



US009321386B1

(12) **United States Patent**  
**Thomas et al.**

(10) **Patent No.:** **US 9,321,386 B1**  
(45) **Date of Patent:** **Apr. 26, 2016**

(54) **LOW PROFILE COMPACT TOOL CARRIERS**

- (71) Applicant: **Vermeer Manufacturing Company,**  
Pella, IA (US)
- (72) Inventors: **Brad Thomas, Pleasant Hill, IA (US);**  
**Louis Hartke, Pella, IA (US); Greg**  
**Langenfeld, Bettendorf, IA (US); Matt**  
**Hutchinson, Pella, IA (US)**
- (73) Assignee: **Vermeer Manufacturing Company,**  
Pella, IA (US)
- (\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/691,649**

(22) Filed: **Apr. 21, 2015**

**Related U.S. Application Data**

- (60) Provisional application No. 62/118,860, filed on Feb.  
20, 2015.
- (51) Int. Cl.  
**B60P 1/50** (2006.01)  
**B66F 9/075** (2006.01)  
**B66F 9/22** (2006.01)  
**B66F 9/06** (2006.01)
- (52) U.S. Cl.  
CPC ... **B60P 1/50** (2013.01); **B66F 9/06** (2013.01);  
**B66F 9/07572** (2013.01); **B66F 9/22** (2013.01)
- (58) Field of Classification Search  
CPC ..... **B60P 1/50; B66F 9/06; B66F 9/07572;**  
**B66F 9/22; E02F 3/34; E02F 3/3405; E02F**  
**3/3414**  
USPC ..... **414/685, 686, 722, 909; 180/89.1, 311**  
See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

|           |      |         |                 |          |
|-----------|------|---------|-----------------|----------|
| 4,117,610 | A *  | 10/1978 | Yates           | 37/409   |
| 4,239,444 | A *  | 12/1980 | Schmelzer       | 414/685  |
| 5,169,278 | A    | 12/1992 | Hoechst et al.  |          |
| 5,470,190 | A    | 11/1995 | Bamford et al.  |          |
| 5,542,814 | A    | 8/1996  | Ashcroft et al. |          |
| 5,609,464 | A    | 3/1997  | Moffitt et al.  |          |
| 6,325,589 | B1   | 12/2001 | Jang et al.     |          |
| 6,474,933 | B1   | 11/2002 | Hoechst et al.  |          |
| 6,616,398 | B2   | 9/2003  | Dershem et al.  |          |
| 6,695,568 | B2   | 2/2004  | Bares et al.    |          |
| 7,214,026 | B2   | 5/2007  | Hilvers et al.  |          |
| 7,264,435 | B2   | 9/2007  | Layko et al.    |          |
| 7,695,236 | B2 * | 4/2010  | Green           | 414/486  |
| 7,980,569 | B2 * | 7/2011  | Azure et al.    | 280/32.5 |
| 8,152,433 | B2   | 4/2012  | Yamada et al.   |          |

(Continued)

**FOREIGN PATENT DOCUMENTS**

|    |            |   |         |
|----|------------|---|---------|
| GB | 2368573    | A | 5/2002  |
| JP | 2006307498 | A | 11/2006 |

**OTHER PUBLICATIONS**

ISO 3411:2007, Earth-moving machinery—Physical dimensions of  
operators and minimum operator space envelope, dated Jul. 2007, pp.  
24.

(Continued)

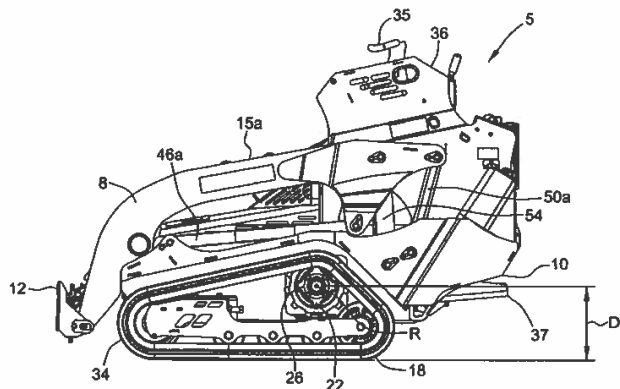
Primary Examiner — Dean Kramer

(74) Attorney, Agent, or Firm — Armstrong Teasdale LLP

(57) **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 piv-  
oted are low relative to the mainframe to reduce the main-  
frame size and to lower the center of gravity to improve the  
stability of the compact tool carrier during use.

**20 Claims, 7 Drawing Sheets**



EX1001 / Page 1 of 26  
Kubota North America Corporation et al

(56)

**References Cited**

**U.S. PATENT DOCUMENTS**

|              |      |         |               |         |
|--------------|------|---------|---------------|---------|
| 8,821,104    | B2 * | 9/2014  | Yasuda et al. | 414/685 |
| 2007/0128012 | A1   | 6/2007  | Yamada et al. |         |
| 2007/0132204 | A1   | 6/2007  | Sewell        |         |
| 2009/0116943 | A1 * | 5/2009  | Valere        | 414/467 |
| 2012/0305025 | A1 * | 12/2012 | Helbig et al. | 134/6   |
| 2014/0271078 | A1   | 9/2014  | Koch          |         |

**OTHER PUBLICATIONS**

ISO 6682:2008, Earth-moving machinery—Zones of comfort and reach for controls, dated Sep. 2008, pp. 18.  
 Bobcat, Mini Track Loaders, available before Feb. 20, 2015, pp. 1.  
 Toro, Dingo Compact Utility Loader, available before Feb. 20, 2015, pp. 1.

Ditch Witch, SK850 Mini Skid Steer, available before Feb. 20, 2015, pp. 1.  
 Cat, 252B Skid Steer Loader, available before Feb. 20, 2015, pp. 1.  
 Deere, 318D Skid Steer, available before Feb. 20, 2015, pp. 1.  
 New Holland, C232 Skid Steer Loader, available before Feb. 20, 2015, pp. 1.  
 JCB, 150T Tracked Skid Steer, available before Feb. 20, 2015, pp. 1.  
 Kubota, SVL75 Compact Track Loader, available before Feb. 20, 2015, pp. 1.  
 Gehl, V270 Vertical Lift Skid Loader, available before Feb. 20, 2015, pp. 1.  
 Bobcat, T190 Compact Track Loader, available before Feb. 20, 2015, pp. 1.  
 Yanmar, S-28-V Skid Steer, available before Feb. 20, 2015, pp. 1.

