



US010202266B2

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

(10) **Patent No.:** **US 10,202,266 B2**
(45) **Date of Patent:** ***Feb. 12, 2019**

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

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

This patent is subject to a terminal dis-
claimer.

(21) Appl. No.: **15/704,685**

(22) Filed: **Sep. 14, 2017**

(65) **Prior Publication Data**
US 2018/0009642 A1 Jan. 11, 2018

Related U.S. Application Data
(63) Continuation of application No. 15/062,801, filed on
Mar. 7, 2016, now Pat. No. 9,975,750, which is a
(Continued)

(51) **Int. Cl.**
B60P 1/50 (2006.01)
B66F 9/075 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC **B66F 9/065** (2013.01); **B60P 1/483**
(2013.01); **B66F 9/06** (2013.01); **B66F 9/0759**
(2013.01);
(Continued)

(58) **Field of Classification Search**

CPC B60P 1/50; B60P 1/483; B66F 9/06; B66F
9/07572; B66F 9/22; B66F 9/065;
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,345,620 A 4/1944 Mork
2,455,474 A 12/1948 Drott et al.
(Continued)

FOREIGN PATENT DOCUMENTS

EP 2280122 A1 2/2011
FR 2209015 A1 6/1974
(Continued)

OTHER PUBLICATIONS

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

(Continued)

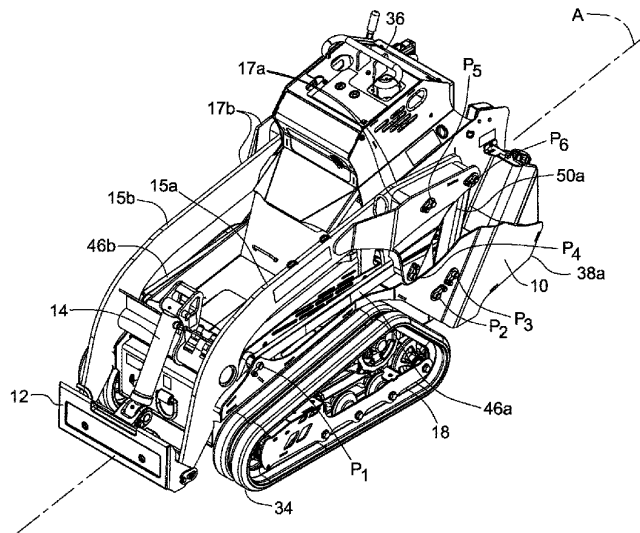
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(57) **ABSTRACT**

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.

27 Claims, 7 Drawing Sheets



Related U.S. Application Data

continuation of application No. 14/691,649, filed on Apr. 21, 2015, now Pat. No. 9,321,386.

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

(51) **Int. Cl.**

B66F 9/22 (2006.01)
B66F 9/06 (2006.01)
B66F 9/065 (2006.01)
E02F 3/34 (2006.01)
E02F 3/96 (2006.01)
E02F 9/08 (2006.01)
E02F 9/20 (2006.01)
B60P 1/48 (2006.01)

(52) **U.S. Cl.**

CPC **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)

(58) **Field of Classification Search**

CPC B66F 9/07577; B66F 9/0759; E02F 3/34; E02F 3/3405; E02F 3/3414; E02F 3/96; E02F 9/08; E02F 9/205
 USPC 414/685, 686, 722, 909; 180/89.1, 311
 See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,558,928 A 7/1951 Bryan
 2,774,496 A 12/1956 Dorkins
 2,849,132 A 8/1958 Clarke
 2,953,264 A 9/1960 Ulinski
 2,980,271 A 4/1961 Ulinski
 3,074,572 A 1/1963 Ulinski
 3,586,195 A 6/1971 Beltrami
 4,117,610 A 10/1978 Yates
 4,239,444 A 12/1980 Schmelzer
 5,169,278 A 12/1992 Hoechst et al.
 D359,497 S 6/1995 Rayner
 5,423,654 A 6/1995 Rohrbach
 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.
 D431,574 S 10/2000 Porter
 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.
 6,866,466 B2 3/2005 Roan 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
 7,805,864 B2 10/2010 Azure et al.
 D631,898 S 2/2011 Major et al.
 7,980,569 B2 7/2011 Azure et al.
 8,152,433 B2 4/2012 Yamada et al.
 8,821,104 B2 9/2014 Yasuda et al.
 9,045,882 B2 6/2015 Major et al.
 9,321,386 B1 4/2016 Thomas et al.
 2003/0095857 A1 5/2003 Degelman et al.
 2004/0026153 A1 2/2004 Dershem et al.
 2005/0036876 A1 2/2005 Walto et al.
 2007/0017713 A1 1/2007 Sewell et al.
 2007/0128012 A1 6/2007 Yamada et al.

