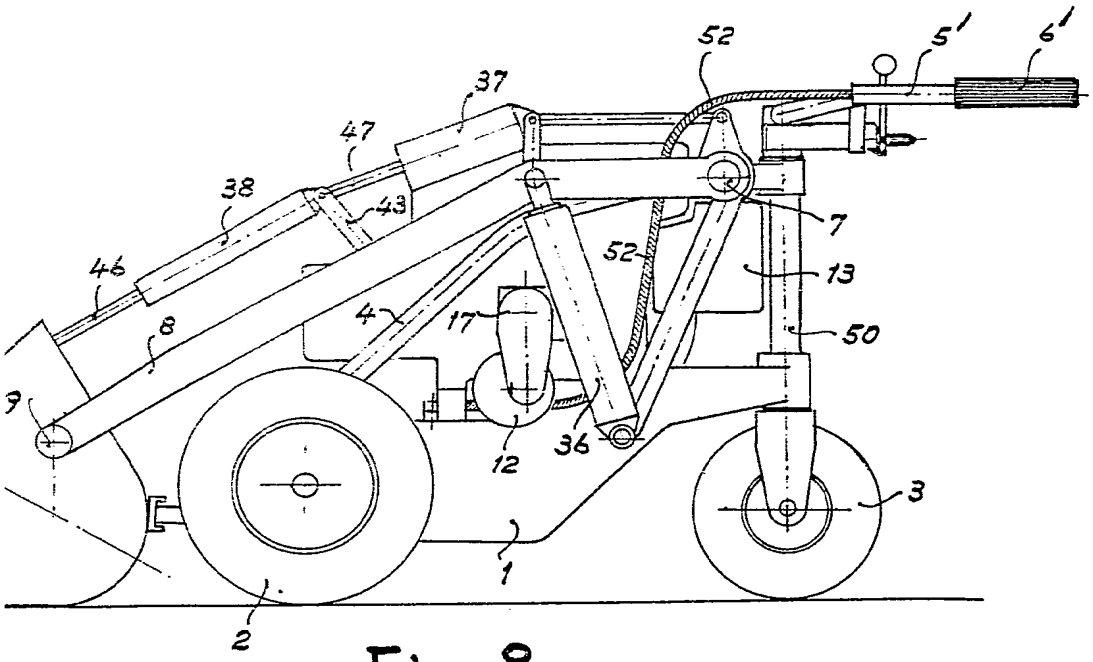


Fig. 8

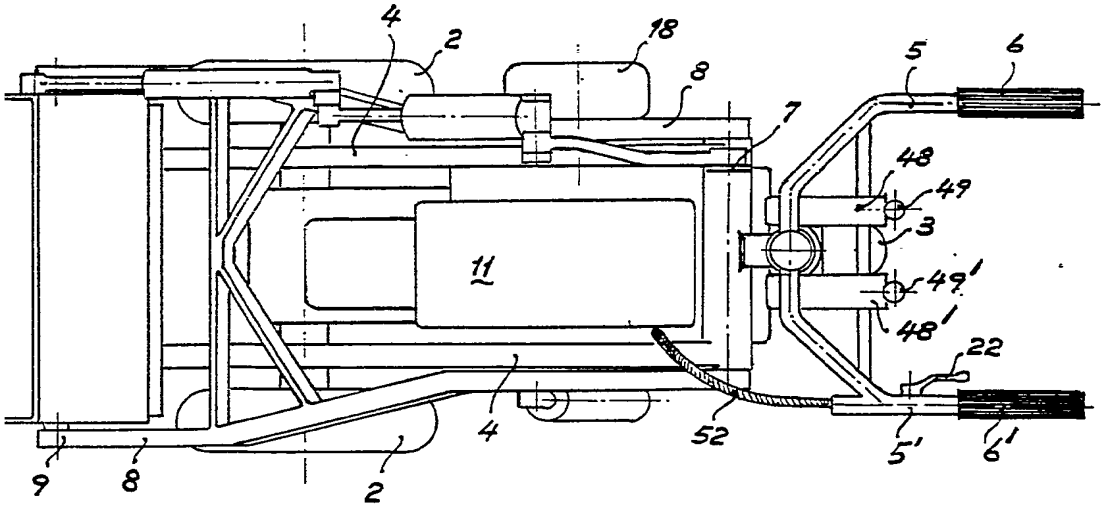


Fig. 9

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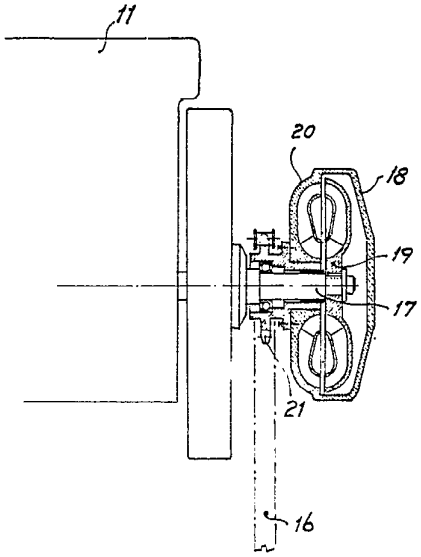


Fig. 5

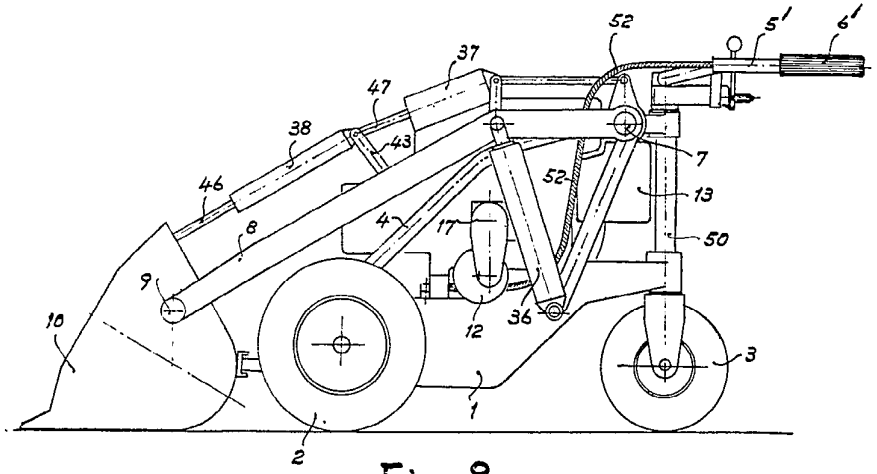


Fig. 8

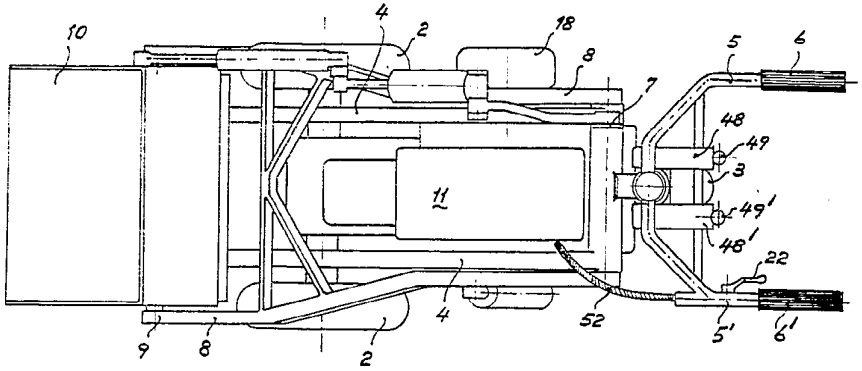


Fig. 9

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Kubota North America Corporation et al

Electronic Acknowledgement Receipt

EFS ID:	46794298
Application Number:	17961868
International Application Number:	
Confirmation Number:	8378
Title of Invention:	LOW PROFILE COMPACT TOOL CARRIERS
First Named Inventor/Applicant Name:	Brad Thomas
Customer Number:	76656
Filer:	Michael J. Vander Molen/Teddi Weber
Filer Authorized By:	Michael J. Vander Molen
Attorney Docket Number:	31681-641
Receipt Date:	11-OCT-2022
Filing Date:	
Time Stamp:	16:46:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	NPL38LitigationDocumentsFeb2017_1-42204755.pdf	14532814 8bb990b550ff64f0f1911a18dbf2e068f686c53e	no	162

Warnings:

Information:					
2	Non Patent Literature	NPL38LitigationDocumentsFeb2017_2-42205414.pdf	9729936 985e2b0eec401b0d46f8d081f7140054a8722a11	no	83
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Information:					
7	Information Disclosure Statement (IDS) Form (SB08)	IDS_31681-641-55827358.pdf	1456082 f27a8026f1d2382e525104cd08d2f10393ef1317	no	14
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			Total Files Size (in bytes):	67166639	

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National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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Document Description: Power of Attorney

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Application Number	
Filing Date	2022-10-07
First Named Inventor	Brad Thomas
Title	LOW PROFILE COMPACT TOOL CARRIERS
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	31681-641

SIGNATURE of Applicant or Patent Practitioner

Signature	/Michael J. Vander Molen/	Date (Optional)	10/07/2022
Name	Michael J. Vander Molen	Registration Number	57,274
Title (if Applicant is a juristic entity)	Attorney for Applicant		
Applicant Name (if Applicant is a juristic entity)	Vermeer Manufacturing Company		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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Document Description: Power of Attorney

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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 76656

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter to:

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Firm or Individual Name					
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I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	15 August 2013
Name	Bob Smith		
Title	General Counsel Vermeer Manufacturing Company		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Brad Thomas Art Unit: TBD
Application No.: TBD
Filed On: October 7, 2022
Confirmation No.: TBD
For: MAINFRAMES FOR A SELF-PROPELLED MACHINE
Examiner: TBD

October 7, 2022

PRELIMINARY AMENDMENT A

TO THE COMMISSIONER FOR PATENTS,

SIR:

Please enter the following amendments and consider the following remarks prior to the examination of the above-referenced patent application:

Amendments to the Specification begin on page 2; and

Remarks begin on page 3.

AMENDMENTS TO THE SPECIFICATION

Please replace the specification with the substitute specification submitted concurrently herewith.

REMARKS

Applicant requests entry of the previous amendments prior to examination of the present application. Allowance of all pending claims is respectfully requested.

Applicant authorizes the Commissioner to charge any fees which may be due in connection with this Preliminary Amendment A to Deposit Account No. 012384 in the name of Armstrong Teasdale LLP.

Respectfully submitted,

/Michael J. Vander Molen/

Michael J. Vander Molen
Reg. No. 57,274
ARMSTRONG TEASDALE LLP
7700 Forsyth Blvd.
Suite 1800
St. Louis, Missouri 63105
(314) 621-5070

MJV/tkw

~~LOW PROFILE COMPACT TOOL CARRIERS~~ MAINFRAMES FOR A SELF-PROPELLED MACHINE

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application is a continuation of 17/397,200, filed August 9, 2021, which issued October 11, 2022 as U.S. Patent No. 11,465,891, which is a continuation of 16/270,070, filed February 7, 2019, which is a continuation of U.S. Patent Application No. 15/704,685, filed September 14, 2017, which issued February 12, 2019 as U.S. Patent No. 10,202,266, which is a continuation of U.S. Patent Application No. 15/062,801, filed March 7, 2016, which issued May 22, 2018 as U.S. Patent No. 9,975,750, which is a continuation of U.S. Patent Application No. 14/691,649, filed April 21, 2015, which issued April 26, 2016 as U.S. Patent No. 9,321,386, which claims the benefit of U.S. Provisional Patent Application No. 62/118,860, filed February 20, 2015, each of which is incorporated herein by reference in its entirety.

FIELD OF THE DISCLOSURE

[0002] The field of the disclosure relates **mainframes for a self-propelled machine** ~~to compact tool carriers having a loader mounted to a low-profile mainframe~~.

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BACKGROUND

[0003] Compact tool carriers are tool-mounted machines that are capable of working in tight spaces for utility or do-it-yourself home projects. Compact tool carriers are walk-behind units or include a platform on which the operator may stand during use. Compact tool carriers are generally defined (e.g., ISO 6165 (2012) and SAE J2752) as "a self-propelled crawler or wheeled machine having an operating mass of less than 1500 kg with a rigid frame, having either a pedestrian operating position or a standing operator platform at the rear of the machine and either front-mounted interchangeable equipment or lift arms with an attachment bracket capable of coupling to interchangeable, front-mounted attachments." The tool carriers may be attached to a variety of interchangeable tools such as buckets, augers, forks, stump grinders, tillers, rollers and the like.

[0004] Compact tool carriers may be distinguished from much larger conventional skid steers in which an operator is seated in the operating position. Compact tool carriers pose difficulty in design relative to full-size skid steers due to variation in weight, complexity and size.