\* cited by examiner

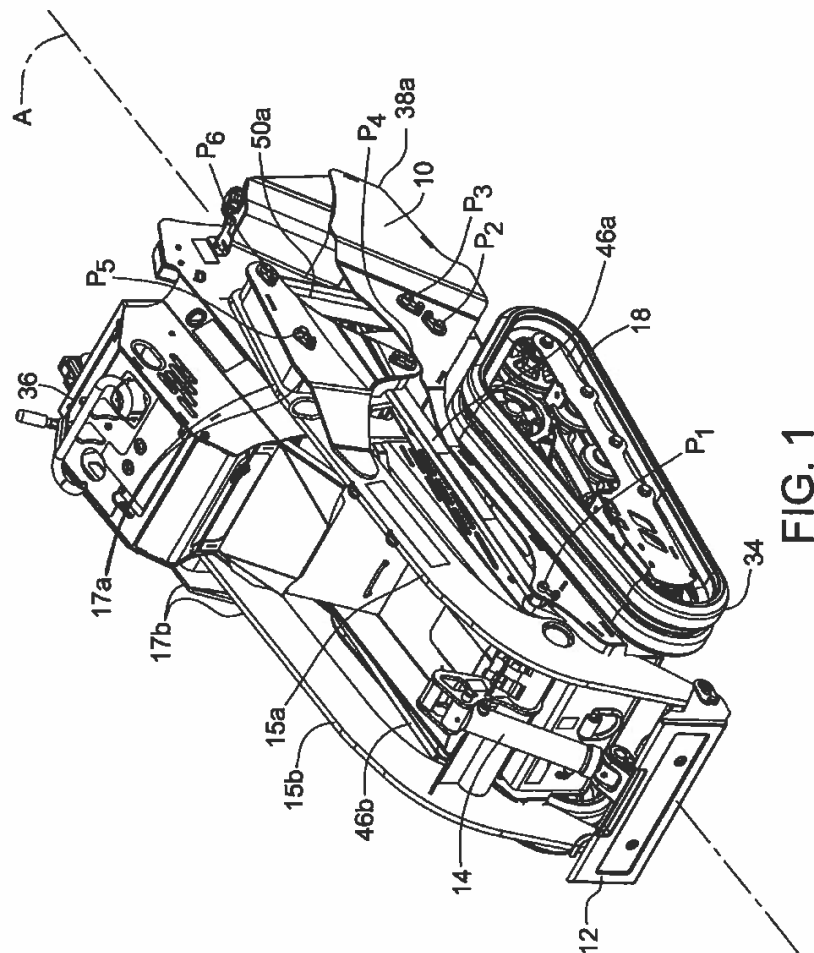


FIG. 1

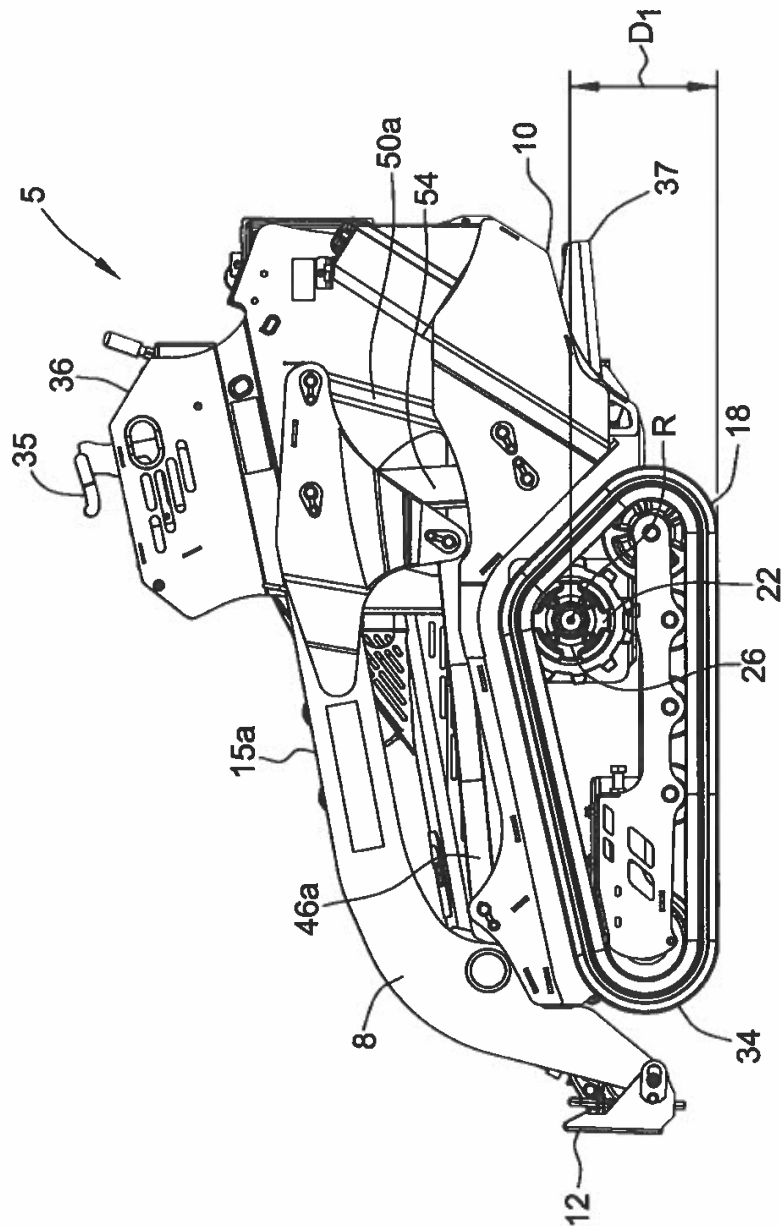


FIG. 2

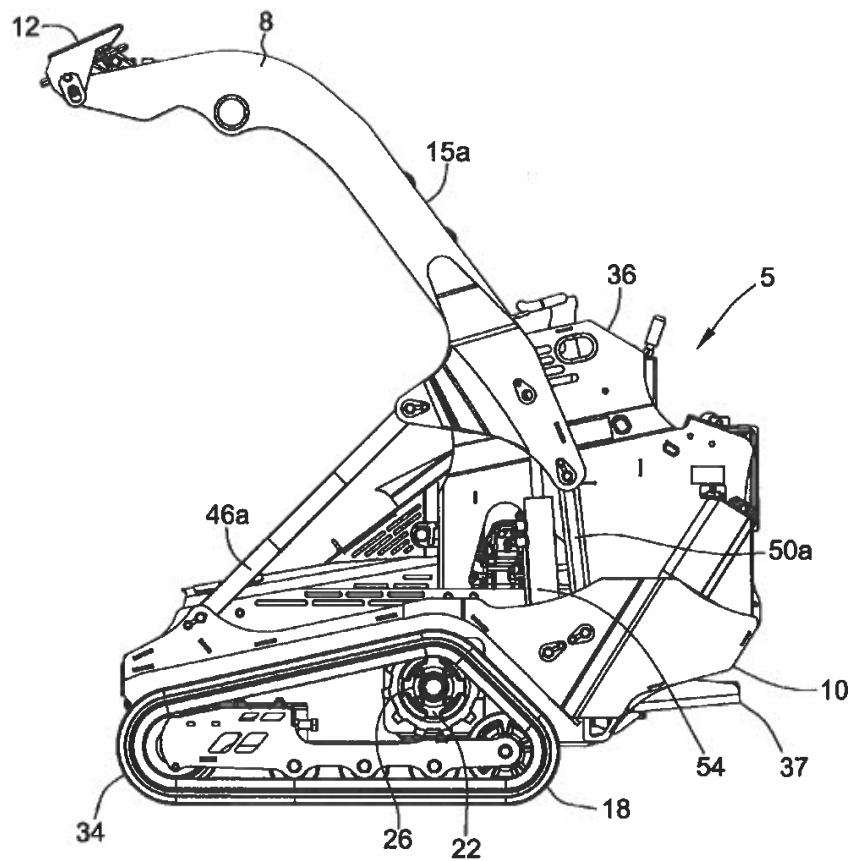


FIG. 3

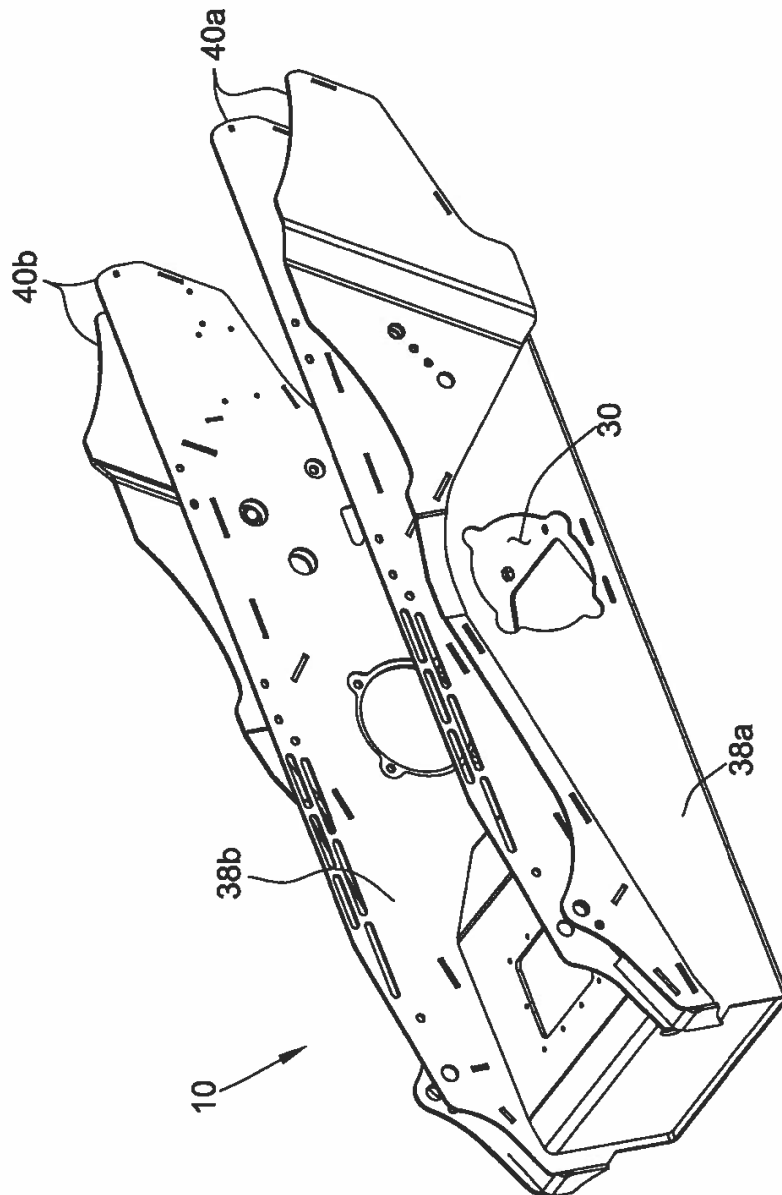


FIG. 4

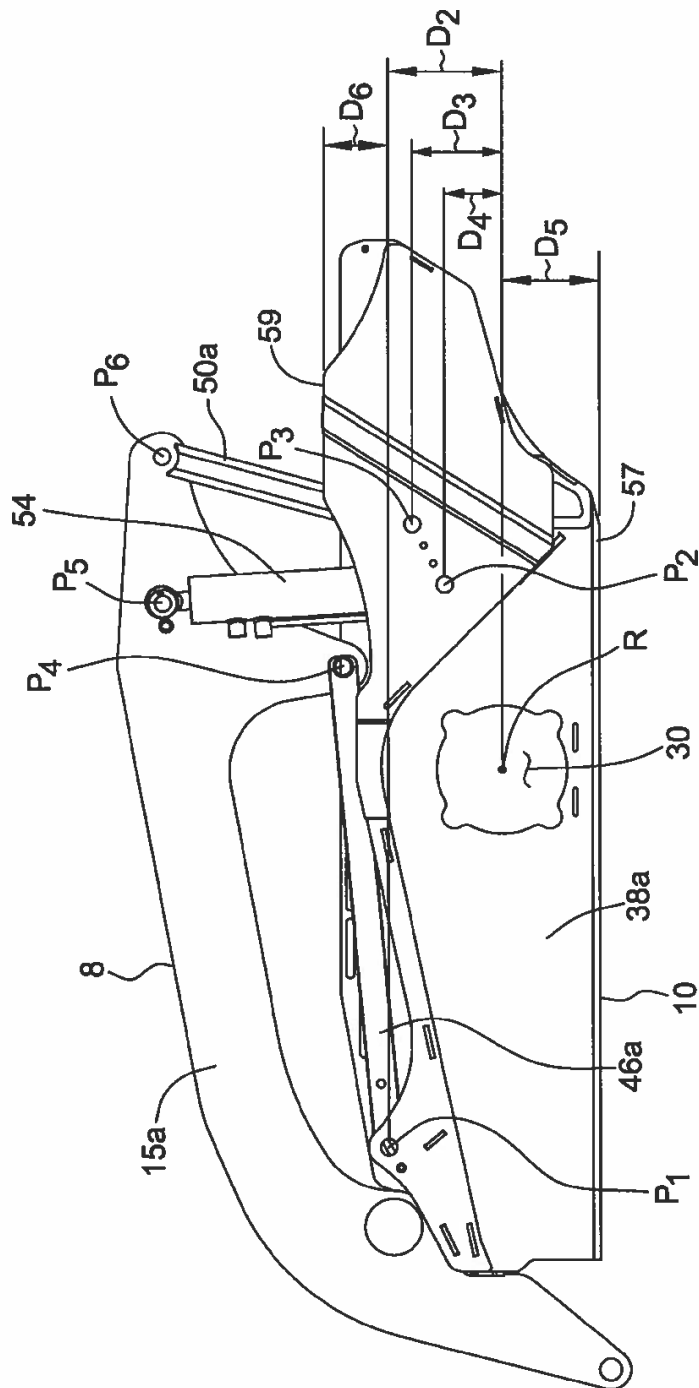


FIG. 5

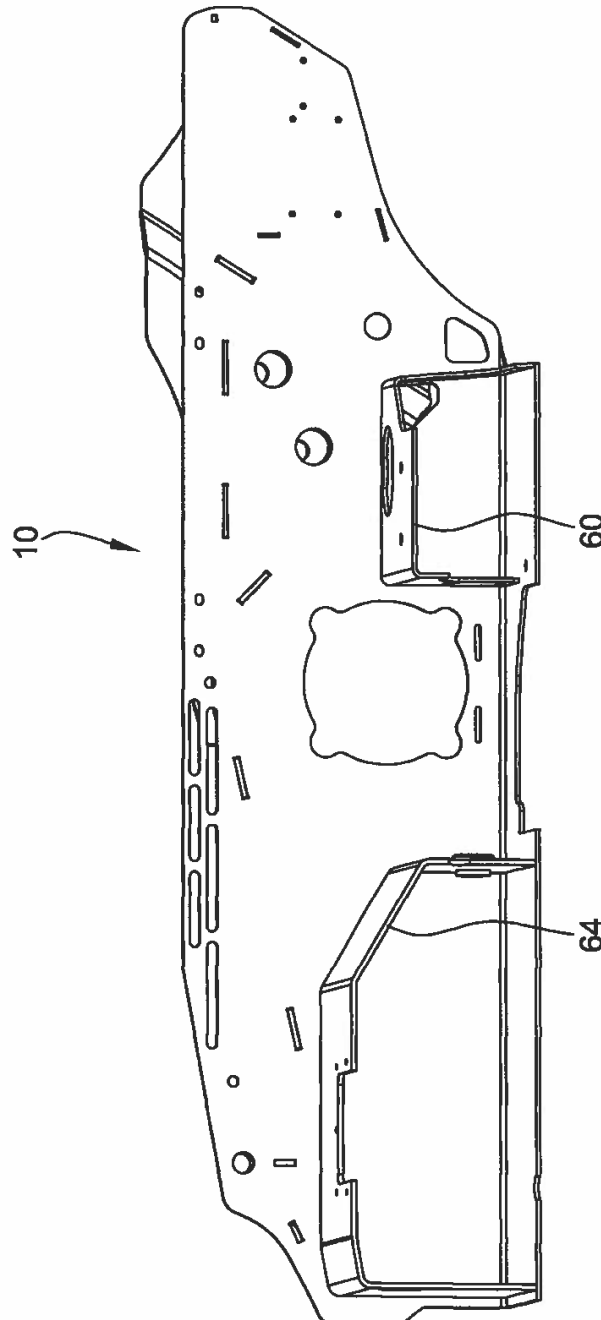