2007/0132204 A1 6/2007 Sewell
 2008/0197588 A1 8/2008 Azure et al.
 2009/0116943 A1 5/2009 Valere
 2010/0106344 A1* 4/2010 Edwards E02F 9/205 701/2
 2010/0183412 A1 7/2010 Borntrager et al.
 2012/0291319 A1 11/2012 Jones
 2012/0305025 A1 12/2012 Helbig et al.
 2014/0271078 A1 9/2014 Koch

FOREIGN PATENT DOCUMENTS

GB 832800 A 2/1958
 GB 947803 A 3/1961
 GB 2368573 A 10/2000
 JP S63265022 A 11/1988
 JP 11140900 5/1999
 JP 2006307498 11/2006

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.
 Extended European Search Report issued in EP3061874, dated Aug. 1, 2016 (8 pages).
 5450TX, Vermeer Manufacturing Company, 2013, 2 pages.
 5450TX Parts Manual, Vermeer Manufacturing Company, 2012-2014, 180 pages.
 Mustang Skid Steer Loaders, Mustang Manufacturing Company Inc., 2014, 24 pages.
 SAE J2752, Surface Vehicle Recommended Practice, Personnel Protection—Compact Tool Carriers, Issued Jun. 2010, 11 pages.
 The Toro Company, “Dingo® 322 Operators Manual”, dated 2000.
 The Toro Company, “Dingo® 322 Parts Catalog”, dated 1999.
 For Construction Pros.com, Curt Bennink, “Size-Up Skid-Steer Loaders” article, dated Mar. 15, 2006.
 Plowsite.com, “Bobcat Weight Kit” chat forum dialogue, 2001.
 Construction Shows, “Case Upgrades its Skid Steer and Compact Tracked Loader Line Up” article, May 16, 2014.
 Dingo, “TX413 Operator’s Manual”, 2004, 40 pgs.
 Dingo, “TX413 Parts Catalog”, 2004, 40 pgs.
 JCB, “Skid Steer and Compact Track Loader Brochure”, 2009, 24 pgs.
 Litigation Documents filed in *Vermeer Corporation v. The Toro Company*, case No. 4:17-cv-00076-CRW-HCA (S.D. IA) (Submitted in Five Parts).
 Litigation Documents for *Vermeer Corporation v. The Toro Company*, case No. 4:17-cv-00076-CRW-HCA (S.D. IA) (Nov. 2, 2018 and Nov. 30, 2018).