[0005] A continuing need exists for compact tool carriers with a relatively low-profile, compact design and/or that are characterized by a more effective loader lifting profile.

[0006] This section is intended to introduce the reader to various aspects of art that may be related to various aspects of the disclosure, which are described and/or claimed below. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present disclosure. Accordingly, it should be understood that these statements are to be read in this light, and not as admissions of prior art.

SUMMARY

[0007] One aspect of the present disclosure is directed to a compact tool carrier configured for standing or walk-behind operator control. The carrier has a mass of less than about 1500 kg and includes a loader having an arm and a linkage pivotally attached to the loader arm. An actuator is pivotally attached to the loader arm. The carrier includes a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader. The control station is configured for remote operation or is mounted toward the rear of the compact tool carrier and is adapted to allow for standing or walk-behind operation.

[0008] Another aspect of the present disclosure is directed to a compact tool carrier. The carrier comprises a loader and a mainframe for supporting the loader. The mainframe has a first side and a second side with each side having a top and a bottom. The first

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side of the mainframe has at least two pivot points relative to the loader. The carrier includes a drive mechanism comprising tracks or wheels for propelling the apparatus over a supporting surface. The drive mechanism is attached to the mainframe about a rotational axis. The compact tool carrier has a bottom at which the drive mechanism contacts the supporting surface. The rotational axis and bottom of the compact tool carrier are separated by a vertical distance D1. The rotational axis and each pivot point are separated by a vertical distance. Each vertical distance between the rotational axis and a pivot point is less than 1.5 times D1.

[0009] Various refinements exist of the features noted in relation to the above-mentioned aspects of the present disclosure. Further features may also be incorporated in the above-mentioned aspects of the present disclosure as well. These refinements and additional features may exist individually or in any combination. For instance, various features discussed below in relation to any of the illustrated embodiments of the present disclosure may be incorporated into any of the above-described aspects of the present disclosure, alone or in any combination.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Figure 1 is a perspective view of a compact tool carrier with the loader in a down position;

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[0011] Figure 2 is a side view of the compact tool carrier with the loader in a down position;

[0012] Figure 3 is a side view of the compact tool carrier with the loader in a raised position;

[0013] Figure 4 is a perspective view of a mainframe of the compact tool carrier;

[0014] Figure 5 is a side view of the mainframe and loader of the compact tool carrier;

[0015] Figure 6 is a cross-section side view of the mainframe; and

[0016] Figure 7 is an exploded perspective view of the mainframe and an upper frame of the compact tool carrier.

[0017] Corresponding reference characters indicate corresponding parts throughout the drawings.

DETAILED DESCRIPTION

[0018] An embodiment of a compact tool carrier is generally referred as “5” in Figure 1. The compact tool carrier 5 includes a loader 8 supported by a mainframe 10. The loader 8 includes an attachment plate 12 for interchangeably attaching any one of a number of tools (not shown). In this regard, such interchangeable tools do not form part of the compact tool carrier 5 unless stated otherwise. The attachment plate 12 is

connected to an actuator 14 for tilting of tools connected to the attachment plate 12. The loader 8 has a first arm 15a and a second arm 15b generally opposite the first arm 15a. Each arm 15a, 15b may be a single weldment or may include various components attached by fasteners (e.g., nuts and bolts). The first and second arms 15a, 15b each include a bracket portion 17a, 17b (Fig. 1) for fastening various linkages.

[0019] As used herein, "compact tool carrier" refers to machines that are self-propelled and are capable of carrying interchangeable equipment and that generally have a mass (not including the interchangeable tool) of less than about 1500 kg (about 3307 lb). Use of the term "compact tool carrier" herein is intended to exclude full size skid steers (e.g., seat-operated units) due to a large variation in weight, complexity and size. In some embodiments, the compact tool carrier 5 meets the definition of a compact tool carrier provided in ISO 6165 (2012) and SAE J2752 set forth above, both standards being incorporated herein by reference for all relevant and consistent purposes.

[0020] The compact tool carrier 5 includes a longitudinal axis A that is parallel to the direction of travel of the carrier (i.e., parallel to its length). The compact tool carrier 5 is generally longitudinally symmetrical (i.e., relative to the longitudinal axis A) in that several components have a corresponding component with the same function opposite the component (i.e., across the axis A). Corresponding components of the pair may be indicated herein by use of a reference number

followed by "A" and "B" and may be referred to as a "first" component and a "second" component, respectively. While the compact tool carrier 5 may be described herein with reference to the components of one side of the compact tool carrier 5, any component designated by "A" or "B" herein or shown in Figures 1-7 includes a corresponding component with the same function opposite the component.

[0021] The compact tool carrier 5 includes a drive mechanism 18 attached to the mainframe 10. In the illustrated embodiment, the drive mechanism 18 is directly mounted (i.e., connected without intermediary parts) to the mainframe 10 by way of drive sprocket 22 connected to a hub 26 (Fig. 2). The hub 26 is attached to a shaft (not shown) that extends through a drive opening 30 (Fig. 4) of the mainframe 10. The sprocket 22, hub 26 and shaft (not shown) rotate about a rotational axis R (Fig. 5). As shown, the drive mechanism 18 includes tracks 34. In other embodiments, the drive mechanism **18** **[[10]]** includes wheels.

[0022] The compact tool carrier 5 includes a control station 36 (Fig. 1) which may include controls (not all controls being shown) for propelling the compact tool carrier 5 forward and/or for raising and lowering the loader 8. The control station 36 may be mounted toward the rear of the compact tool carrier 5 (i.e., opposite the attachment plate 12) and is generally adapted to allow for standing or walk-behind operation. As used herein, "standing operation" generally refers to operation in which the operator stands on a platform

attached to the compact tool carrier while "walk-behind operation" generally refers to operation in which the operator stands on the surface supporting the compact tool carrier 5. In the illustrated embodiment, the compact tool carrier 5 includes an operator platform 37 (Fig. 2).

[0023] In embodiments in which the compact tool carrier 5 includes an operator platform 37 for standing operation, the difference between the height of the control station 36 (e.g., as measured from the highest control for operating the loader or propelling the apparatus forward) and the platform 37 may be at least about 90 cm (e.g., from about 90 cm to about 130 cm). In embodiments in which the operator walks behind the compact tool carrier 5, the control station 36 may be at least about 90 cm (e.g., from about 90 cm to about 130 cm) from the surface supporting the compact tool carrier. Such a range generally complies with the zones of comfort and reach for controls in earth-moving equipment set forth in ISO 6682 (2008) as determined from the physical dimensions of operators and minimum operator space envelope as set forth in ISO 3411 (2007), both of which are incorporated herein by reference for all relevant and consistent purposes.

[0024] In the illustrated embodiment, the control station 36 is attached to an upper frame 39 (Fig. 7) that is attached and supported by the mainframe 10. In other embodiments, rather than being integrated as one unit in the compact tool carrier 5, the control station 36 is separate from the body (e.g., mainframe) of the

carrier and is operated remotely. In such embodiments, the control station 36 may be wired or may operate wirelessly to propel the carrier 5 and/or raise and lower the loader 8.

[0025] The mainframe 10 includes a first side 38a and a second side 38b generally opposite the first side 38a. As used herein, the term "mainframe" generally refers to a single weldment to which the loader 8 is attached, optionally through one or more pivotal linkages. The mainframe 10 includes bracket portions 40a, 40b (Fig. 4) through which various pivot linkages are attached. In the illustrated embodiment, the engine (not shown) and the drive mechanism **18** **[[10]]** comprising tracks or wheels are directly connected to the mainframe 10.

[0026] The first loader arm 15a is pivotally connected to the first side 38a of the mainframe 10, and the second loader arm 15b is pivotally connected to the second side 38b of the mainframe 10. The loader arms 15a, 15b and sides 38a, 38b of the mainframe 10 each include three pivot points for pivoting the loader 8 relative to the mainframe 10. The first side 38a of the mainframe 10 includes a forward pivot point P_1 (Fig. 5) a rear pivot point P_3 and a central pivot point P_2 between the forward pivot point P_1 and the rear pivot point P_3. Similarly, the first arm 15a includes a forward pivot point P_4, a rear pivot point P_6 and a central pivot point P_5 between the forward pivot point P_4 and the rear pivot point P_6. The compact tool carrier 5 includes a first forward linkage 46a attached to the first side 38a of the

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mainframe 10 at its forward pivot point P_1 and attached to the first arm 15a at its forward pivot point P_4. A first rear linkage 50a is attached to the first side 38a of the mainframe 10 at its rear pivot point P_3 and is attached to the first arm 15a of the loader 8 at its rear pivot point P_6. While the carrier 5 is shown with two loader linkages 46a, 50a on each side of the carrier 5, in other embodiments the carrier 5 includes a single linkage.

[0027] An actuator 54, shown as a hydraulic cylinder, is attached to the first side 38a of the mainframe 10 at its center pivot point **P_2** **[[P_4]]** and is attached to the loader arm 15a at its center pivot point P5 to raise the loader 8. The compact tool carrier 5 may include a single actuator 54, or, as in other embodiments, a second actuator (not shown) is connected to the second side 38b (Fig. 4) of the mainframe 10 and the second arm 15b (Fig. 1). The actuator 54 is powered to raise the loader 8 and, in some embodiments, is also powered to lower the loader 8 (as opposed to a one-way actuator lowered by gravity alone).

[0028] The second side 38b (Fig. 4) of the mainframe 10 may include a forward pivot point and a rear pivot point to which a second forward linkage 46b (Fig. 1) and second rear linkage (not shown) are respectively attached. The second arm 15b may also include a forward pivot point and rear pivot point to which the second forward linkage 46b and second rear linkage are attached. In embodiments in which the compact tool carrier 5 includes a second actuator (not shown), the second side 38b of the mainframe 10 includes a central pivot point

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between its forward pivot point and its rear pivot point, and the second arm 15b also includes a central pivot point between its forward pivot point and its rear pivot point. The second cylinder may be attached to the central pivot point of the second side 38b of the mainframe 10 and the central pivot point of the second arm 15b.

[0029] In some embodiments, the first and second ends 38a, 38b of the mainframe 10 and the first and second loader arms 15a, 15b do not include more than three pivot points at which the mainframe 10 and loader 8 pivot relative to each other. While the actuator 54 is shown as being attached between the other two linkages 46a, 50a, in other embodiments the actuator 54 is forward to both linkages 46a, 50a or rearward to both linkages 46a, 50a. Further, each side of the carrier 5 having an actuator 54 may include a single linkage rather than two linkages.

[0030] In some embodiments, the mainframe 10 is characterized by a relatively low profile (i.e., the pivot points are positioned relatively low on the mainframe allowing its height to be reduced). The rotational axis R (Fig. 5) and the bottom of the compact tool carrier 5 (Fig. 2) are separated by a distance D1. Generally, the bottom of the compact tool carrier 5 corresponds to the point at which the drive mechanism 18 contacts the surface supporting the compact tool carrier 5. The rotational axis R and the forward pivot point P_1 of the first side 38a of the mainframe 10 are separated by a vertical distance D2. The rotational axis R and the

rear pivot point P_3 are separated by a vertical distance D3. The rotational axis R and the central pivot point **$\underline{P_2}$** **[[P_4]]** are separated by a vertical distance D4. Each of D2, D3 and D4 is less than about 1.5 times D1 (1.5xD1). In some embodiments, each of D2, D3 and D4 is less than D1 or even less than about 0.75 times D1 (0.75xD1).

[0031] The mainframe 10 profile may also be expressed relative to the distance D5 between the rotational axis R (Fig. 5) and the bottom 57 of the mainframe 10. Each of D2, D3 and D4 is less than about twice D5 (2xD5). In some embodiments, each of D2, D3 and D4 is less than about 1.75 times D5 (1.75xD5) or less than about 1.5 times D5 (1.5XD5). P2 and P3 may be relatively lower than P1 and their distances D3, D4 from the rotational axis R may be even less than about 1.25 times D5 (1.25xD5). The distance D6 between the top 59 of the first side 38a of the mainframe 10 and the highest pivot point (P_1 in the illustrated embodiment), is less than about 1.5 times D5, less than about D5 or less than about 0.75 times D5.

[0032] The second side 38b (Fig. 1) of the mainframe 10 may have a similar pivot point arrangement. The rotational axis R and the forward pivot point of the second side 38b are separated by a vertical distance D2′ (not shown). The rotational axis R and the rear pivot point of the second side are separated by a vertical distance D3′ (not shown). The rotational axis R and the central pivot point (if any) of the second side 38b of mainframe 10 are separated by a vertical distance D4′ (not shown). Each of D2′, D3′ and D4′ is less than about

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1.5 times D1 (1.5xD1) or less than D1 or even less than about 0.75 times D1 (0.75xD1). The rotational axis R and the bottom of the second side 38b of the mainframe 10 are separated by a vertical distance D5′ (not shown). Each of D2′, D3′ and D4′ is less than twice D5′ (2xD5′) or less than about 1.75 times D5′ (1.75xD5′) or less than about 1.5 times D5′ (1.5XD5′). D3′ and D4′ may be even less than about 1.25 times D5′ (1.25xD5′). The distance D6′ between the top of the second side 38b of the mainframe 10 and the highest pivot point is less than about 1.5 times D5′, less than about D5′ or less than about 0.75 times D5′.