FIG. 6

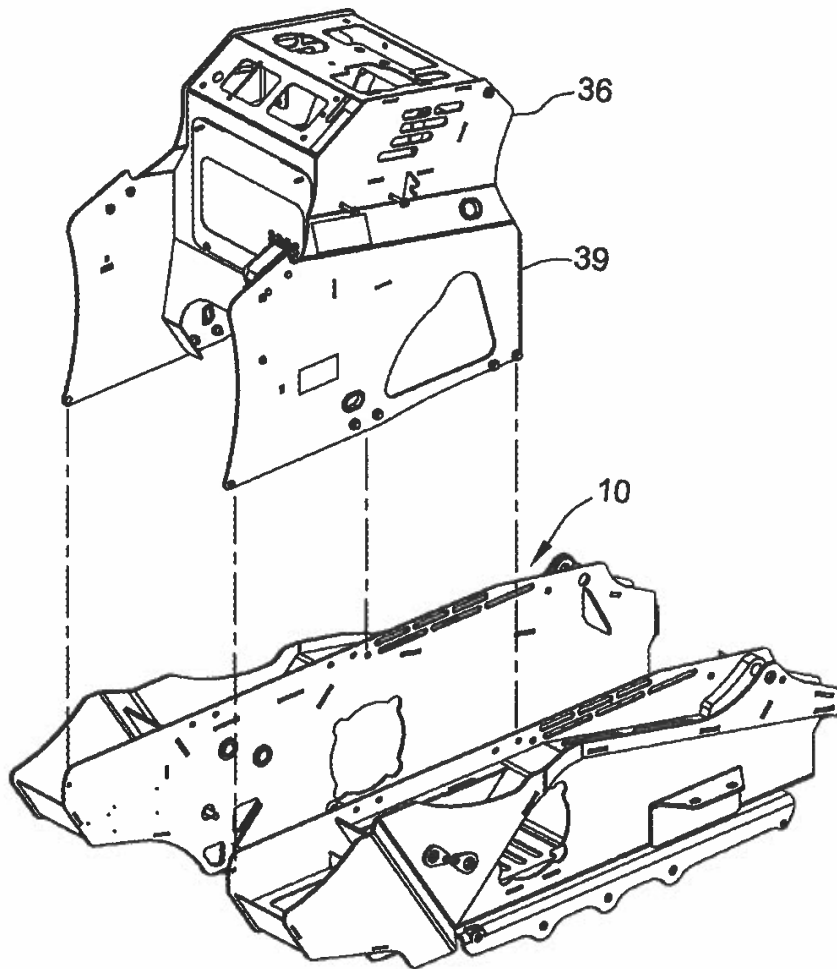


FIG. 7

1

**LOW PROFILE COMPACT TOOL CARRIERS****CROSS-REFERENCE TO RELATED APPLICATION**

This application claims the benefit of U.S. Provisional Patent Application No. 62/118,860, filed Feb. 20, 2015, which is incorporated herein by reference in its entirety.