* cited by examiner

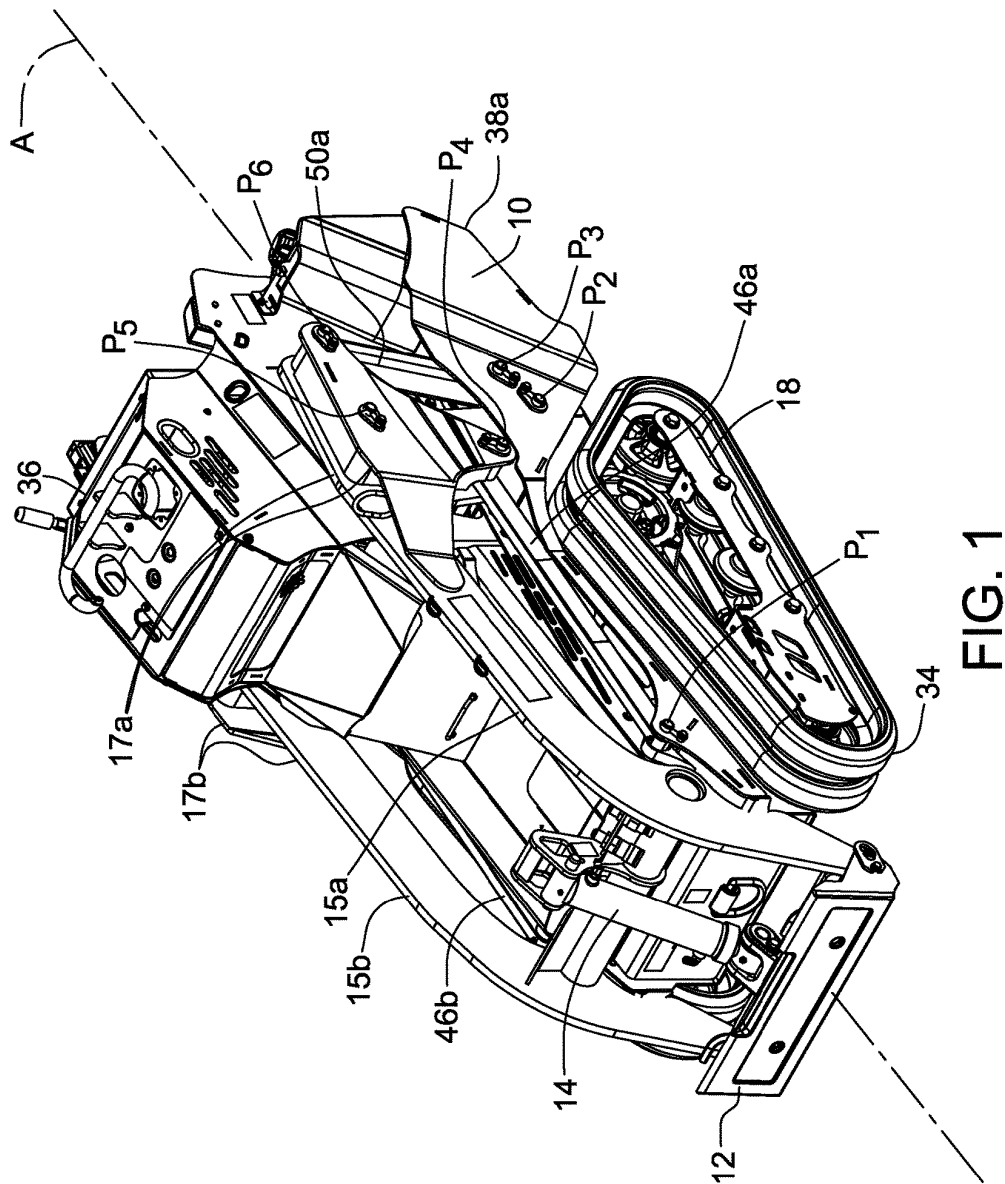


FIG. 1