[0033] The compact tool carrier 5 includes an engine (not shown) for propelling the drive mechanism 18. As shown in Figure 6, the engine may be mounted to an engine bracket 60 that forms part of the mainframe 10. The engine may drive a hydraulic pump that powers hydraulic motors (not shown) which drive the drive mechanism 18 (Fig. 1) and which provide hydraulic power to actuator 54. The mainframe 10 includes a reservoir 64 for storing and cycling of hydraulic fluid.

[0034] Compared to conventional compact tool carriers, embodiments of the compact tool carrier 5 described above have several advantages. By positioning the pivot points relatively low on the mainframe 10, the mass of the mainframe 10 and the resulting cost of the carrier 5 may be reduced. Further, such a low-profile mainframe 10 improves visibility for the operator and allows the center of gravity of the carrier 5 to be lowered which improves its stability. In embodiments in

which the carrier 5 includes an actuator 54 (Fig. 5) for lifting the loader 8 that is disposed between forward linkage 46a and a rear linkage 50a on at least one side 38a, 38b of the mainframe 10, the loader 8 is characterized by an travel path in which the loader travels vertically rather than over a radial path. The vertical travel path of the loader 8 is more effective relative to conventional travel paths for compact tool carriers 5 as the carrier 5 may operate closer to other structures.

[0035] As used herein, the terms “about,” “substantially,” “essentially” and “approximately” when used in conjunction with ranges of dimensions, concentrations, temperatures or other physical or chemical properties or characteristics is meant to cover variations that may exist in the upper and/or lower limits of the ranges of the properties or characteristics, including, for example, variations resulting from rounding, measurement methodology or other statistical variation.

[0036] When introducing elements of the present disclosure or the embodiment(s) thereof, the articles "a", "an", "the" and "said" are intended to mean that there are one or more of the elements. The terms "comprising," "including," “containing” and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements. The use of terms indicating a particular orientation (e.g., "top", "bottom", "side", etc.) is for convenience of

description and does not require any particular orientation of the item described.

[0037] As various changes could be made in the above constructions and methods without departing from the scope of the disclosure, it is intended that all matter contained in the above description and shown in the accompanying drawing[s] shall be interpreted as illustrative and not in a limiting sense.

ABSTRACT

~~Compact tool carriers having a loader mounted to a low-profile mainframe are disclosed. In some embodiments, the pivot points of the mainframe about which the loader is pivoted are low relative to the mainframe to reduce the mainframe size.~~ Mainframes for a self-propelled machine are disclosed. The mainframe includes first and second pockets that extend from the front end to the rear end of the mainframe. A hydraulic reservoir housing extends from the first side to the second side of the mainframe. The hydraulic reservoir housing is disposed between the front end of the mainframe and first and second drive openings.

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Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	LOW PROFILE COMPACT TOOL CARRIERS
First Named Inventor/Applicant Name:	Brad Thomas
Filer:	Michael J. Vander Molen/Teddi Weber
Attorney Docket Number:	31681-641

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Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	320	320
UTILITY SEARCH FEE	1111	1	700	700
UTILITY EXAMINATION FEE	1311	1	800	800
Pages:				
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Miscellaneous-Filing:				
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Post-Allowance-and-Post-Issuance:				
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Electronic Acknowledgement Receipt

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First Named Inventor/Applicant Name:	Brad Thomas
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Filer:	Michael J. Vander Molen/Teddi Weber
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1	Application Data Sheet	ADS_31681-641.pdf	2296300 97820c6e28d566c80f2c84e0273745c0f0ef759f	no	10
Warnings:					
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2		Continuating_Application_31681-641.pdf	87778 3619ca07b8d31507a54987720dcbb2a285484968	yes	18

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	Document Description	**Start**	**End**
	Specification	1	15
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3	Drawings-only black and white line drawings	Figures_31681-641.pdf	477870 73e058323c459fc5e5a414bf0f57a93664024875	no	7
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4	Oath or Declaration filed	Declaration_and_Assignment_31681-641.pdf	6154009 b3a6b2dc4dfbb52743d852a959d4b8f34caeb058	no	8
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	Document Description	**Start**	**End**
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7	Specification	Substitute_Specification_Marked-Up.pdf	130121 76a3b786d5395a03c64ca50bd7001c8bec93940b	no	16
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	31681-641
	Application Number	
Title of Invention	LOW PROFILE COMPACT TOOL CARRIERS	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
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Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	31681-641
	Application Number	
Title of Invention	LOW PROFILE COMPACT TOOL CARRIERS	

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Application Information:

Title of the Invention	LOW PROFILE COMPACT TOOL CARRIERS		
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Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	7	Suggested Figure for Publication (if any)	4

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	31681-641
	Application Number	
Title of Invention	LOW PROFILE COMPACT TOOL CARRIERS	

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Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

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Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
	Continuation of	17397200	2021-08-09	11465891	2022-10-11

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	31681-641
	Application Number	
Title of Invention	LOW PROFILE COMPACT TOOL CARRIERS	

Prior Application Status	Abandoned		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
17397200	Continuation of	16270070	2019-02-07
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16270070	Continuation of	15704685	2017-09-14	10202266	2019-02-12

Prior Application Status	Patented	Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15704685	Continuation of	15062801	2016-03-07	9975750	2018-05-22

Prior Application Status	Patented	Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15062801	Continuation of	14691649	2015-04-21	9321386	2016-04-26

Prior Application Status	Expired	Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
14691649	Claims benefit of provisional	62118860	2015-02-20

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	31681-641
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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	31681-641
	Application Number	
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	Application Number	
Title of Invention	LOW PROFILE COMPACT TOOL CARRIERS	

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Applicant 1 — Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

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● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Vermeer Manufacturing Company		
Mailing Address Information For Applicant:			
Address 1	1210 Vermeer Road East		
Address 2			
City	Pella	**State/Province**	IA
Country	US	Postal Code	50219
Phone Number		Fax Number	
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Signature	/Michael J. Vander Molen/			Date (YYYY-MM-DD)	2022-10-07
First Name	Michael J.	Last Name	Vander Molen	Registration Number	57274

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	31681-641
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LOW PROFILE COMPACT TOOL CARRIERS

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application is a continuation of 17/397,200, filed August 9, 2021, which issued October 11, 2022 as U.S. Patent No. 11,465,891, which is a continuation of 16/270,070, filed February 7, 2019, which is a continuation of U.S. Patent Application No. 15/704,685, filed September 14, 2017, which issued February 12, 2019 as U.S. Patent No. 10,202,266, which is a continuation of U.S. Patent Application No. 15/062,801, filed March 7, 2016, which issued May 22, 2018 as U.S. Patent No. 9,975,750, which is a continuation of U.S. Patent Application No. 14/691,649, filed April 21, 2015, which issued April 26, 2016 as U.S. Patent No. 9,321,386, which claims the benefit of U.S. Provisional Patent Application No. 62/118,860, filed February 20, 2015, each of which is incorporated herein by reference in its entirety.

FIELD OF THE DISCLOSURE

[0002] The field of the disclosure relates to compact tool carriers having a loader mounted to a low-profile mainframe.

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BACKGROUND

[0003] Compact tool carriers are tool-mounted machines that are capable of working in tight spaces for utility or do-it-yourself home projects. Compact tool carriers are walk-behind units or include a platform on which the operator may stand during use. Compact tool carriers are generally defined (e.g., ISO 6165 (2012) and SAE J2752) as "a self-propelled crawler or wheeled machine having an operating mass of less than 1500 kg with a rigid frame, having either a pedestrian operating position or a standing operator platform at the rear of the machine and either front-mounted interchangeable equipment or lift arms with an attachment bracket capable of coupling to interchangeable, front-mounted attachments." The tool carriers may be attached to a variety of interchangeable tools such as buckets, augers, forks, stump grinders, tillers, rollers and the like.

[0004] Compact tool carriers may be distinguished from much larger conventional skid steers in which an operator is seated in the operating position. Compact tool carriers pose difficulty in design relative to full-size skid steers due to variation in weight, complexity and size.

[0005] A continuing need exists for compact tool carriers with a relatively low-profile, compact design and/or that are characterized by a more effective loader lifting profile.

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[0006] This section is intended to introduce the reader to various aspects of art that may be related to various aspects of the disclosure, which are described and/or claimed below. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present disclosure. Accordingly, it should be understood that these statements are to be read in this light, and not as admissions of prior art.

SUMMARY

[0007] One aspect of the present disclosure is directed to a compact tool carrier configured for standing or walk-behind operator control. The carrier has a mass of less than about 1500 kg and includes a loader having an arm and a linkage pivotally attached to the loader arm. An actuator is pivotally attached to the loader arm. The carrier includes a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader. The control station is configured for remote operation or is mounted toward the rear of the compact tool carrier and is adapted to allow for standing or walk-behind operation.

[0008] Another aspect of the present disclosure is directed to a compact tool carrier. The carrier comprises a loader and a mainframe for supporting the loader. The mainframe has a first side and a second side with each side having a top and a bottom. The first

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side of the mainframe has at least two pivot points relative to the loader. The carrier includes a drive mechanism comprising tracks or wheels for propelling the apparatus over a supporting surface. The drive mechanism is attached to the mainframe about a rotational axis. The compact tool carrier has a bottom at which the drive mechanism contacts the supporting surface. The rotational axis and bottom of the compact tool carrier are separated by a vertical distance D1. The rotational axis and each pivot point are separated by a vertical distance. Each vertical distance between the rotational axis and a pivot point is less than 1.5 times D1.

[0009] Various refinements exist of the features noted in relation to the above-mentioned aspects of the present disclosure. Further features may also be incorporated in the above-mentioned aspects of the present disclosure as well. These refinements and additional features may exist individually or in any combination. For instance, various features discussed below in relation to any of the illustrated embodiments of the present disclosure may be incorporated into any of the above-described aspects of the present disclosure, alone or in any combination.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Figure 1 is a perspective view of a compact tool carrier with the loader in a down position;

[0011] Figure 2 is a side view of the compact tool carrier with the loader in a down position;

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[0012] Figure 3 is a side view of the compact tool carrier with the loader in a raised position;

[0013] Figure 4 is a perspective view of a mainframe of the compact tool carrier;

[0014] Figure 5 is a side view of the mainframe and loader of the compact tool carrier;

[0015] Figure 6 is a cross-section side view of the mainframe; and

[0016] Figure 7 is an exploded perspective view of the mainframe and an upper frame of the compact tool carrier.

[0017] Corresponding reference characters indicate corresponding parts throughout the drawings.

DETAILED DESCRIPTION

[0018] An embodiment of a compact tool carrier is generally referred as “5” in Figure 1. The compact tool carrier 5 includes a loader 8 supported by a mainframe 10. The loader 8 includes an attachment plate 12 for interchangeably attaching any one of a number of tools (not shown). In this regard, such interchangeable tools do not form part of the compact tool carrier 5 unless stated otherwise. The attachment plate 12 is connected to an actuator 14 for tilting of tools connected to the attachment plate 12. The loader 8 has a first arm 15a and a second arm 15b generally opposite the

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first arm 15a. Each arm 15a, 15b may be a single weldment or may include various components attached by fasteners (e.g., nuts and bolts). The first and second arms 15a, 15b each include a bracket portion 17a, 17b (Fig. 1) for fastening various linkages.

[0019] As used herein, "compact tool carrier" refers to machines that are self-propelled and are capable of carrying interchangeable equipment and that generally have a mass (not including the interchangeable tool) of less than about 1500 kg (about 3307 lb). Use of the term "compact tool carrier" herein is intended to exclude full size skid steers (e.g., seat-operated units) due to a large variation in weight, complexity and size. In some embodiments, the compact tool carrier 5 meets the definition of a compact tool carrier provided in ISO 6165 (2012) and SAE J2752 set forth above, both standards being incorporated herein by reference for all relevant and consistent purposes.

[0020] The compact tool carrier 5 includes a longitudinal axis A that is parallel to the direction of travel of the carrier (i.e., parallel to its length). The compact tool carrier 5 is generally longitudinally symmetrical (i.e., relative to the longitudinal axis A) in that several components have a corresponding component with the same function opposite the component (i.e., across the axis A). Corresponding components of the pair may be indicated herein by use of a reference number followed by "A" and "B" and may be referred to as a "first" component and a "second" component, respectively. While the compact tool carrier 5 may be described herein

with reference to the components of one side of the compact tool carrier 5, any component designated by "A" or "B" herein or shown in Figures 1-7 includes a corresponding component with the same function opposite the component.