**FIELD OF THE DISCLOSURE**

The field of the disclosure relates to compact tool carriers having a loader mounted to a low-profile mainframe.

**BACKGROUND**

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.

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.

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.

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**

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.

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 side of the mainframe has at least two pivot points relative to the loader. The carrier includes a drive

2

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.

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**

FIG. 1 is a perspective view of a compact tool carrier with the loader in a down position;

FIG. 2 is a side view of the compact tool carrier with the loader in a down position;

FIG. 3 is a side view of the compact tool carrier with the loader in a raised position;

FIG. 4 is a perspective view of a mainframe of the compact tool carrier;

FIG. 5 is a side view of the mainframe and loader of the compact tool carrier;

FIG. 6 is a cross-section side view of the mainframe; and

FIG. 7 is an exploded perspective view of the mainframe and an upper frame of the compact tool carrier.

Corresponding reference characters indicate corresponding parts throughout the drawings.

**DETAILED DESCRIPTION**

An embodiment of a compact tool carrier is generally referred to as “5” in FIG. 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.

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.

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 FIGS. 1-7 includes a corresponding component with the same function opposite the component.

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.

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).

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.

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.

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.

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<sub>1</sub> (FIG. 5) a rear pivot point P<sub>3</sub> and a central pivot point P<sub>2</sub> between the forward pivot point P<sub>1</sub> and the rear pivot point P<sub>3</sub>. Similarly, the first arm 15a includes a forward pivot point P<sub>4</sub>, a rear pivot point P<sub>6</sub> and a central pivot point P<sub>5</sub> between the forward pivot point P<sub>4</sub> and the rear pivot point P<sub>6</sub>. 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<sub>1</sub> and attached to the first arm 15a at its forward pivot point P<sub>4</sub>. A first rear linkage 50a is attached to the first side 38a of the mainframe 10 at its rear pivot point P<sub>3</sub> and is attached to the first arm 15a of the loader 8 at its rear pivot point P<sub>6</sub>. 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.

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<sub>2</sub> and is attached to the loader arm 15a at its center pivot point P<sub>5</sub> 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).

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.

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

5

linkages 46a, 50a. Further, each side of the carrier 5 having an actuator 54 may include a single linkage rather than two linkages.

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<sub>1</sub> 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<sub>2</sub> are separated by a vertical distance D3. The rotational axis R and the central pivot point P<sub>4</sub> are separated by a vertical distance D4. Each of D2, D3 and D4 is less than about 1.5 times D1 (1.5×D1). In some embodiments, each of D2, D3 and D4 is less than D1 or even less than about 0.75 times D1 (0.75×D1).

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 (2×D5). In some embodiments, each of D2, D3 and D4 is less than about 1.75 times D5 (1.75×D5) or less than about 1.5 times D5 (1.5×D5). 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 (1.25×D5). The distance D6 between the top 59 of the first side 38a of the mainframe 10 and the highest pivot point (P<sub>1</sub> in the illustrated embodiment), is less than about 1.5 times D5, less than about D5 or less than about 0.75 times D5.

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 (1.5×D1) or less than D1 or even less than about 0.75 times D1 (0.75×D1). 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' (2×D5') or less than about 1.75 times D5' (1.75×D5') or less than about 1.5 times D5' (1.5×D5'). D3' and D4' may be even less than about 1.25 times D5' (1.25×D5'). 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'.

The compact tool carrier 5 includes an engine (not shown) for propelling the drive mechanism 18. As shown in FIG. 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.

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

6

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 a 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.

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.

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.

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.

What is claimed is:

1. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an 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, 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, the loader arm not being directly attached to the mainframe;

a 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 of the compact tool carrier and adapted to allow for standing or walk-behind operation.

2. The compact tool carrier as set forth in claim 1 wherein the mainframe incorporates a single weldment.

3. The compact tool carrier as set forth in claim 1 wherein the loader arm is a first loader arm and the linkage is a first linkage, the loader comprising a second loader arm and the compact tool carrier comprising a second linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

4. The compact tool carrier as set forth in claim 3 wherein the actuator is a first actuator, the compact tool carrier comprising a second actuator, the second actuator being pivotally

7

attached to the second side of the mainframe and pivotally attached to the second loader arm.

5. The compact tool carrier as set forth in claim 1 comprising a drive mechanism comprising tracks or wheels, the drive mechanism being attached to the mainframe.

6. The compact tool carrier as set forth in claim 1 comprising an engine to propel a drive mechanism, the engine being attached to the engine bracket.

7. The compact tool carrier as set forth in claim 1 wherein the actuator is a hydraulic cylinder.

8. The compact tool carrier as set forth in claim 1 wherein each loader arm incorporates a single weldment.

9. The compact tool carrier as set forth in claim 1 wherein the control station is mounted toward the rear of the compact tool carrier, the compact tool carrier comprising an operator platform for standing operation of the compact tool carrier, the difference between the height of the control station and the height of the platform being at least 90 cm.

10. The compact tool carrier as set forth in claim 1 wherein the control station is mounted toward the rear of the compact tool carrier, and the height of the control station from a surface supporting the compact tool carrier is at least 90 cm.

11. A method for operating the compact tool carrier as set forth in claim 1, the method comprising standing behind the compact tool carrier and operating the control station to propel the compact tool carrier forward and/or raise or lower the loader.

12. The method as set forth in claim 11 wherein the control station is operated while standing on an operator platform or while standing on a surface supporting the compact tool carrier.

13. The compact tool carrier as set forth in claim 1 further comprising a tool attached to the loader, the tool being selected from the group consisting of a bucket, auger, fork, stump grinder, tiller and roller.

14. The compact tool carrier as set forth in claim 1 wherein a single linkage is attached to the first side of the mainframe and pivotally attached to the loader arm.

15. A compact tool carrier comprising:

a loader 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, 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, each side having a top and a bottom, the first side of the mainframe

8

having at least two pivot points relative to the loader, the loader not being directly attached to the mainframe;

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

an actuator pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader;

a drive mechanism comprising tracks or wheels for propelling the compact tool carrier over a supporting surface, the drive mechanism being attached to the mainframe about a rotational axis, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis and bottom of the compact tool carrier being separated by a vertical distance D1, the rotational axis and each pivot point being separated by a vertical distance, each vertical distance between the rotational axis and a pivot point being less than 1.5 times D1; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and/or lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation.

16. The compact tool carrier as set forth in claim 15 wherein the rotational axis and the pivot point at which the linkage is attached are separated by a vertical distance D2, the rotational axis and the pivot point at which the actuator is attached are separated by a vertical distance D3, both D2 and D3 being less than 1.5 times D1.

17. The compact tool carrier as set forth in claim 16 wherein the second side of the mainframe comprises two pivot points, each vertical distance between the rotational axis and a pivot point being less than 1.5 times D1.

18. The compact tool carrier as set forth in claim 16 wherein the rotational axis and the bottom of the first side of the mainframe are separated by a vertical distance D5, both D2 and D3 being less than twice D5.

19. The compact tool carrier as set forth in claim 18 wherein the first side of the mainframe comprises a top most pivot point, the top most pivot point and the top of the first side of the mainframe being separated by a vertical distance D6, D6 being less than about 1.5 times D5.

20. The compact tool carrier as set forth in claim 15 further comprising a tool attached to the loader, the tool being selected from the group consisting of a bucket, auger, fork, stump grinder, tiller and roller.

\* \* \* \* \*



US009321386C1

(12) **EX PARTE REEXAMINATION CERTIFICATE** (11288th)  
**United States Patent**  
**Thomas et al.**

(10) Number: **US 9,321,386 C1**(45) Certificate Issued: **Apr. 12, 2018**(54) **LOW PROFILE COMPACT TOOL CARRIERS***E02F 3/96* (2006.01)*E02F 9/20* (2006.01)(71) Applicant: **Vermeer Manufacturing Company,**  
Pella, IA (US)*B60P 1/48* (2006.01)*B66F 9/065* (2006.01)(72) Inventors: **Brad Thomas,** Pleasant Hill, IA (US);  
**Louis Hartke,** Pella, IA (US); **Greg**  
**Langenfeld,** Bettendorf, IA (US); **Matt**  
**Hutchinson,** Pella, IA (US)

(52) U.S. Cl.