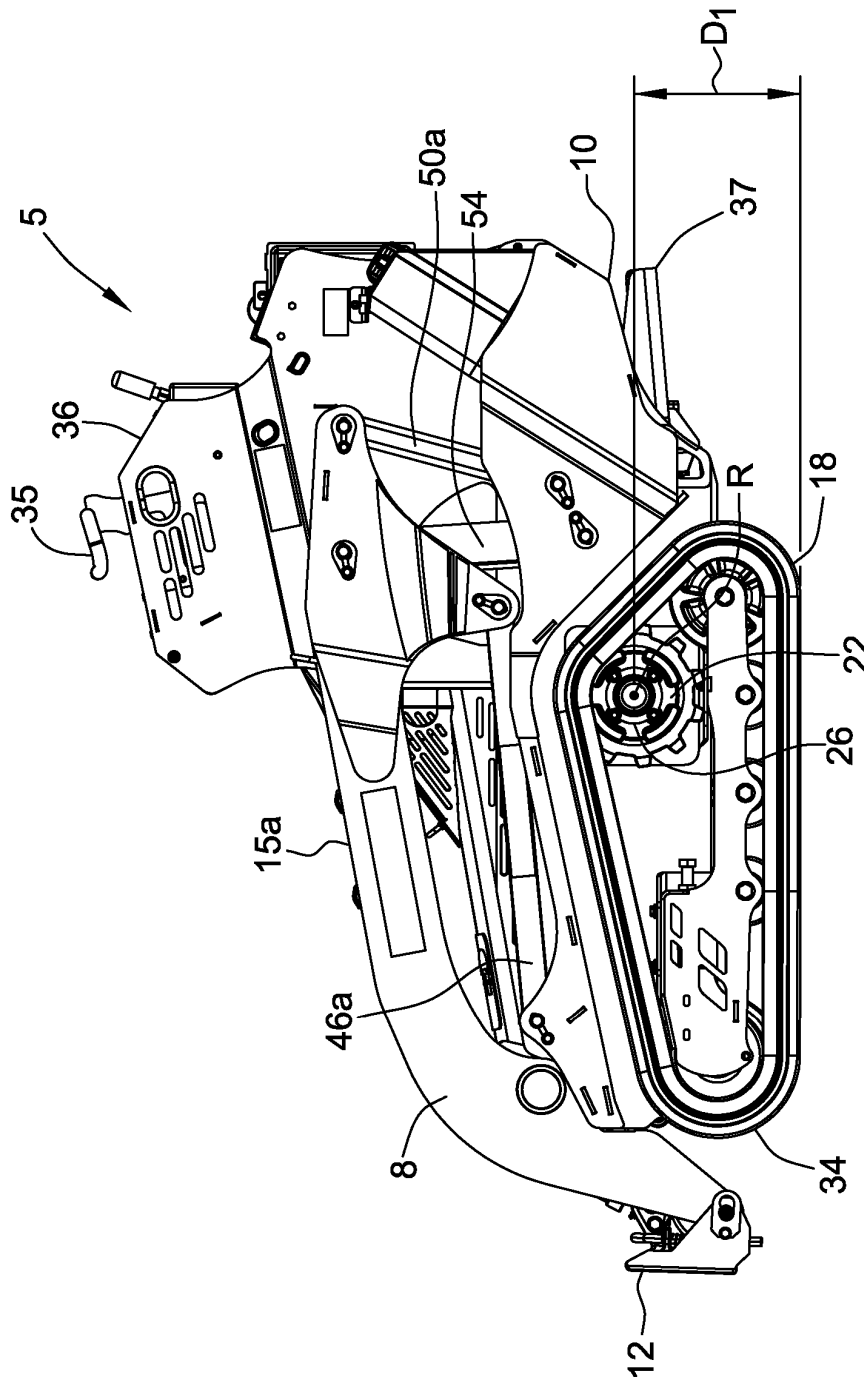


FIG. 2

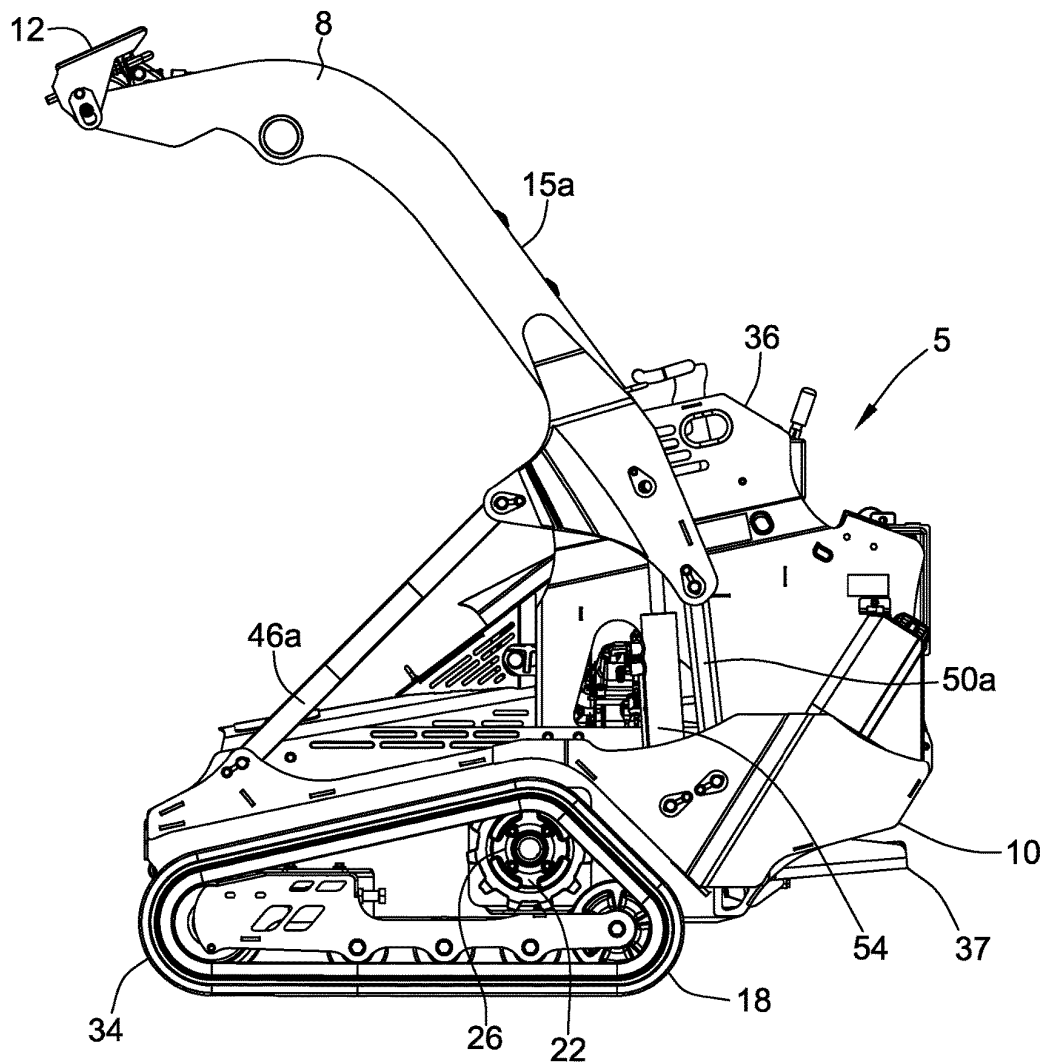