[0021] The compact tool carrier 5 includes a drive mechanism 18 attached to the mainframe 10. In the illustrated embodiment, the drive mechanism 18 is directly mounted (i.e., connected without intermediary parts) to the mainframe 10 by way of drive sprocket 22 connected to a hub 26 (Fig. 2). The hub 26 is attached to a shaft (not shown) that extends through a drive opening 30 (Fig. 4) of the mainframe 10. The sprocket 22, hub 26 and shaft (not shown) rotate about a rotational axis R (Fig. 5). As shown, the drive mechanism 18 includes tracks 34. In other embodiments, the drive mechanism 10 includes wheels.

[0022] The compact tool carrier 5 includes a control station 36 (Fig. 1) which may include controls (not all controls being shown) for propelling the compact tool carrier 5 forward and/or for raising and lowering the loader 8. The control station 36 may be mounted toward the rear of the compact tool carrier 5 (i.e., opposite the attachment plate 12) and is generally adapted to allow for standing or walk-behind operation. As used herein, "standing operation" generally refers to operation in which the operator stands on a platform attached to the compact tool carrier while "walk-behind operation" generally refers to operation in which the operator stands on the surface supporting the compact

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tool carrier 5. In the illustrated embodiment, the compact tool carrier 5 includes an operator platform 37 (Fig. 2).

[0023] In embodiments in which the compact tool carrier 5 includes an operator platform 37 for standing operation, the difference between the height of the control station 36 (e.g., as measured from the highest control for operating the loader or propelling the apparatus forward) and the platform 37 may be at least about 90 cm (e.g., from about 90 cm to about 130 cm). In embodiments in which the operator walks behind the compact tool carrier 5, the control station 36 may be at least about 90 cm (e.g., from about 90 cm to about 130 cm) from the surface supporting the compact tool carrier. Such a range generally complies with the zones of comfort and reach for controls in earth-moving equipment set forth in ISO 6682 (2008) as determined from the physical dimensions of operators and minimum operator space envelope as set forth in ISO 3411 (2007), both of which are incorporated herein by reference for all relevant and consistent purposes.

[0024] In the illustrated embodiment, the control station 36 is attached to an upper frame 39 (Fig. 7) that is attached and supported by the mainframe 10. In other embodiments, rather than being integrated as one unit in the compact tool carrier 5, the control station 36 is separate from the body (e.g., mainframe) of the carrier and is operated remotely. In such embodiments, the control station 36 may be wired or may operate

wirelessly to propel the carrier 5 and/or raise and lower the loader 8.

[0025] The mainframe 10 includes a first side 38a and a second side 38b generally opposite the first side 38a. As used herein, the term "mainframe" generally refers to a single weldment to which the loader 8 is attached, optionally through one or more pivotal linkages. The mainframe 10 includes bracket portions 40a, 40b (Fig. 4) through which various pivot linkages are attached. In the illustrated embodiment, the engine (not shown) and the drive mechanism 10 comprising tracks or wheels are directly connected to the mainframe 10.

[0026] The first loader arm 15a is pivotally connected to the first side 38a of the mainframe 10, and the second loader arm 15b is pivotally connected to the second side 38b of the mainframe 10. The loader arms 15a, 15b and sides 38a, 38b of the mainframe 10 each include three pivot points for pivoting the loader 8 relative to the mainframe 10. The first side 38a of the mainframe 10 includes a forward pivot point P_1 (Fig. 5) a rear pivot point P_3 and a central pivot point P_2 between the forward pivot point P_1 and the rear pivot point P_3. Similarly, the first arm 15a includes a forward pivot point P_4, a rear pivot point P_6 and a central pivot point P_5 between the forward pivot point P_4 and the rear pivot point P_6. The compact tool carrier 5 includes a first forward linkage 46a attached to the first side 38a of the mainframe 10 at its forward pivot point P_1 and attached to the first arm 15a at its forward pivot point P_4. A first rear linkage 50a is attached to the first side 38a of the

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mainframe 10 at its rear pivot point P_3 and is attached to the first arm 15a of the loader 8 at its rear pivot point P_6. While the carrier 5 is shown with two loader linkages 46a, 50a on each side of the carrier 5, in other embodiments the carrier 5 includes a single linkage.

[0027] An actuator 54, shown as a hydraulic cylinder, is attached to the first side 38a of the mainframe 10 at its center pivot point P_4 and is attached to the loader arm 15a at its center pivot point P_5 to raise the loader 8. The compact tool carrier 5 may include a single actuator 54, or, as in other embodiments, a second actuator (not shown) is connected to the second side 38b (Fig. 4) of the mainframe 10 and the second arm 15b (Fig. 1). The actuator 54 is powered to raise the loader 8 and, in some embodiments, is also powered to lower the loader 8 (as opposed to a one-way actuator lowered by gravity alone).

[0028] The second side 38b (Fig. 4) of the mainframe 10 may include a forward pivot point and a rear pivot point to which a second forward linkage 46b (Fig. 1) and second rear linkage (not shown) are respectively attached. The second arm 15b may also include a forward pivot point and rear pivot point to which the second forward linkage 46b and second rear linkage are attached. In embodiments in which the compact tool carrier 5 includes a second actuator (not shown), the second side 38b of the mainframe 10 includes a central pivot point between its forward pivot point and its rear pivot point, and the second arm 15b also includes a central pivot point between its forward pivot point and its rear pivot

point. The second cylinder may be attached to the central pivot point of the second side 38b of the mainframe 10 and the central pivot point of the second arm 15b.

[0029] In some embodiments, the first and second ends 38a, 38b of the mainframe 10 and the first and second loader arms 15a, 15b do not include more than three pivot points at which the mainframe 10 and loader 8 pivot relative to each other. While the actuator 54 is shown as being attached between the other two linkages 46a, 50a, in other embodiments the actuator 54 is forward to both linkages 46a, 50a or rearward to both linkages 46a, 50a. Further, each side of the carrier 5 having an actuator 54 may include a single linkage rather than two linkages.

[0030] In some embodiments, the mainframe 10 is characterized by a relatively low profile (i.e., the pivot points are positioned relatively low on the mainframe allowing its height to be reduced). The rotational axis R (Fig. 5) and the bottom of the compact tool carrier 5 (Fig. 2) are separated by a distance D1. Generally, the bottom of the compact tool carrier 5 corresponds to the point at which the drive mechanism 18 contacts the surface supporting the compact tool carrier 5. The rotational axis R and the forward pivot point P_1 of the first side 38a of the mainframe 10 are separated by a vertical distance D2. The rotational axis R and the rear pivot point P_3 are separated by a vertical distance D3. The rotational axis R and the central pivot point P_4 are separated by a vertical distance D4. Each of D2, D3

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and D4 is less than about 1.5 times D1 (1.5xD1). In some embodiments, each of D2, D3 and D4 is less than D1 or even less than about 0.75 times D1 (0.75xD1).

[0031] The mainframe 10 profile may also be expressed relative to the distance D5 between the rotational axis R (Fig. 5) and the bottom 57 of the mainframe 10. Each of D2, D3 and D4 is less than about twice D5 (2xD5). In some embodiments, each of D2, D3 and D4 is less than about 1.75 times D5 (1.75xD5) or less than about 1.5 times D5 (1.5XD5). P2 and P3 may be relatively lower than P1 and their distances D3, D4 from the rotational axis R may be even less than about 1.25 times D5 (1.25xD5). The distance D6 between the top 59 of the first side 38a of the mainframe 10 and the highest pivot point (P_1 in the illustrated embodiment), is less than about 1.5 times D5, less than about D5 or less than about 0.75 times D5.

[0032] The second side 38b (Fig. 1) of the mainframe 10 may have a similar pivot point arrangement. The rotational axis R and the forward pivot point of the second side 38b are separated by a vertical distance D2′ (not shown). The rotational axis R and the rear pivot point of the second side are separated by a vertical distance D3′ (not shown). The rotational axis R and the central pivot point (if any) of the second side 38b of mainframe 10 are separated by a vertical distance D4′ (not shown). Each of D2′, D3′ and D4′ is less than about 1.5 times D1 (1.5xD1) or less than D1 or even less than about 0.75 times D1 (0.75xD1). The rotational axis R and the bottom of the second side 38b of the mainframe 10 are

separated by a vertical distance D5′ (not shown). Each of D2′, D3′ and D4′ is less than twice D5′ (2xD5′) or less than about 1.75 times D5′ (1.75xD5′) or less than about 1.5 times D5′ (1.5XD5′). D3′ and D4′ may be even less than about 1.25 times D5′ (1.25xD5′). The distance D6′ between the top of the second side 38b of the mainframe 10 and the highest pivot point is less than about 1.5 times D5′, less than about D5′ or less than about 0.75 times D5′.

[0033] The compact tool carrier 5 includes an engine (not shown) for propelling the drive mechanism 18. As shown in Figure 6, the engine may be mounted to an engine bracket 60 that forms part of the mainframe 10. The engine may drive a hydraulic pump that powers hydraulic motors (not shown) which drive the drive mechanism 18 (Fig. 1) and which provide hydraulic power to actuator 54. The mainframe 10 includes a reservoir 64 for storing and cycling of hydraulic fluid.

[0034] Compared to conventional compact tool carriers, embodiments of the compact tool carrier 5 described above have several advantages. By positioning the pivot points relatively low on the mainframe 10, the mass of the mainframe 10 and the resulting cost of the carrier 5 may be reduced. Further, such a low-profile mainframe 10 improves visibility for the operator and allows the center of gravity of the carrier 5 to be lowered which improves its stability. In embodiments in which the carrier 5 includes an actuator 54 (Fig. 5) for lifting the loader 8 that is disposed between forward linkage 46a and a rear linkage 50a on at least one side

38a, 38b of the mainframe 10, the loader 8 is characterized by an travel path in which the loader travels vertically rather than over a radial path. The vertical travel path of the loader 8 is more effective relative to conventional travel paths for compact tool carriers 5 as the carrier 5 may operate closer to other structures.

[0035] As used herein, the terms “about,” “substantially,” “essentially” and “approximately” when used in conjunction with ranges of dimensions, concentrations, temperatures or other physical or chemical properties or characteristics is meant to cover variations that may exist in the upper and/or lower limits of the ranges of the properties or characteristics, including, for example, variations resulting from rounding, measurement methodology or other statistical variation.

[0036] When introducing elements of the present disclosure or the embodiment(s) thereof, the articles "a", "an", "the" and "said" are intended to mean that there are one or more of the elements. The terms "comprising," "including," “containing” and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements. The use of terms indicating a particular orientation (e.g., "top", "bottom", "side", etc.) is for convenience of description and does not require any particular orientation of the item described.

[0037] As various changes could be made in the above constructions and methods without departing

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from the scope of the disclosure, it is intended that all matter contained in the above description and shown in the accompanying drawing[s] shall be interpreted as illustrative and not in a limiting sense.

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WHAT IS CLAIMED IS:

1. A mainframe for a self-propelled machine, the mainframe having a front end a rear end and comprising:

a first side having a first bracket portion for supporting a load, the first bracket portion forming an upward-facing first pocket that extends from the front end to the rear end of the mainframe, the first side defining a first drive opening for receiving a first hub of a drive mechanism;

a second side having a second bracket portion for supporting a load, the second bracket portion forming an upward-facing second pocket that extends from the front end to the rear end of the mainframe, the second side defining a second drive opening for receiving a second hub of a drive mechanism; and

a hydraulic reservoir housing configured to store hydraulic fluid, the hydraulic reservoir housing being connected to the first side of the mainframe and connected to the second side of the mainframe, the hydraulic reservoir housing being disposed between the front end of the mainframe and the first and second drive openings.

2. The mainframe as set forth in claim 1 further comprising and engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being disposed between the rear end and the first and second drive openings.

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3. The mainframe as set forth in claim 1 wherein the mainframe is a single weldment.

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ABSTRACT

Compact tool carriers having a loader mounted to a low-profile mainframe are disclosed. In some embodiments, the pivot points of the mainframe about which the loader is pivoted are low relative to the mainframe to reduce the mainframe size.