CPC ..... *B66F 9/06* (2013.01); *B60P 1/483*(2013.01); *B66F 9/065* (2013.01); *B66F**9/0759* (2013.01); *B66F 9/07572* (2013.01);*B66F 9/07577* (2013.01); *B66F 9/22*(2013.01); *E02F 3/3405* (2013.01); *E02F**3/3414* (2013.01); *E02F 3/96* (2013.01); *E02F**9/08* (2013.01); *E02F 9/205* (2013.01)(73) Assignee: **VERMEER MANUFACTURING**  
**COMPANY,** Pella, IA (US)

(58) Field of Classification Search

None

See application file for complete search history.

**Reexamination Request:**

No. 90/013,915, Feb. 28, 2017

**Reexamination Certificate for:**Patent No.: **9,321,386**Issued: **Apr. 26, 2016**Appl. No.: **14/691,649**Filed: **Apr. 21, 2015**

(56)

**References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/013,915, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

*Primary Examiner* — William Doerfler**Related U.S. Application Data**

(60) Provisional application No. 62/118,860, filed on Feb. 20, 2015.

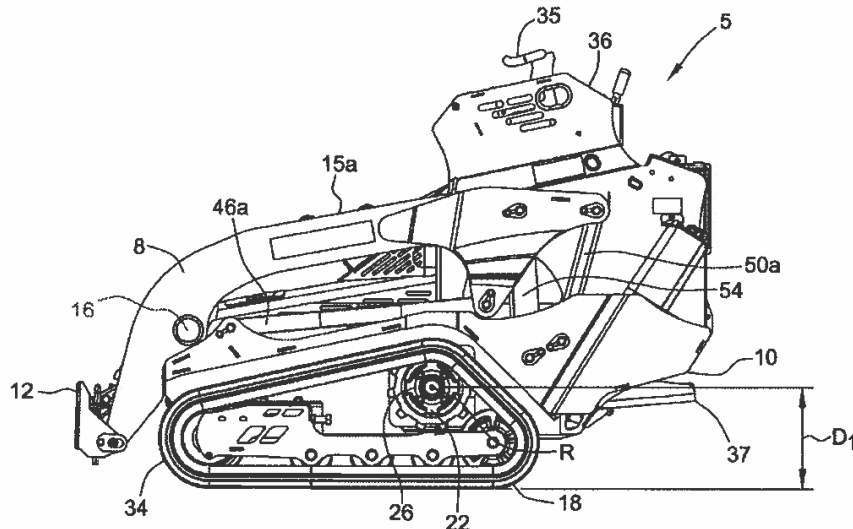
(51) Int. Cl.

*B60P 1/50* (2006.01)*B66F 9/075* (2006.01)*B66F 9/22* (2006.01)*B66F 9/06* (2006.01)*E02F 3/34* (2006.01)*E02F 9/08* (2006.01)

(57)

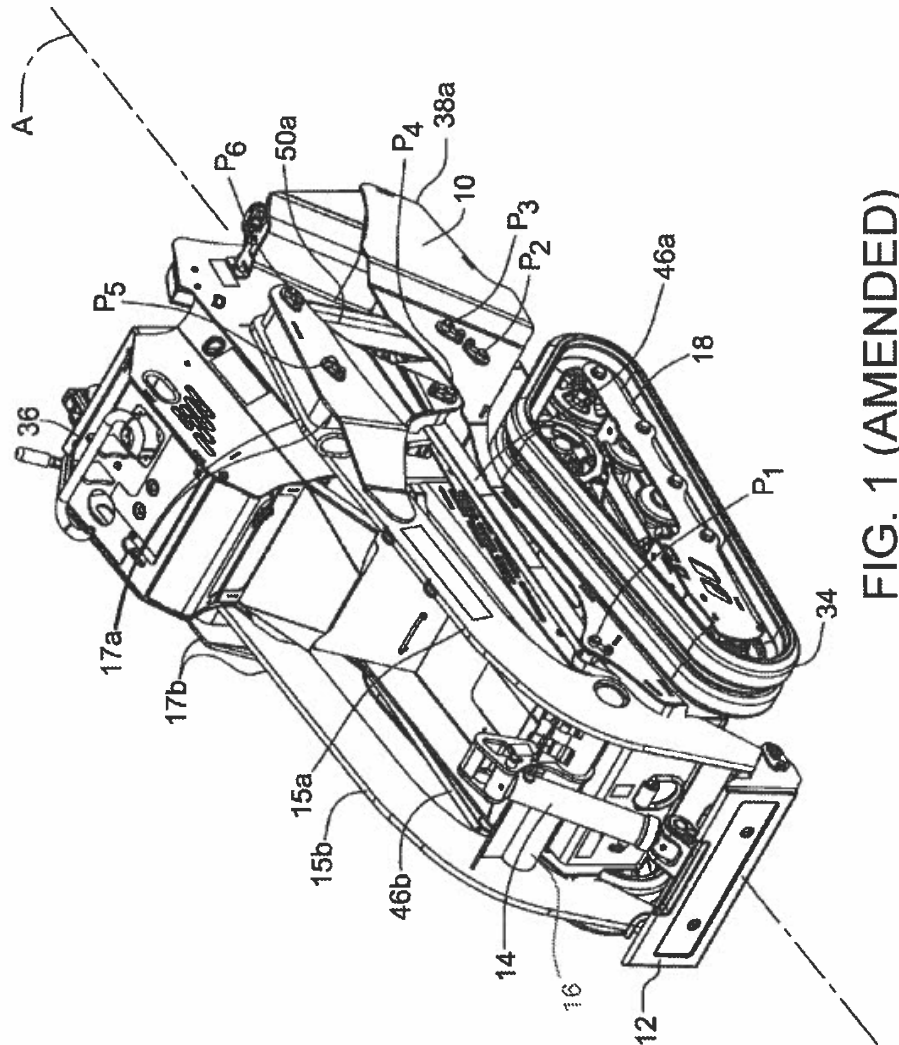
**ABSTRACT**

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 and to lower the center of gravity to improve the stability of the compact tool carrier during use.



(AMENDED)

EX1001 / Page 14 of 26  
Kubota North America Corporation et al





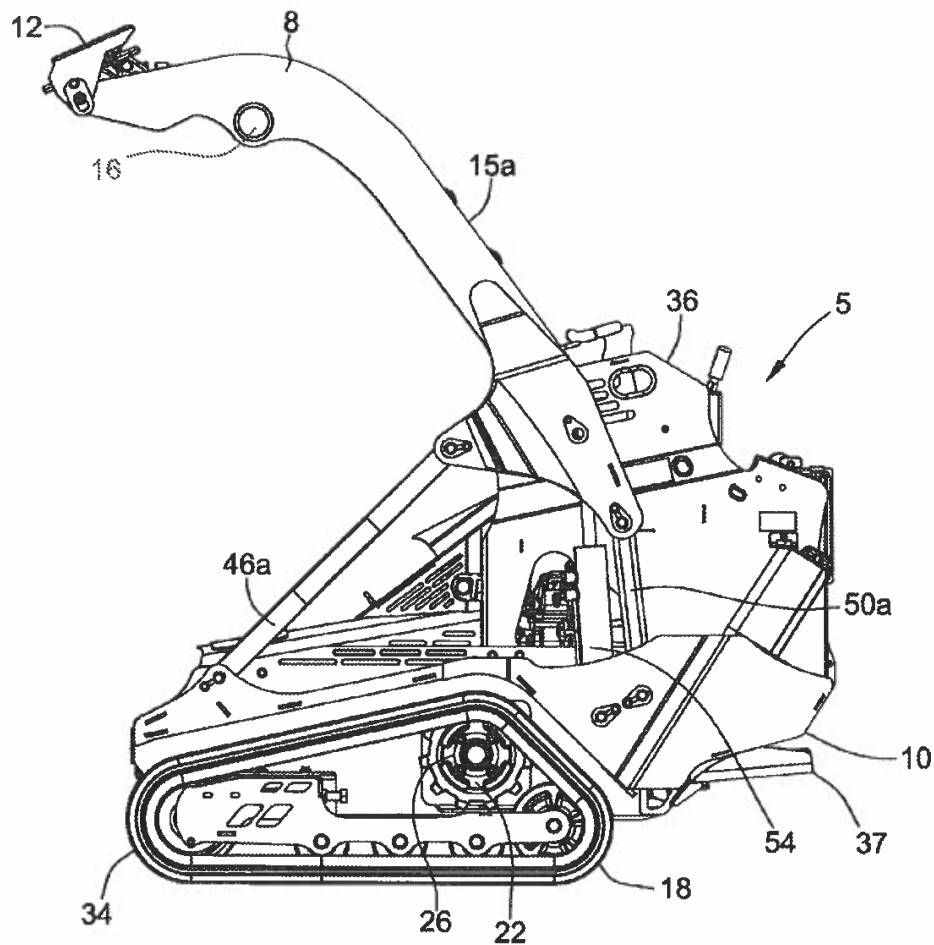


FIG. 3 (AMENDED)

**1**  
**EX PARTE**  
**REEXAMINATION CERTIFICATE**

THE PATENT IS HEREBY AMENDED AS  
INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

ONLY THOSE PARAGRAPHS OF THE  
SPECIFICATION AFFECTED BY AMENDMENT  
ARE PRINTED HEREIN.

Column 2, lines 44-58:

An embodiment of a compact tool carrier is generally referred to as "5" in FIG. 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. *A cross-member 16 extends from the first arm 15a to the second arm 15b. The actuator 14 is connected to the cross-member 16.* 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.

Column 3, lines 20-30:

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] 18 includes wheels.

Column 4, lines 35-45:

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<sub>4</sub>] P<sub>2</sub> and is attached to the loader arm 15a at its center pivot point P<sub>5</sub> 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).

Column 5, lines 4-19:

In some embodiments, the mainframe 10 is characterized by a relatively low profile (i.e., the pivot points are posi-

**2**

tioned 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<sub>1</sub> 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<sub>3</sub> are separated by a vertical distance D3. The rotational axis R and the central pivot point [P<sub>4</sub>] P<sub>2</sub> are separated by a vertical distance D4. Each of D2, D3 and D4 is less than about 1.5 times D1 (1.5×D1). In some embodiments, each of D2, D3 and D4 is less than D1 or even less than about 0.75 times D1 (0.75×D1).

THE DRAWING FIGURES HAVE BEEN  
CHANGED AS FOLLOWS:

On FIGS. 1, 2 and 3, A reference numeral has been added (16) for the crossbar between the arms (15a and 15b).

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims 1 and 3-13 is confirmed.

Claims 16 and 18 are cancelled.

Claims 15, 17 and 19 are determined to be patentable as amended.

Claim 20, dependent on an amended claim, is determined to be patentable.

New claims 21-63 are added and determined to be patentable.

Claims 2 and 14 were not reexamined.

15. A compact tool carrier comprising:

a loader 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, 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, each side having a top and a bottom, the first side of the mainframe having at least two pivot points relative to the loader, the loader not being directly attached to the mainframe;

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

an actuator pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader;

a drive mechanism comprising tracks or wheels for propelling the compact tool carrier over a supporting surface, the drive mechanism being attached to the mainframe about a rotational axis, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis and bottom of the compact tool carrier being separated by a vertical distance D1, *the rotational axis and the bottom of the first side of the mainframe being separated by a vertical distance D5, the rotational axis and [each] the pivot point at which the linkage is attached to the mainframe being separated by a vertical distance D2, the rotational axis and the pivot point at which the*

3

actuator is attached to the mainframe being separated by a vertical distance  $D4$ , [each vertical distance between the rotational axis and a pivot point]  $D2$  and  $D4$  each being less than 1.5 times  $D1$  and each being less than twice  $D5$ ; and

a control station having operator controls for propelling the compact tool carrier forward and for raising and/or lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation.

17. The compact tool carrier as set forth in claim [16] 15 wherein the second side of the mainframe comprises two pivot points, each vertical distance between the rotational axis and a pivot point being less than 1.5 times  $D1$ .

19. The compact tool carrier as set forth in claim [18] 15 wherein the first side of the mainframe comprises a top most pivot point, the top most pivot point and the top of the first side of the mainframe being separated by a vertical distance  $D6$ ,  $D6$  being less than about 1.5 times  $D5$ .

21. The compact tool carrier as set forth in claim 1 20 wherein the linkage is a first linkage, the first linkage being pivotally attached to the first side of the mainframe at a first pivot point and pivotally attached to the loader arm at a second pivot point, the actuator being attached to the mainframe at a third pivot point and pivotally attached to the loader arm at a fourth pivot point, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a fifth pivot point and pivotally attached to the loader arm at a sixth pivot point, wherein as the loader travels from a down position to a vertically raised position, the first, second, third, fourth, fifth, and sixth pivot points are (1) disposed between the operator controls and a bottom of the mainframe and/or (2) disposed forward of the control station.

22. The compact tool carrier as set forth in claim 21 35 further comprising an operator platform for standing operation of the operator controls of the control station, the operator platform being located toward a rear of the compact tool carrier such that the first pivot point, third pivot point, and fifth pivot point are disposed forward of the operator platform. 40

23. The compact tool carrier as set forth in claim 15 wherein  $D2$  and  $D4$  are each less than 1.75  $D5$ .

24. The compact tool carrier as set forth in claim 15 wherein  $D2$  and  $D4$  are each less than 1.5  $D5$ . 45

25. The compact tool carrier as set forth in claim 15 wherein  $D2$  and  $D4$  are each less than  $D1$ .

26. The compact tool carrier as set forth in claim 15 wherein  $D2$  and  $D4$  are each less than 0.75  $D1$ .

27. The compact tool carrier as set forth in claim 15 50 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, the rotational axis and the pivot point at which the second linkage is attached to the mainframe being separated by a vertical distance  $D3$ ,  $D3$  being less than 1.5 times  $D1$ . 55

28. The compact tool carrier as set forth in claim 15 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most 65

4

pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than  $D1$ .

29. The compact tool carrier as set forth in claim 15 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than 0.75  $D1$ .

30. The compact tool carrier as set forth in claim 15 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than 1.5  $D5$ .

31. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

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

a first loader arm;

a second loader arm; and

at least one cross-member that extends from the first loader arm to the second loader arm;

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, the first loader arm not being directly attached to the mainframe;

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

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 of the compact tool carrier and adapted to allow for standing operation, each cross-member being disposed forward of the control station in the vertically raised position of the loader; and an operator platform for standing operation of the operator controls of the control station.

32. The compact tool carrier as set forth in claim 31 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm.

33. The compact tool carrier as set forth in claim 31 wherein the mainframe incorporates a single weldment.

5

34. The compact tool carrier as set forth in claim 31 wherein each cross-member is disposed forward of the operator platform and forward of the control station in the down position of the loader.

35. The compact tool carrier as set forth in claim 31 further comprising an attachment plate for removably attaching a tool to the compact tool carrier, the cross-member being spaced from the attachment plate.

36. The compact tool carrier as set forth in claim 35 further comprising an actuator for tilting of tools connected to the attachment plate, the actuator being connected to the cross-member and the attachment plate.

37. The compact tool carrier as set forth in claim 31 further comprising a drive mechanism for propelling the compact tool carrier over a supporting surface, the drive mechanism having a drive sprocket, the cross-member being disposed forward of the drive sprocket in the vertically raised position and the down position.

38. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader being adapted to carry a tool, the loader comprising:

a first loader arm;

a second loader arm; and

a single cross-member that extends from the first loader arm to the second loader arm;

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 of the mainframe, the first loader arm not being directly attached to the mainframe;

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

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 of the compact tool carrier and adapted to allow for standing operation; and an operator platform for standing operation of the operator controls of the control station.

39. The compact tool carrier as set forth in claim 38 wherein the loader is moveable between a down position and a vertically raised position, the cross-member being disposed forward of the operator platform in the down position and the vertically raised position of the loader.

40. The compact tool carrier as set forth in claim 38 wherein the loader is moveable between a down position and a vertically raised position, the compact tool carrier further comprising a drive mechanism for propelling the compact tool carrier over a supporting surface, the drive mechanism having a drive sprocket, the cross-member being disposed forward of the drive sprocket in the down position and the vertically raised position of the loader.

41. The compact tool carrier as set forth in claim 38 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm.

6

42. The compact tool carrier as set forth in claim 38 wherein the mainframe incorporates a single weldment.

43. The compact tool carrier as set forth in claim 38 further comprising an attachment plate for removably attaching a tool to the compact tool carrier, the cross-member being spaced from the attachment plate.