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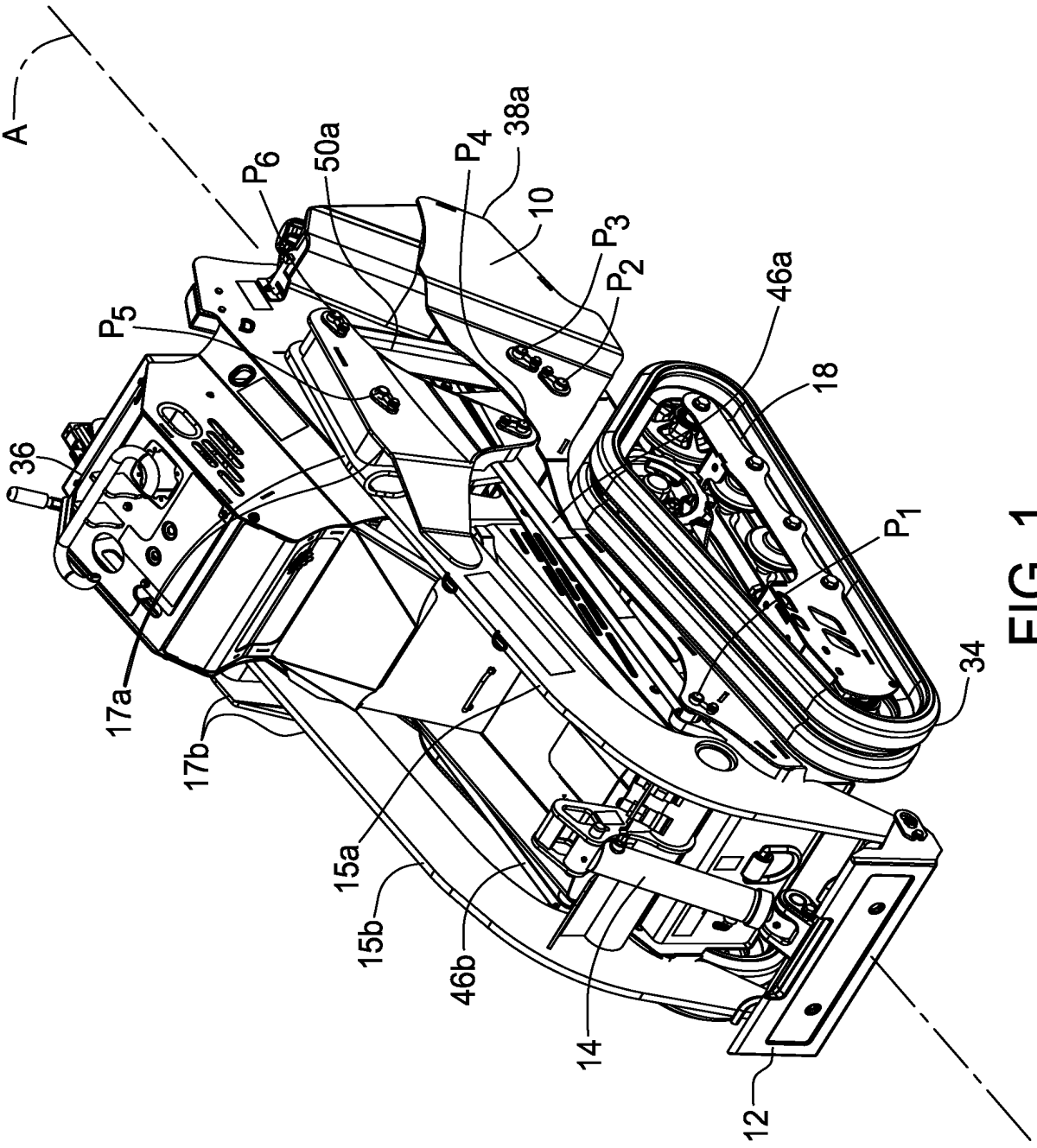


FIG. 1

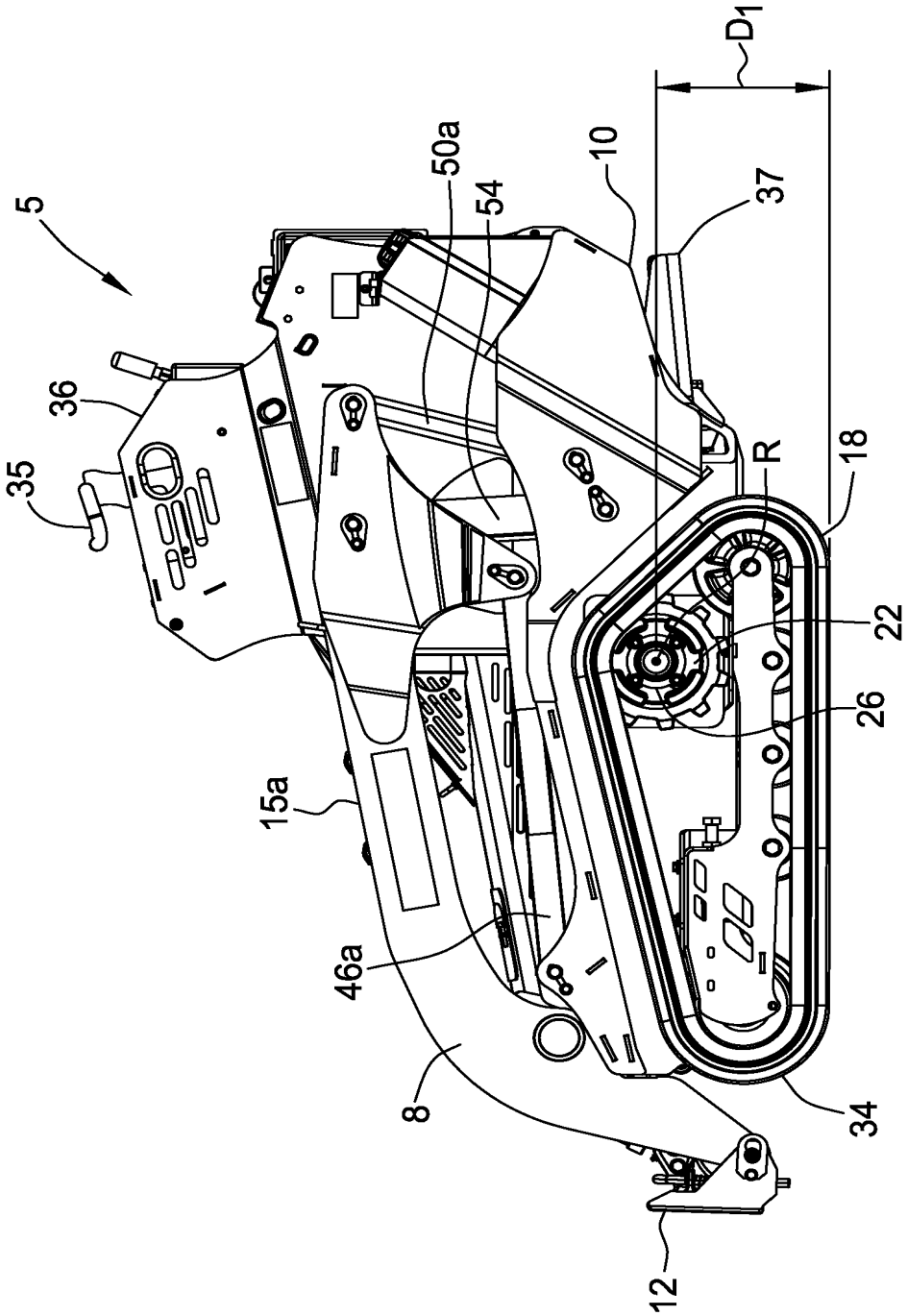


FIG. 2

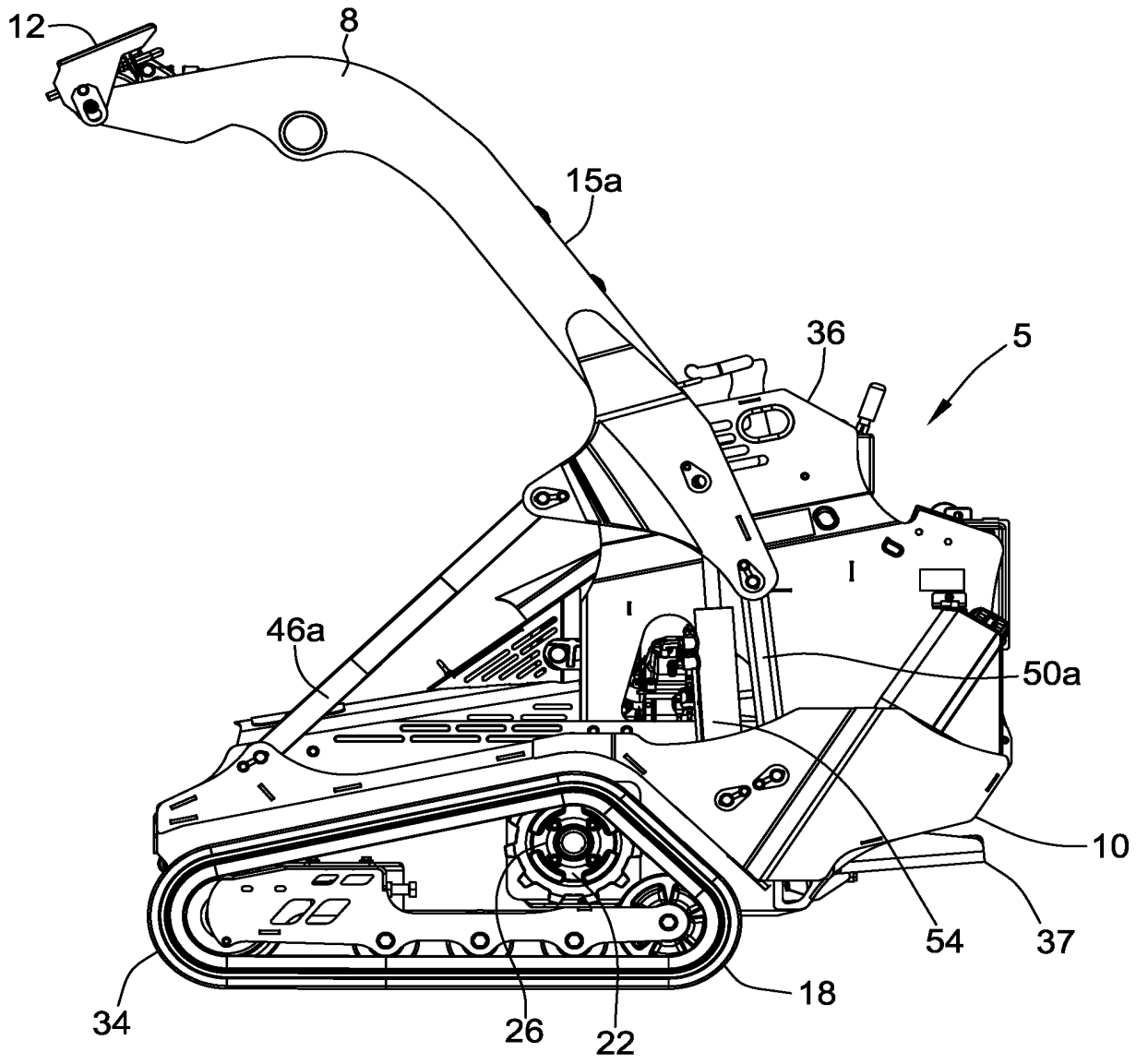


FIG. 3

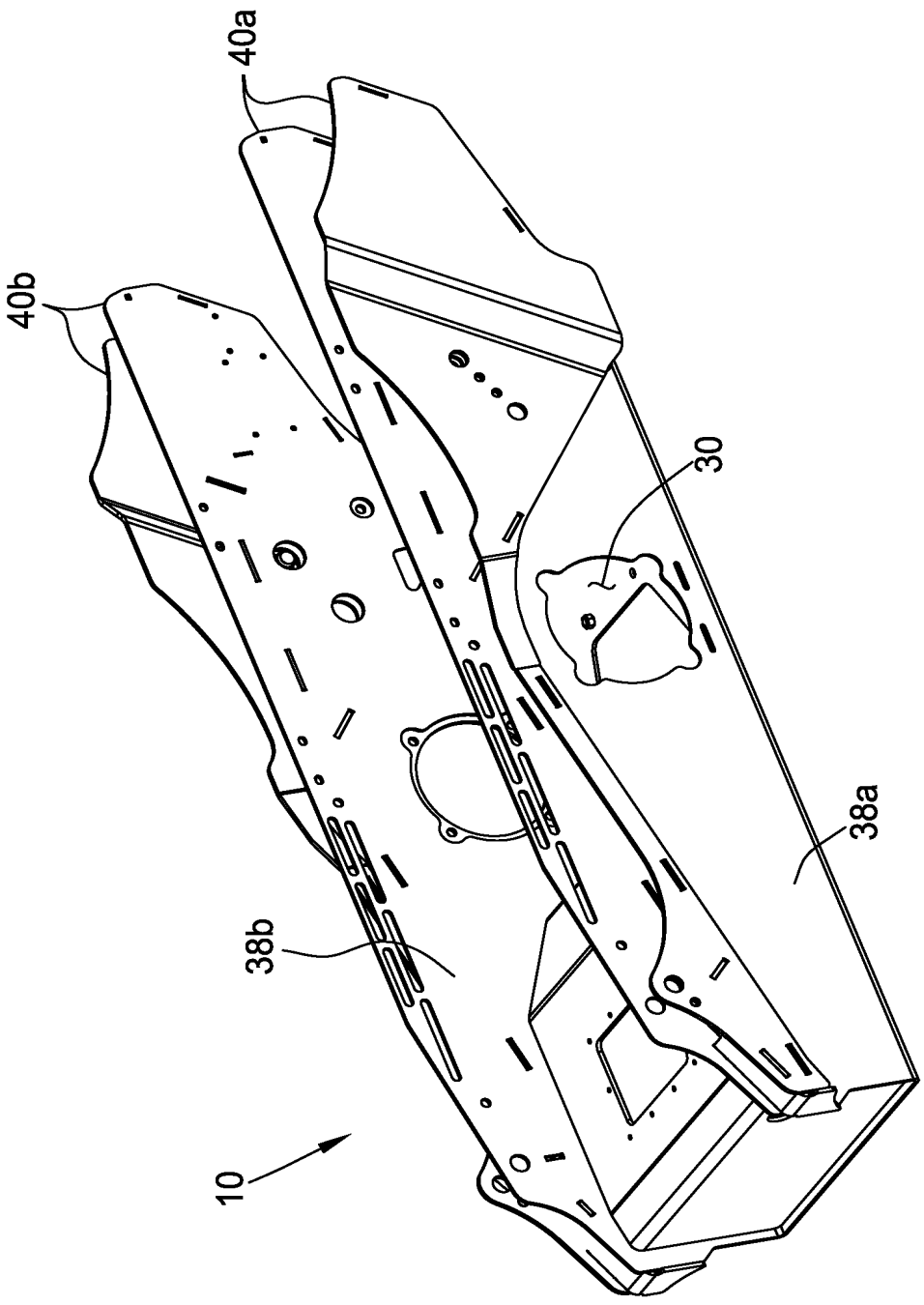


FIG. 4

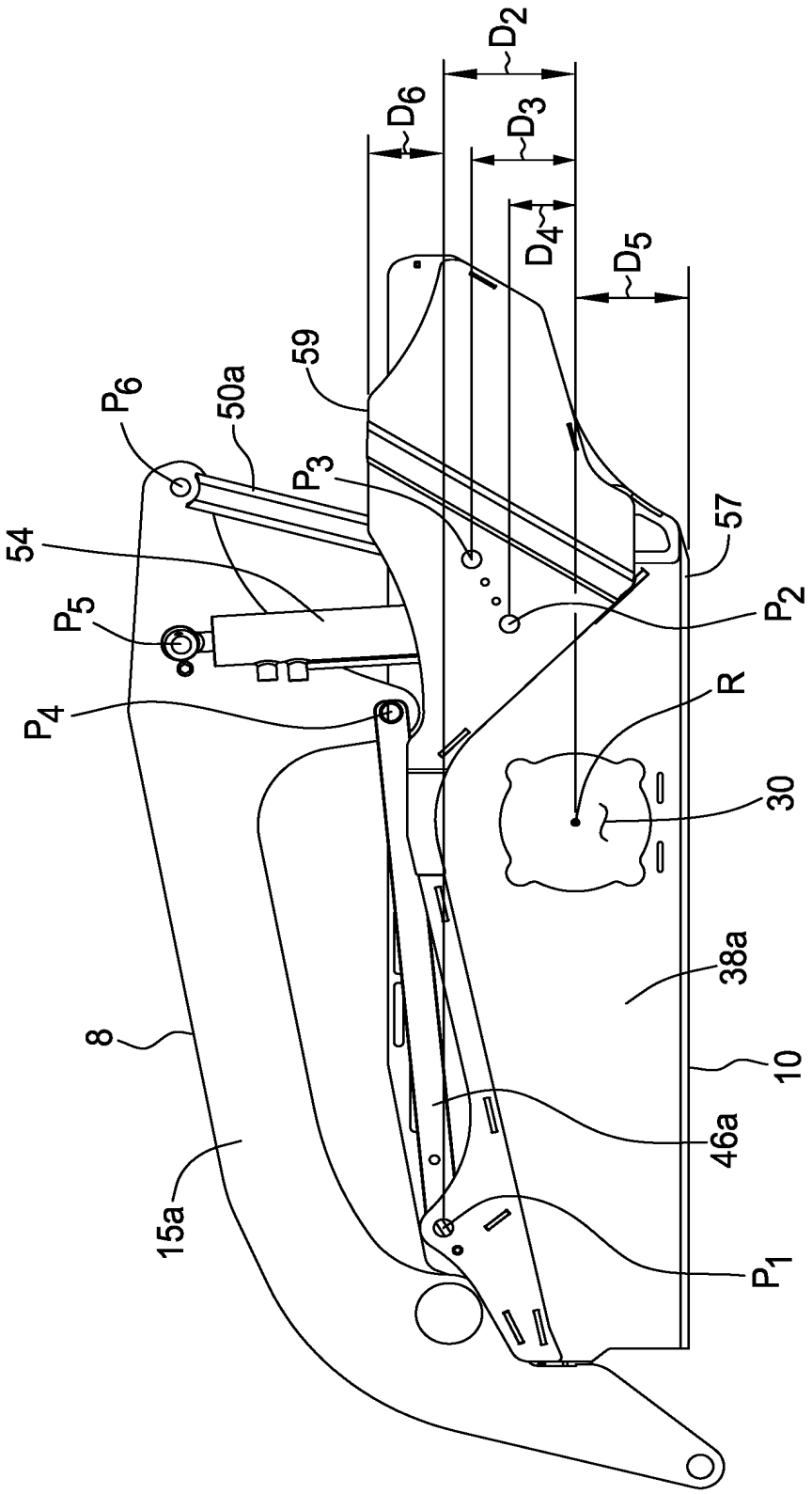


FIG. 5

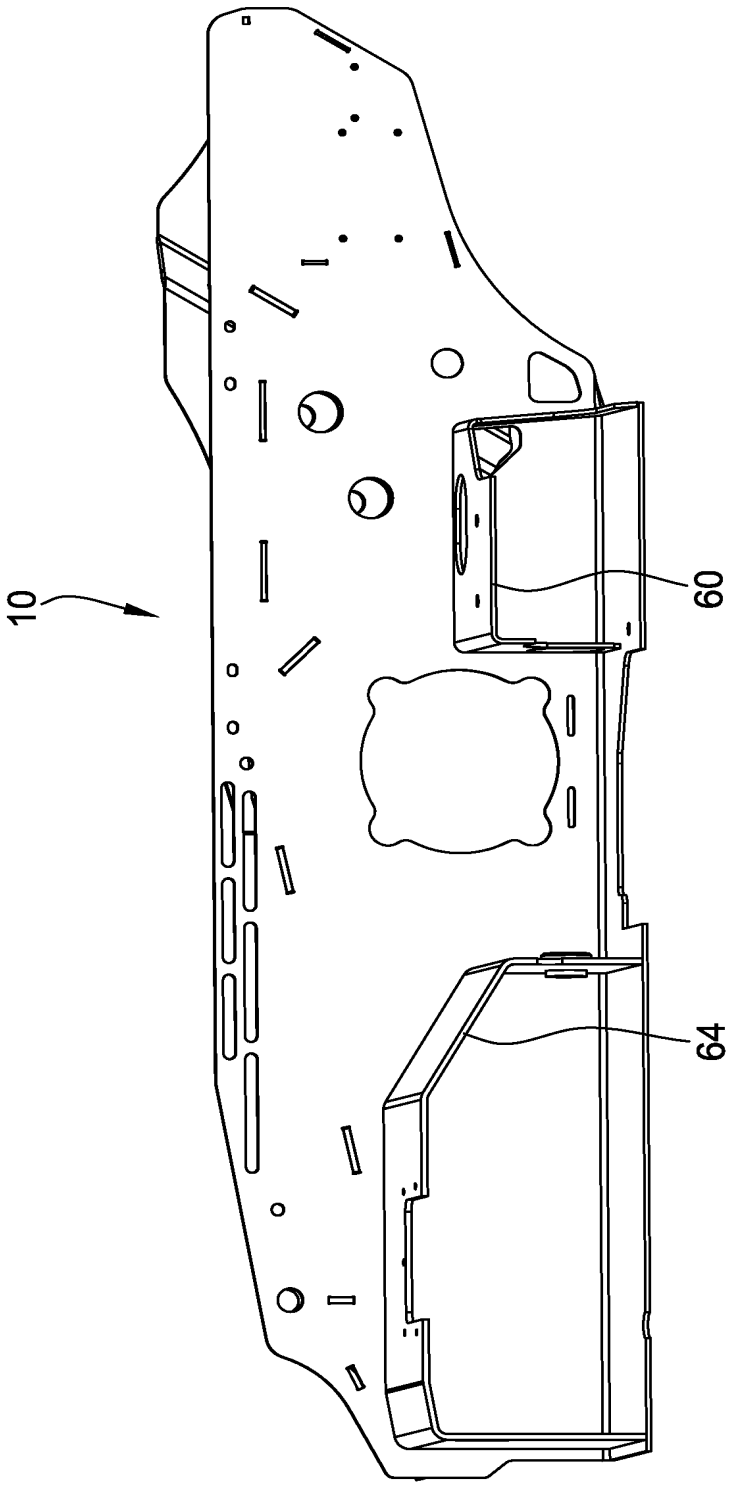


FIG. 6

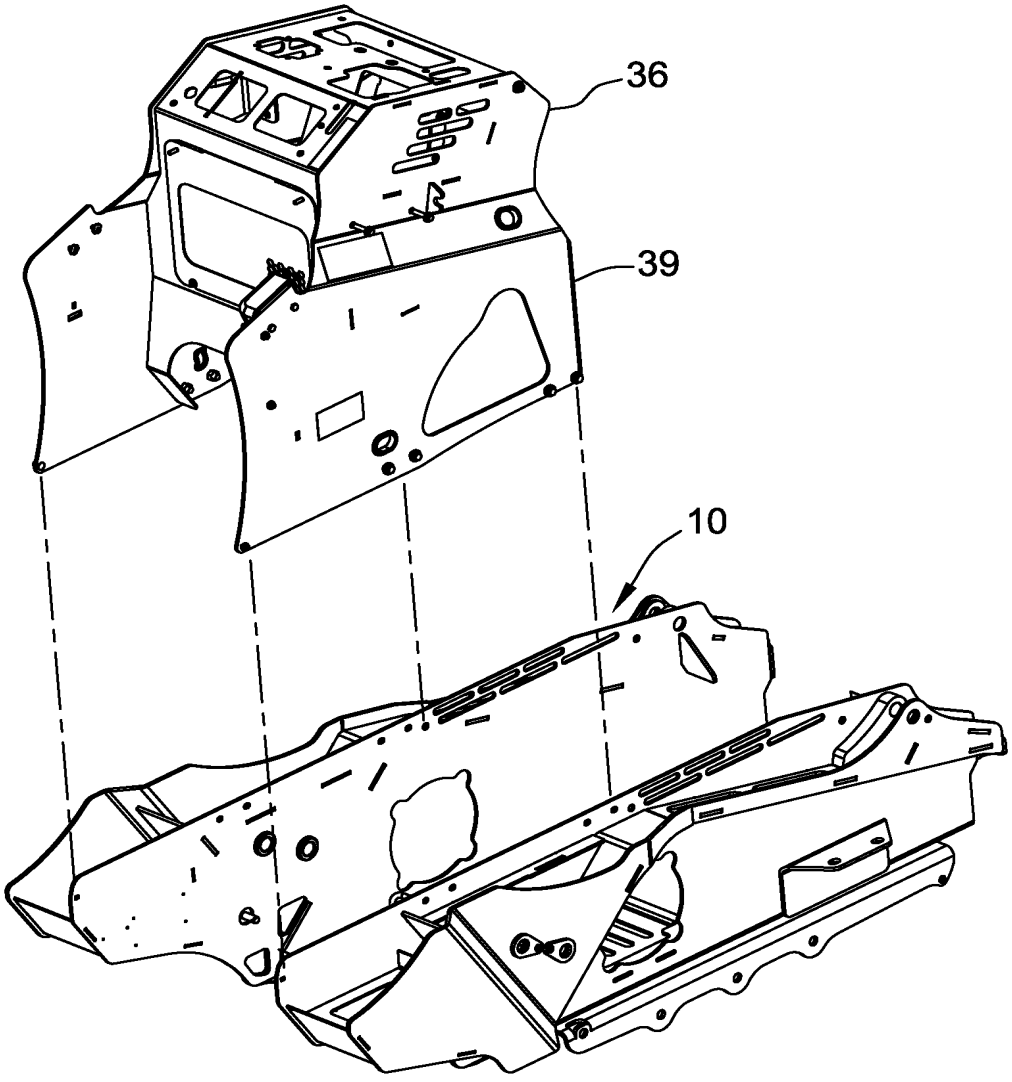


FIG. 7

First Named Inventor: Brad Thomas
Application Number: 14/691,649
Filing Date: April 21, 2015
Art Unit: To Be Determined
Confirmation No.: 7913

DECLARATION AND ASSIGNMENT FOR UTILITY OR DESIGN APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and country of residence are as stated below next to my name.