44. The compact tool carrier as set forth in claim 43 further comprising an actuator for tilting of tools connected to the attachment plate, the actuator being connected to the cross-member and the attachment plate.

45. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an 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, 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 of the mainframe, the loader arm not being directly attached to the mainframe;

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

a second linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm at a second linkage pivot point, the loader being free of cross-members between the first linkage pivot point and the second linkage pivot point;

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

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 of the compact tool carrier and adapted to allow for standing or walk-behind operation; and an operator platform for standing operation of the operator controls of the control station.

46. The compact tool carrier as set forth in claim 45 wherein the loader comprises:

a first arm;

a second arm; and

a cross-member that extends from the first arm to the second arm, the cross-member being disposed forward of the first linkage pivot point, the second linkage pivot point, and the actuator pivot point.

47. The compact tool carrier as set forth in claim 46 further comprising an attachment plate for removably attaching a tool to the compact tool carrier, the cross-member being spaced from the attachment plate.

48. The compact tool carrier as set forth in claim 47 further comprising an actuator for tilting of tools connected to the attachment plate, the actuator being connected to the cross-member and the attachment plate.

49. The compact tool carrier as set forth in claim 45 wherein the mainframe incorporates a single weldment.

50. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader adapted to carry a tool, the loader comprising:

a first loader arm;

a second loader arm; and

7

at least one cross-member that extends from the first loader arm to the second loader arm;

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, the first loader arm not being directly attached to the mainframe;

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

a second linkage pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm at a second linkage pivot point, each cross-member being disposed forward of the first linkage pivot point and the second linkage pivot point;

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

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 of the compact tool carrier and adapted to allow for standing or walk-behind operation; and an operator platform for standing operation of the operator controls of the control station.

51. The compact tool carrier as set forth in claim 50 wherein each cross-member is disposed forward of the actuator pivot point.

52. The compact tool carrier as set forth in claim 50 wherein the mainframe incorporates a single weldment.

53. The compact tool carrier as set forth in claim 50 further comprising an attachment plate for removably attaching a tool to the compact tool carrier, the cross-member being spaced from the attachment plate.

54. The compact tool carrier as set forth in claim 53 further comprising an actuator for tilting of tools connected to the attachment plate, the actuator being connected to the cross-member and the attachment plate.

55. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an 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, 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, each side having a top and a bottom, the first side of the mainframe having at least two pivot points relative to the loader, the loader arm not being directly attached to the mainframe;

a 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;

a drive mechanism comprising tracks for propelling the compact tool carrier over a supporting surface, the drive mechanism having a rotational axis, the compact tool carrier having a bottom at which the drive mecha-

8

nism contacts the supporting surface, the rotational axis and bottom of the compact tool carrier being separated by a vertical distance D1, the rotational axis and the bottom of the first side of the mainframe being separated by a vertical distance D5, the rotational axis and the pivot point at which the linkage is attached to the mainframe being separated by a vertical distance D2, the rotational axis and the pivot point at which the actuator is attached to the mainframe being separated by a vertical distance D4, both D2 and D4 being less than D1 and being less than 1.5 D5; 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 of the compact tool carrier and adapted to allow for standing or walk-behind operation.

56. The compact tool carrier as set forth in claim 55 wherein D2 and D4 are each less than 0.75 D1.

57. The compact tool carrier as set forth in claim 55 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, the rotational axis and the pivot point at which the second linkage is attached to the mainframe being separated by a vertical distance D3, D3 being less than 1.5 times D1.

58. The compact tool carrier as set forth in claim 55 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than D1.

59. The compact tool carrier as set forth in claim 55 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than 0.75 D1.

60. The compact tool carrier as set forth in claim 55 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than 0.75 D5.

61. The compact tool carrier as set forth in claim 55 wherein the drive mechanism comprises a drive sprocket, the drive sprocket rotating about the rotational axis.

9

62. The compact tool carrier as set forth in claim 55 further comprising an operator platform for standing operation of the operator controls of the control station.

63. The compact tool carrier as set forth in claim 55 wherein the mainframe incorporates a single weldment. 5

\* \* \* \* \*

10



US009321386C2

(12) **EX PARTE REEXAMINATION CERTIFICATE** (11629th)  
**United States Patent**  
**Thomas et al.**

(10) **Number:** **US 9,321,386 C2**(45) **Certificate Issued:** **Jan. 24, 2020**(54) **LOW PROFILE COMPACT TOOL CARRIERS***B66F 9/065* (2006.01)*B60P 1/48* (2006.01)*E02F 3/96* (2006.01)*E02F 3/34* (2006.01)(71) **Applicant:** **Vermeer Manufacturing Company,**  
Pella, IA (US)(72) **Inventors:** **Brad Thomas,** Pleasant Hill, IA (US);  
**Louis Hartke,** Pella, IA (US); **Greg**  
**Langenfeld,** Bettendorf, IA (US); **Matt**  
**Hutchinson,** Pella, IA (US)(52) **U.S. Cl.**CPC ..... *B66F 9/065* (2013.01); *B60P 1/483*  
(2013.01); *B66F 9/0759* (2013.01); *B66F*  
*9/07572* (2013.01); *B66F 9/22* (2013.01);  
*E02F 3/3405* (2013.01); *E02F 3/96* (2013.01)(73) **Assignee:** **VERMEER MANUFACTURING**  
**COMPANY,** Pella, IA (US)(58) **Field of Classification Search**

None

See application file for complete search history.

**Reexamination Request:**

No. 90/014,109, Mar. 12, 2018

No. 90/014,124, Apr. 13, 2019

(56) **References Cited****Reexamination Certificate for:**Patent No.: **9,321,386**Issued: **Apr. 26, 2016**Appl. No.: **14/691,649**Filed: **Apr. 21, 2015**

To view the complete listing of prior art documents cited during the proceedings for Reexamination Control Numbers 90/014,109 and 90/014,124, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

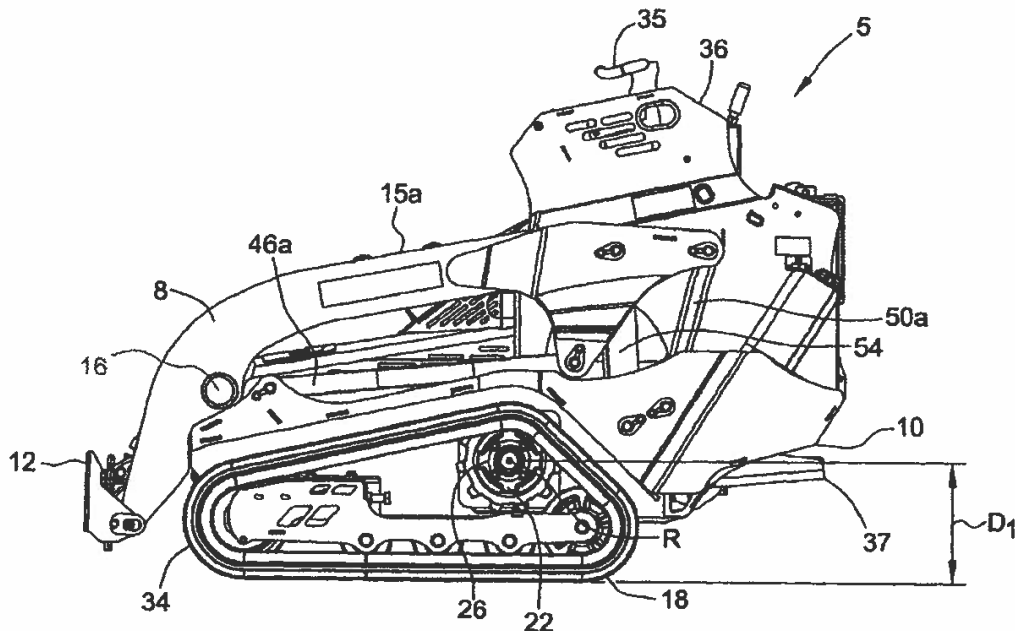
Reexamination Certificate C1 9,321,386 issued Apr. 12, 2018

*Primary Examiner* — Russell D Stormer**Related U.S. Application Data**

(60) Provisional application No. 62/118,860, filed on Feb. 20, 2015.

(51) **Int. Cl.***B66F 9/075* (2006.01)*B66F 9/22* (2006.01)(57) **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 and to lower the center of gravity to improve the stability of the compact tool carrier during use.



EX1001 / Page 23 of 26

Kubota North America Corporation et al

**1**  
**EX PARTE**  
**REEXAMINATION CERTIFICATE**

THE PATENT IS HEREBY AMENDED AS  
INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims 1-13, 15, 17, 20, 22-45 and 49-63 is confirmed.