I believe I am the original and sole inventor (if only one name is listed below) or an original and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

LOW PROFILE COMPACT TOOL CARRIERS

the specification of which: (check one)

☐ is attached hereto

☒ was filed on April 21, 2015 as Application Serial No. 14/691,649.

We hereby authorize and request our attorneys and agents, and the assignee or its delegated attorneys or agents, to insert above the application number and filing date of the application when known.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims and any claims amended by any amendment made prior to the date of this Declaration.

I acknowledge my duty to disclose all information which is material to patentability of this application in accordance with 37 CFR §1.56.

The above-identified application was made or was authorized to be made by me.

ASSIGNMENT

WHEREAS, the undersigned have invented improvements described in the above-identified application.

AND, WHEREAS, Vermeer Manufacturing Company of 1210 Vermeer Road East, Pella, Iowa 50219, a corporation of the State of Iowa (hereinafter referred to as "ASSIGNEE") is desirous of acquiring certain rights thereunder;

NOW, THEREFORE, for one dollar and other good and valuable consideration, receipt of all of which is hereby acknowledged, I have agreed to and do hereby sell, assign and transfer unto said ASSIGNEE the entire right, title and interest in and throughout the United States of America (including its territories and dependencies) and all countries foreign thereto in and to said invention, said United States application, any other United States applications (including provisional, non-provisional, divisional, continuing, or reissue applications) based in whole or in part on said United States application or in whole or in part on said invention, any foreign applications based in whole or in part on any of the aforesaid United States applications or in whole or in part on said invention, and any and all patents (including extensions thereof) of any country which have been or may be granted on any of the aforesaid applications or on said invention or any part thereof;

TO BE HELD AND ENJOYED by said ASSIGNEE, its successors and assigns, as fully and entirely as the same would have been held and enjoyed by me had no sale and assignment of said interest been made;

AND I hereby authorize and request the Commissioner of Patents of the United States of America to issue any and all United States patents which may be granted upon said United States applications or any of them, or upon said invention or any part thereof, to said ASSIGNEE;

AND I hereby agree for myself and for my heirs, executors and administrators, to execute without further consideration any further lawful documents and any further assurances, and any provisional, non-provisional, divisional, continuing, reissue, or other applications for patents of any country, that may be deemed necessary by said ASSIGNEE fully to secure to said ASSIGNEE its interest as aforesaid in and to said invention or any part thereof, and in and to said several patents or any of them;

AND I hereby covenant for myself and my legal representatives that I have granted no right or license to make, use or sell said invention, to anyone except said ASSIGNEE, that prior to the execution of this deed my right, title and interest in said invention had not been otherwise encumbered, and that I have not executed and will not execute any instrument in conflict herewith.

PRIORITY CLAIM

I hereby claim foreign priority benefits under 35 U.S.C. §119 (a)-(d) or (f) or 365(b) of any foreign application(s) for patent or inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below, and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed:

Priority Claimed

COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY NOT CLAIMED	CERTIFIED COPY ATTACHED
				☐ Yes ☐ No
				☐ Yes ☐ No

CLAIM FOR BENEFIT OF PROVISIONAL APPLICATION(S)

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

APPLICATION NUMBER(S)	FILING DATE (day, month, year)
62/118,860	20 February 2015

CLAIM FOR BENEFIT OF EARLIER U.S. APPLICATION(S) UNDER 35 U.S.C. §120

(complete this part only if this is a divisional, continuation or CIP application)

I hereby claim the benefit under 35 U.S.C. §120 of any United States application(s), or 365(c) of any PCT International application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose material information as defined in 37 CFR §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

U.S. PARENT APPLICATION OR PCT PARENT NUMBER	PARENT FILING DATE (day, month, year)	STATUS (patent and number, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment of not more than five (5) years, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor Brad Thomas

Inventor's signature Brad Thomas Date 5/8/15

Residence Pleasant Hill, Iowa Country of Residence US

Post Office address 465 Hillside Court

Pleasant Hill, Iowa 50327

STATE OF Iowa

ss.

COUNTY OF Marion

This 8th day of May, 2015 before me personally came the above-named **Brad Thomas**, to me personally known as the individual who executed the foregoing assignment, who acknowledged to me that he/she executed the same of his/her own free will for the purposes therein set forth.

Seal

VALERIE LINDENMAN
Commission Number 768349
My Commission Expires
6-3-2017

Valerie Lindenman
(Notary Public)

Full name of second joint inventor Louis Hartke

Inventor's signature Louis Hartke Date 5/5/15

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Pella, Iowa 50219

STATE OF

ss.

COUNTY OF

This 5th day of May, _____ before me personally came the above-named **Louis Hartke**, to me personally known as the individual who executed the foregoing assignment, who acknowledged to me that he/she executed the same of his/her own free will for the purposes therein set forth.

Seal

NOTARIAL SEAL IOWA
VALERIE LINDENMAN
Commission Number 766349
My Commission Expires
6-7-2017

Valerie Lindenman
(Notary Public)

Full name of third joint inventor Greg Langenfeld

Inventor's signature Greg Langenfeld Date 5/18/2015

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Post Office address 2425 Baron Court

Bettendorf, Iowa 52722

STATE OF Iowa

ss.

COUNTY OF Marion

This 18th day of May, 2015 before me personally came the above-named **Greg Langenfeld**, to me personally known as the individual who executed the foregoing assignment, who acknowledged to me that he/she executed the same of his/her own free will for the purposes therein set forth.

Seal

VALERIE LINDENMAN
Commission Number 768349
My Commission Expires
6-7-2017

Valerie Lindenman
(Notary Public)

Full name of fourth joint inventor Matt Hutchinson

Inventor's signature [signature] Date 5/4/15

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Pella, Iowa 50219

STATE OF Iowa

ss.

COUNTY OF Marion

This 4th day of May, 2015 before me personally came the above-named **Matt Hutchinson**, to me personally known as the individual who executed the foregoing assignment, who acknowledged to me that he/she executed the same of his/her own free will for the purposes therein set forth.

Seal

VALERIE LINDENMAN
Commission Number 768349
My Commission Expires
6-1-2017

[signature]
(Notary Public)

EXPLANATION OF ACKNOWLEDGEMENT

By signing the declaration, you acknowledge your duty to disclose to the U.S. Patent and Trademark Office information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, 1.56. Material information includes any information concerning whether:

The subject matter of this application was known or used by others in the United States before your invention thereof; or

The subject matter of this application was patented or described in any printed publication in any country before your invention thereof or more than one year prior to the date of this application; or

The subject matter of this application was in public use, offered for sale or on sale in the United States more than one year prior to the filing date of this application; or

The subject matter of this application was first patented or made the subject of an inventor's certificate issued in any country foreign to the United States as an application filed by you or your representatives or assigns more than twelve months prior to the date of this application; or

any application for patent or inventor's certificate on the subject matter of this application has been filed by your representatives or assigns in any foreign country.

In addition, you must advise us of the closest prior art (including your own patents and publications) of which you are aware so that we may bring it to the attention of the U.S. Patent and Trademark Office.

This duty to disclose material information continues after the application is filed. During the pendency of this patent application, each person substantially involved in the preparation or prosecution of this patent application, including each inventor, has a duty to disclose to the U.S. Patent and Trademark Office all known information which would be material to patentability. Failure to meet this duty can result in an unenforceable and/or invalid patent.

Any of the above information should be brought to the attention of the U.S. Patent and Trademark Office within three months of filing of this application, or within three months of acquiring such information, whichever is later. Accordingly, please promptly advise us of any of the above information, or any other information that may be material to patentability and is either presently known to you or later becomes known to you during the pendency of this application.

MAINFRAMES FOR A SELF-PROPELLED MACHINE

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application is a continuation of 17/397,200, filed August 9, 2021, which issued October 11, 2022 as U.S. Patent No. 11,465,891, which is a continuation of 16/270,070, filed February 7, 2019, which is a continuation of U.S. Patent Application No. 15/704,685, filed September 14, 2017, which issued February 12, 2019 as U.S. Patent No. 10,202,266, which is a continuation of U.S. Patent Application No. 15/062,801, filed March 7, 2016, which issued May 22, 2018 as U.S. Patent No. 9,975,750, which is a continuation of U.S. Patent Application No. 14/691,649, filed April 21, 2015, which issued April 26, 2016 as U.S. Patent No. 9,321,386, which claims the benefit of U.S. Provisional Patent Application No. 62/118,860, filed February 20, 2015, each of which is incorporated herein by reference in its entirety.

FIELD OF THE DISCLOSURE

[0002] The field of the disclosure relates mainframes for a self-propelled machine.

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BACKGROUND

[0003] Compact tool carriers are tool-mounted machines that are capable of working in tight spaces for utility or do-it-yourself home projects. Compact tool carriers are walk-behind units or include a platform on which the operator may stand during use. Compact tool carriers are generally defined (e.g., ISO 6165 (2012) and SAE J2752) as "a self-propelled crawler or wheeled machine having an operating mass of less than 1500 kg with a rigid frame, having either a pedestrian operating position or a standing operator platform at the rear of the machine and either front-mounted interchangeable equipment or lift arms with an attachment bracket capable of coupling to interchangeable, front-mounted attachments." The tool carriers may be attached to a variety of interchangeable tools such as buckets, augers, forks, stump grinders, tillers, rollers and the like.

[0004] Compact tool carriers may be distinguished from much larger conventional skid steers in which an operator is seated in the operating position. Compact tool carriers pose difficulty in design relative to full-size skid steers due to variation in weight, complexity and size.

[0005] A continuing need exists for compact tool carriers with a relatively low-profile, compact design and/or that are characterized by a more effective loader lifting profile.

[0006] This section is intended to introduce the reader to various aspects of art that may be related to various aspects of the disclosure, which are described and/or claimed below. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present disclosure. Accordingly, it should be understood that these statements are to be read in this light, and not as admissions of prior art.

SUMMARY

[0007] One aspect of the present disclosure is directed to a compact tool carrier configured for standing or walk-behind operator control. The carrier has a mass of less than about 1500 kg and includes a loader having an arm and a linkage pivotally attached to the loader arm. An actuator is pivotally attached to the loader arm. The carrier includes a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader. The control station is configured for remote operation or is mounted toward the rear of the compact tool carrier and is adapted to allow for standing or walk-behind operation.

[0008] Another aspect of the present disclosure is directed to a compact tool carrier. The carrier comprises a loader and a mainframe for supporting the loader. The mainframe has a first side and a second side with each side having a top and a bottom. The first

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side of the mainframe has at least two pivot points relative to the loader. The carrier includes a drive mechanism comprising tracks or wheels for propelling the apparatus over a supporting surface. The drive mechanism is attached to the mainframe about a rotational axis. The compact tool carrier has a bottom at which the drive mechanism contacts the supporting surface. The rotational axis and bottom of the compact tool carrier are separated by a vertical distance D1. The rotational axis and each pivot point are separated by a vertical distance. Each vertical distance between the rotational axis and a pivot point is less than 1.5 times D1.

[0009] Various refinements exist of the features noted in relation to the above-mentioned aspects of the present disclosure. Further features may also be incorporated in the above-mentioned aspects of the present disclosure as well. These refinements and additional features may exist individually or in any combination. For instance, various features discussed below in relation to any of the illustrated embodiments of the present disclosure may be incorporated into any of the above-described aspects of the present disclosure, alone or in any combination.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Figure 1 is a perspective view of a compact tool carrier with the loader in a down position;

[0011] Figure 2 is a side view of the compact tool carrier with the loader in a down position;

[0012] Figure 3 is a side view of the compact tool carrier with the loader in a raised position;

[0013] Figure 4 is a perspective view of a mainframe of the compact tool carrier;

[0014] Figure 5 is a side view of the mainframe and loader of the compact tool carrier;

[0015] Figure 6 is a cross-section side view of the mainframe; and

[0016] Figure 7 is an exploded perspective view of the mainframe and an upper frame of the compact tool carrier.

[0017] Corresponding reference characters indicate corresponding parts throughout the drawings.

DETAILED DESCRIPTION

[0018] An embodiment of a compact tool carrier is generally referred as “5” in Figure 1. The compact tool carrier 5 includes a loader 8 supported by a mainframe 10. The loader 8 includes an attachment plate 12 for interchangeably attaching any one of a number of tools (not shown). In this regard, such interchangeable tools do not form part of the compact tool carrier 5 unless stated otherwise. The attachment plate 12 is

connected to an actuator 14 for tilting of tools connected to the attachment plate 12. The loader 8 has a first arm 15a and a second arm 15b generally opposite the first arm 15a. Each arm 15a, 15b may be a single weldment or may include various components attached by fasteners (e.g., nuts and bolts). The first and second arms 15a, 15b each include a bracket portion 17a, 17b (Fig. 1) for fastening various linkages.

[0019] As used herein, "compact tool carrier" refers to machines that are self-propelled and are capable of carrying interchangeable equipment and that generally have a mass (not including the interchangeable tool) of less than about 1500 kg (about 3307 lb). Use of the term "compact tool carrier" herein is intended to exclude full size skid steers (e.g., seat-operated units) due to a large variation in weight, complexity and size. In some embodiments, the compact tool carrier 5 meets the definition of a compact tool carrier provided in ISO 6165 (2012) and SAE J2752 set forth above, both standards being incorporated herein by reference for all relevant and consistent purposes.

[0020] The compact tool carrier 5 includes a longitudinal axis A that is parallel to the direction of travel of the carrier (i.e., parallel to its length). The compact tool carrier 5 is generally longitudinally symmetrical (i.e., relative to the longitudinal axis A) in that several components have a corresponding component with the same function opposite the component (i.e., across the axis A). Corresponding components of the pair may be indicated herein by use of a reference number

followed by “A” and “B” and may be referred to as a “first” component and a “second” component, respectively. While the compact tool carrier 5 may be described herein with reference to the components of one side of the compact tool carrier 5, any component designated by “A” or “B” herein or shown in Figures 1-7 includes a corresponding component with the same function opposite the component.

[0021] The compact tool carrier 5 includes a drive mechanism 18 attached to the mainframe 10. In the illustrated embodiment, the drive mechanism 18 is directly mounted (i.e., connected without intermediary parts) to the mainframe 10 by way of drive sprocket 22 connected to a hub 26 (Fig. 2). The hub 26 is attached to a shaft (not shown) that extends through a drive opening 30 (Fig. 4) of the mainframe 10. The sprocket 22, hub 26 and shaft (not shown) rotate about a rotational axis R (Fig. 5). As shown, the drive mechanism 18 includes tracks 34. In other embodiments, the drive mechanism 18 includes wheels.

[0022] The compact tool carrier 5 includes a control station 36 (Fig. 1) which may include controls (not all controls being shown) for propelling the compact tool carrier 5 forward and/or for raising and lowering the loader 8. The control station 36 may be mounted toward the rear of the compact tool carrier 5 (i.e., opposite the attachment plate 12) and is generally adapted to allow for standing or walk-behind operation. As used herein, “standing operation” generally refers to operation in which the operator stands on a platform

attached to the compact tool carrier while "walk-behind operation" generally refers to operation in which the operator stands on the surface supporting the compact tool carrier 5. In the illustrated embodiment, the compact tool carrier 5 includes an operator platform 37 (Fig. 2).

[0023] In embodiments in which the compact tool carrier 5 includes an operator platform 37 for standing operation, the difference between the height of the control station 36 (e.g., as measured from the highest control for operating the loader or propelling the apparatus forward) and the platform 37 may be at least about 90 cm (e.g., from about 90 cm to about 130 cm). In embodiments in which the operator walks behind the compact tool carrier 5, the control station 36 may be at least about 90 cm (e.g., from about 90 cm to about 130 cm) from the surface supporting the compact tool carrier. Such a range generally complies with the zones of comfort and reach for controls in earth-moving equipment set forth in ISO 6682 (2008) as determined from the physical dimensions of operators and minimum operator space envelope as set forth in ISO 3411 (2007), both of which are incorporated herein by reference for all relevant and consistent purposes.

[0024] In the illustrated embodiment, the control station 36 is attached to an upper frame 39 (Fig. 7) that is attached and supported by the mainframe 10. In other embodiments, rather than being integrated as one unit in the compact tool carrier 5, the control station 36 is separate from the body (e.g., mainframe) of the

carrier and is operated remotely. In such embodiments, the control station 36 may be wired or may operate wirelessly to propel the carrier 5 and/or raise and lower the loader 8.

[0025] The mainframe 10 includes a first side 38a and a second side 38b generally opposite the first side 38a. As used herein, the term "mainframe" generally refers to a single weldment to which the loader 8 is attached, optionally through one or more pivotal linkages. The mainframe 10 includes bracket portions 40a, 40b (Fig. 4) through which various pivot linkages are attached. In the illustrated embodiment, the engine (not shown) and the drive mechanism 18 comprising tracks or wheels are directly connected to the mainframe 10.

[0026] The first loader arm 15a is pivotally connected to the first side 38a of the mainframe 10, and the second loader arm 15b is pivotally connected to the second side 38b of the mainframe 10. The loader arms 15a, 15b and sides 38a, 38b of the mainframe 10 each include three pivot points for pivoting the loader 8 relative to the mainframe 10. The first side 38a of the mainframe 10 includes a forward pivot point P_1 (Fig. 5) a rear pivot point P_3 and a central pivot point P_2 between the forward pivot point P_1 and the rear pivot point P_3. Similarly, the first arm 15a includes a forward pivot point P_4, a rear pivot point P_6 and a central pivot point P_5 between the forward pivot point P_4 and the rear pivot point P_6. The compact tool carrier 5 includes a first forward linkage 46a attached to the first side 38a of the mainframe 10 at its forward pivot point P_1 and attached to

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the first arm 15a at its forward pivot point P_4. A first rear linkage 50a is attached to the first side 38a of the mainframe 10 at its rear pivot point P_3 and is attached to the first arm 15a of the loader 8 at its rear pivot point P_6. While the carrier 5 is shown with two loader linkages 46a, 50a on each side of the carrier 5, in other embodiments the carrier 5 includes a single linkage.

[0027] An actuator 54, shown as a hydraulic cylinder, is attached to the first side 38a of the mainframe 10 at its center pivot point P_2 and is attached to the loader arm 15a at its center pivot point P5 to raise the loader 8. The compact tool carrier 5 may include a single actuator 54, or, as in other embodiments, a second actuator (not shown) is connected to the second side 38b (Fig. 4) of the mainframe 10 and the second arm 15b (Fig. 1). The actuator 54 is powered to raise the loader 8 and, in some embodiments, is also powered to lower the loader 8 (as opposed to a one-way actuator lowered by gravity alone).

[0028] The second side 38b (Fig. 4) of the mainframe 10 may include a forward pivot point and a rear pivot point to which a second forward linkage 46b (Fig. 1) and second rear linkage (not shown) are respectively attached. The second arm 15b may also include a forward pivot point and rear pivot point to which the second forward linkage 46b and second rear linkage are attached. In embodiments in which the compact tool carrier 5 includes a second actuator (not shown), the second side 38b of the mainframe 10 includes a central pivot point between its forward pivot point and its rear pivot point,

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and the second arm 15b also includes a central pivot point between its forward pivot point and its rear pivot point. The second cylinder may be attached to the central pivot point of the second side 38b of the mainframe 10 and the central pivot point of the second arm 15b.

[0029] In some embodiments, the first and second ends 38a, 38b of the mainframe 10 and the first and second loader arms 15a, 15b do not include more than three pivot points at which the mainframe 10 and loader 8 pivot relative to each other. While the actuator 54 is shown as being attached between the other two linkages 46a, 50a, in other embodiments the actuator 54 is forward to both linkages 46a, 50a or rearward to both linkages 46a, 50a. Further, each side of the carrier 5 having an actuator 54 may include a single linkage rather than two linkages.

[0030] In some embodiments, the mainframe 10 is characterized by a relatively low profile (i.e., the pivot points are positioned relatively low on the mainframe allowing its height to be reduced). The rotational axis R (Fig. 5) and the bottom of the compact tool carrier 5 (Fig. 2) are separated by a distance D1. Generally, the bottom of the compact tool carrier 5 corresponds to the point at which the drive mechanism 18 contacts the surface supporting the compact tool carrier 5. The rotational axis R and the forward pivot point P_1 of the first side 38a of the mainframe 10 are separated by a vertical distance D2. The rotational axis R and the rear pivot point P_3 are separated by a vertical distance

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D3. The rotational axis R and the central pivot point P_2 are separated by a vertical distance D4. Each of D2, D3 and D4 is less than about 1.5 times D1 (1.5xD1). In some embodiments, each of D2, D3 and D4 is less than D1 or even less than about 0.75 times D1 (0.75xD1).

[0031] The mainframe 10 profile may also be expressed relative to the distance D5 between the rotational axis R (Fig. 5) and the bottom 57 of the mainframe 10. Each of D2, D3 and D4 is less than about twice D5 (2xD5). In some embodiments, each of D2, D3 and D4 is less than about 1.75 times D5 (1.75xD5) or less than about 1.5 times D5 (1.5XD5). P2 and P3 may be relatively lower than P1 and their distances D3, D4 from the rotational axis R may be even less than about 1.25 times D5 (1.25xD5). The distance D6 between the top 59 of the first side 38a of the mainframe 10 and the highest pivot point (P_1 in the illustrated embodiment), is less than about 1.5 times D5, less than about D5 or less than about 0.75 times D5.

[0032] The second side 38b (Fig. 1) of the mainframe 10 may have a similar pivot point arrangement. The rotational axis R and the forward pivot point of the second side 38b are separated by a vertical distance D2′ (not shown). The rotational axis R and the rear pivot point of the second side are separated by a vertical distance D3′ (not shown). The rotational axis R and the central pivot point (if any) of the second side 38b of mainframe 10 are separated by a vertical distance D4′ (not shown). Each of D2′, D3′ and D4′ is less than about 1.5 times D1 (1.5xD1) or less than D1 or even less than

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about 0.75 times D1 (0.75xD1). The rotational axis R and the bottom of the second side 38b of the mainframe 10 are separated by a vertical distance D5′ (not shown). Each of D2′, D3′ and D4′ is less than twice D5′ (2xD5′) or less than about 1.75 times D5′ (1.75xD5′) or less than about 1.5 times D5′ (1.5XD5′). D3′ and D4′ may be even less than about 1.25 times D5′ (1.25xD5′). The distance D6′ between the top of the second side 38b of the mainframe 10 and the highest pivot point is less than about 1.5 times D5′, less than about D5′ or less than about 0.75 times D5′.

[0033] The compact tool carrier 5 includes an engine (not shown) for propelling the drive mechanism 18. As shown in Figure 6, the engine may be mounted to an engine bracket 60 that forms part of the mainframe 10. The engine may drive a hydraulic pump that powers hydraulic motors (not shown) which drive the drive mechanism 18 (Fig. 1) and which provide hydraulic power to actuator 54. The mainframe 10 includes a reservoir 64 for storing and cycling of hydraulic fluid.

[0034] Compared to conventional compact tool carriers, embodiments of the compact tool carrier 5 described above have several advantages. By positioning the pivot points relatively low on the mainframe 10, the mass of the mainframe 10 and the resulting cost of the carrier 5 may be reduced. Further, such a low-profile mainframe 10 improves visibility for the operator and allows the center of gravity of the carrier 5 to be lowered which improves its stability. In embodiments in which the carrier 5 includes an actuator 54 (Fig. 5) for

lifting the loader 8 that is disposed between forward linkage 46a and a rear linkage 50a on at least one side 38a, 38b of the mainframe 10, the loader 8 is characterized by an travel path in which the loader travels vertically rather than over a radial path. The vertical travel path of the loader 8 is more effective relative to conventional travel paths for compact tool carriers 5 as the carrier 5 may operate closer to other structures.

[0035] As used herein, the terms “about,” “substantially,” “essentially” and “approximately” when used in conjunction with ranges of dimensions, concentrations, temperatures or other physical or chemical properties or characteristics is meant to cover variations that may exist in the upper and/or lower limits of the ranges of the properties or characteristics, including, for example, variations resulting from rounding, measurement methodology or other statistical variation.

[0036] When introducing elements of the present disclosure or the embodiment(s) thereof, the articles "a", "an", "the" and "said" are intended to mean that there are one or more of the elements. The terms "comprising," "including," “containing” and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements. The use of terms indicating a particular orientation (e.g., "top", "bottom", "side", etc.) is for convenience of description and does not require any particular orientation of the item described.

[0037] As various changes could be made in the above constructions and methods without departing from the scope of the disclosure, it is intended that all matter contained in the above description and shown in the accompanying drawing[s] shall be interpreted as illustrative and not in a limiting sense.

ABSTRACT

Mainframes for a self-propelled machine are disclosed. The mainframe includes first and second pockets that extend from the front end to the rear end of the mainframe. A hydraulic reservoir housing extends from the first side to the second side of the mainframe. The hydraulic reservoir housing is disposed between the front end of the mainframe and first and second drive openings.