Claims 16 and 18 were previously cancelled.

Claims 21 and 46 are determined to be patentable as amended.

Claims 47 and 48, dependent on an amended claim, are determined to be patentable.

New claims 64-87 are added and determined to be patentable.

Claims 14 and 19 were not reexamined.

21. The compact tool carrier as set forth in claim 1 wherein the linkage is a first linkage, the first linkage being pivotally attached to the first side of the mainframe at a first pivot point and pivotally attached to the loader arm at a second pivot point, the actuator being attached to the mainframe at a third pivot point and pivotally attached to the loader arm at a fourth pivot point, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a fifth pivot point and pivotally attached to the loader arm at a sixth pivot point, wherein as the loader travels from a down position to a vertically raised position, the first, second, third, fourth, fifth, and sixth pivot points are (1) disposed between the operator controls and a bottom of the mainframe [and/or] or (2) disposed forward of the control station.

46. The compact tool carrier as set forth in claim 45 wherein the loader comprises:

- a first arm;
- a second arm; and
- a cross-member that extends from the first arm to the second arm, the cross-member being fully disposed forward of the first linkage pivot point, the second linkage pivot point, and the actuator pivot point.

64. The compact tool carrier as set forth in claim 1 further comprising an operator platform for standing operation of the operator controls of the control station, the operator platform extending from the mainframe.

65. The compact tool carrier as set forth in claim 64 wherein least a portion of the operator platform is forward of the rear end of the mainframe.

66. The compact tool carrier as set forth in claim 15 wherein the pivot point at which the actuator is attached to the first side of the mainframe is above the rotational axis.

67. The compact tool carrier as set forth in claim 15 wherein the pivot point at which the linkage is attached to the first side of the mainframe is disposed above the tracks or wheels.

68. The compact tool carrier as set forth in claim 55 wherein the drive mechanism further comprises a drive sprocket, the drive sprocket rotating about the rotational

**2**

axis, and the pivot point at which the actuator is attached to the first side of the mainframe being above the rotational axis.

69. The compact tool carrier as set forth in claim 55 wherein the pivot point at which the linkage is attached to the first side of the mainframe is above the tracks or wheels.

70. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an 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, 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, the loader arm not being directly attached to the mainframe;

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

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

a drive mechanism comprising a drive sprocket and tracks for propelling the compact tool carrier over a supporting surface, at least a portion of the tracks angling downward from the drive sprocket toward the front end of the mainframe, the linkage pivot point being disposed above the portion of the tracks that angles downward from the drive sprocket toward the front end of the mainframe; 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 of the compact tool carrier and adapted to allow for standing or walk-behind operation.

71. The compact tool carrier as set forth in claim 70 wherein the linkage is a first linkage and the linkage pivot point is a first linkage pivot point, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a second linkage pivot point and pivotally attached to the loader arm, the first linkage being forward of the second linkage.

72. The compact tool carrier as set forth in claim 70 further comprising an operator platform for standing operation of the operator controls of the control station, the operator platform extending from the mainframe, at least a portion of the operator platform being forward of the rear end of the mainframe.

73. The compact tool carrier as set forth in claim 70 wherein the mainframe incorporates a single weldment.

74. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an 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, 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

3

spaced from the rear end of the mainframe, the loader arm not being directly attached to the mainframe;  
 a first linkage pivotally attached to the first side of the mainframe at a first linkage pivot point and pivotally attached to the loader arm;  
 a second linkage pivotally attached to the first side of the mainframe at a second linkage pivot point and pivotally attached to the loader arm;  
 an actuator pivotally attached to the first side of the mainframe at an actuator pivot point and pivotally attached to the loader arm;  
 a drive mechanism comprising a drive sprocket and tracks for propelling the compact tool carrier over a supporting surface, the tracks being spaced from the rear end of the mainframe, at least a portion of the tracks angling downward from the drive sprocket toward the front end of the mainframe, each of the first linkage pivot point, second linkage pivot point, and actuator pivot point being (1) disposed above at least part of the portion of the tracks that angles downward from the drive sprocket toward the front end of the mainframe or (2) disposed between the tracks and the rear end of the mainframe; 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 of the compact tool carrier and adapted to allow for standing or walk-behind operation; and an operator platform for standing operation of the operator controls of the control station.

75. The compact tool carrier as set forth in claim 74 wherein the first linkage is forward of the second linkage, the first linkage being disposed above the portion of the tracks that angles downward from the drive sprocket toward the front end of the mainframe.

76. The compact tool carrier as set forth in claim 74 wherein the operator platform extends from the mainframe, at least a portion of the operator platform being forward of the rear end of the mainframe.

77. The compact tool carrier as set forth in claim 74 wherein the mainframe incorporates a single weldment.

78. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

- a loader having an 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, 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, the loader arm not being directly attached to the mainframe;
- a linkage pivotally attached to the first side of the mainframe at a linkage pivot point and pivotally attached to the loader arm;
- an actuator pivotally attached to the first side of the mainframe at an actuator pivot point and pivotally attached to the loader arm;
- a drive mechanism comprising a drive sprocket and tracks for propelling the compact tool carrier over a supporting surface, the tracks being spaced from the rear end of the mainframe; and
- a control station having operator controls for propelling the compact tool carrier forward and for raising and

4

lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation; and an operator platform for standing operation of the operator controls of the control station that extends from the mainframe, at least a portion of the operator platform being forward of the rear end of the mainframe.

79. The compact tool carrier as set forth in claim 78 wherein the mainframe incorporates a single weldment.

80. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

- a loader having an 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, 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, each side having a top and a bottom, the first side of the mainframe having at least two pivot points relative to the loader, the loader arm not being directly attached to the mainframe;
- a 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;
- a drive mechanism comprising tracks for propelling the compact tool carrier over a supporting surface, the drive mechanism having a rotational axis, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis and bottom of the compact tool carrier being separated by a vertical distance D1, the rotational axis and the bottom of the first side of the mainframe being separated by a vertical distance D5, the rotational axis and the pivot point at which the linkage is attached to the mainframe being separated by a vertical distance D2, the rotational axis and the pivot point at which the actuator is attached to the mainframe being separated by a vertical distance D4, both D2 and D4 being less than 2.0 D5, the pivot point at which the linkage is attached to the mainframe being disposed above the tracks; 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 of the compact tool carrier and adapted to allow for standing or walk-behind operation.

81. The compact tool carrier as set forth in claim 80 further comprising an operator platform for standing operation of the operator controls of the control station, the operator platform extending from the mainframe, at least a portion of the operator platform being forward of the rear end of the mainframe.

82. The compact tool carrier as set forth in claim 81 wherein the mainframe incorporates a single weldment.

83. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

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

5

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, each side having a top and a bottom, the first side of the mainframe having at least two pivot points relative to the loader, the loader arm not being directly attached to the mainframe;

a 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;

a drive mechanism comprising tracks for propelling the compact tool carrier over a supporting surface, the drive mechanism having a rotational axis, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis and bottom of the compact tool carrier being separated by a vertical distance D1, the rotational axis and the bottom of the first side of the mainframe being separated by a vertical distance D5, the rotational axis and the pivot point at which the linkage is attached to the mainframe being separated by a vertical distance D2, the rotational axis and the pivot point at which the actuator is attached to the mainframe being separated by a vertical distance D4, both D2 and D4 being less than 2.0 D5, the pivot point at which the actuator is attached to the mainframe being above the rotational axis; 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 of the compact tool carrier and adapted to allow for standing or walk-behind operation.

84. The compact tool carrier as set forth in claim 83 further comprising an operator platform for standing operation of the operator controls of the control station, the operator platform extending from the mainframe, at least a portion of the operator platform being forward of the rear end of the mainframe.

6

85. The compact tool carrier as set forth in claim 83 wherein the mainframe incorporates a single weldment.

86. A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an arm, the loader being 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, the loader arm not being directly attached to the mainframe;

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

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

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

a drive mechanism comprising tracks or wheels, the drive mechanism having a rotational axis, the pivot point at which the actuator is attached to the mainframe being above the rotational axis;

an attachment plate for removably attaching a tool to the compact tool carrier, at least a portion of the attachment plate being forward of the drive mechanism when the loader is in the vertically raised position;

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 of the compact tool carrier and adapted to allow for standing or walk-behind operation; and an operator platform for standing operation of the operator controls of the control station.

87. The compact tool carrier as set forth in claim 86 wherein the mainframe incorporates a single weldment.

\* \* \* \* \*