FIG. 3

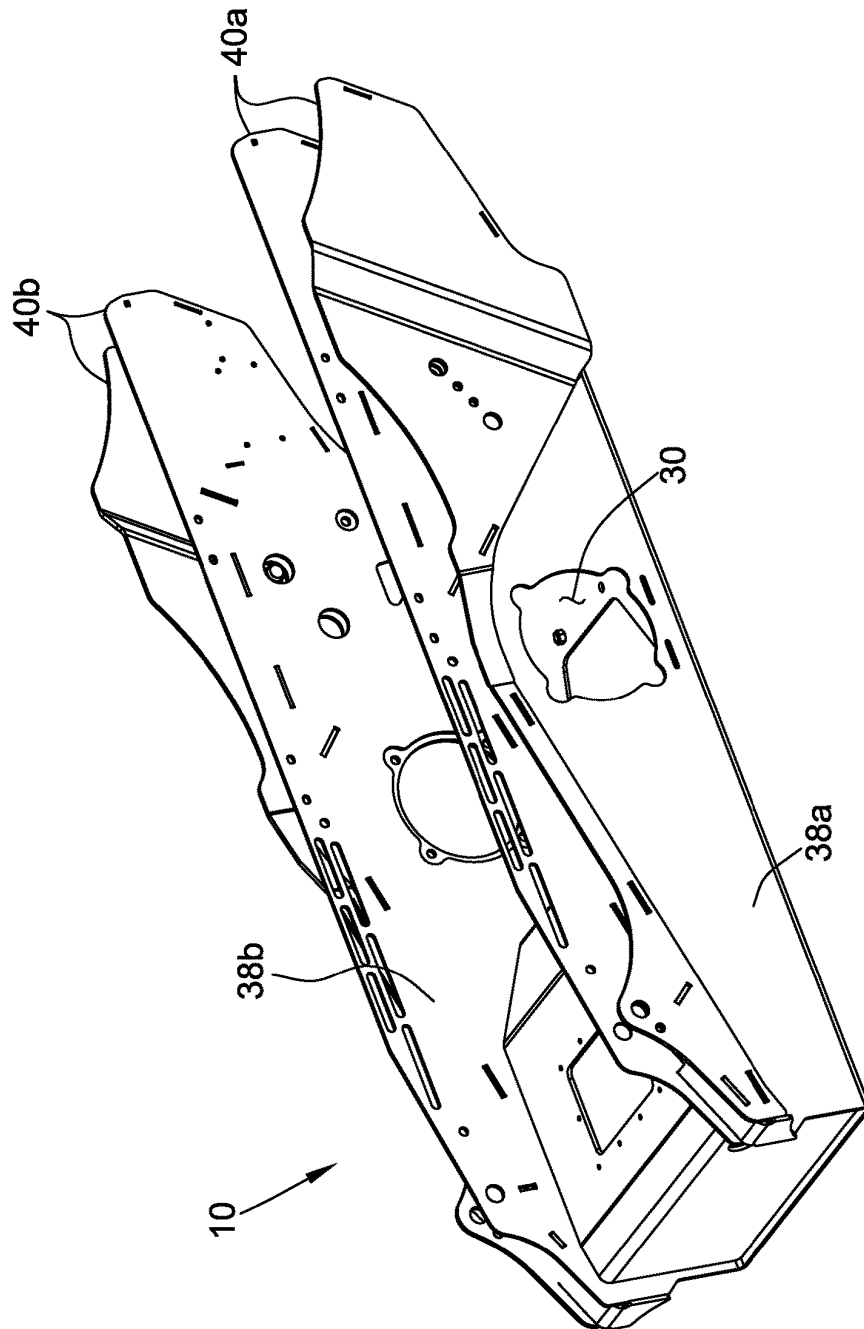


FIG. 4

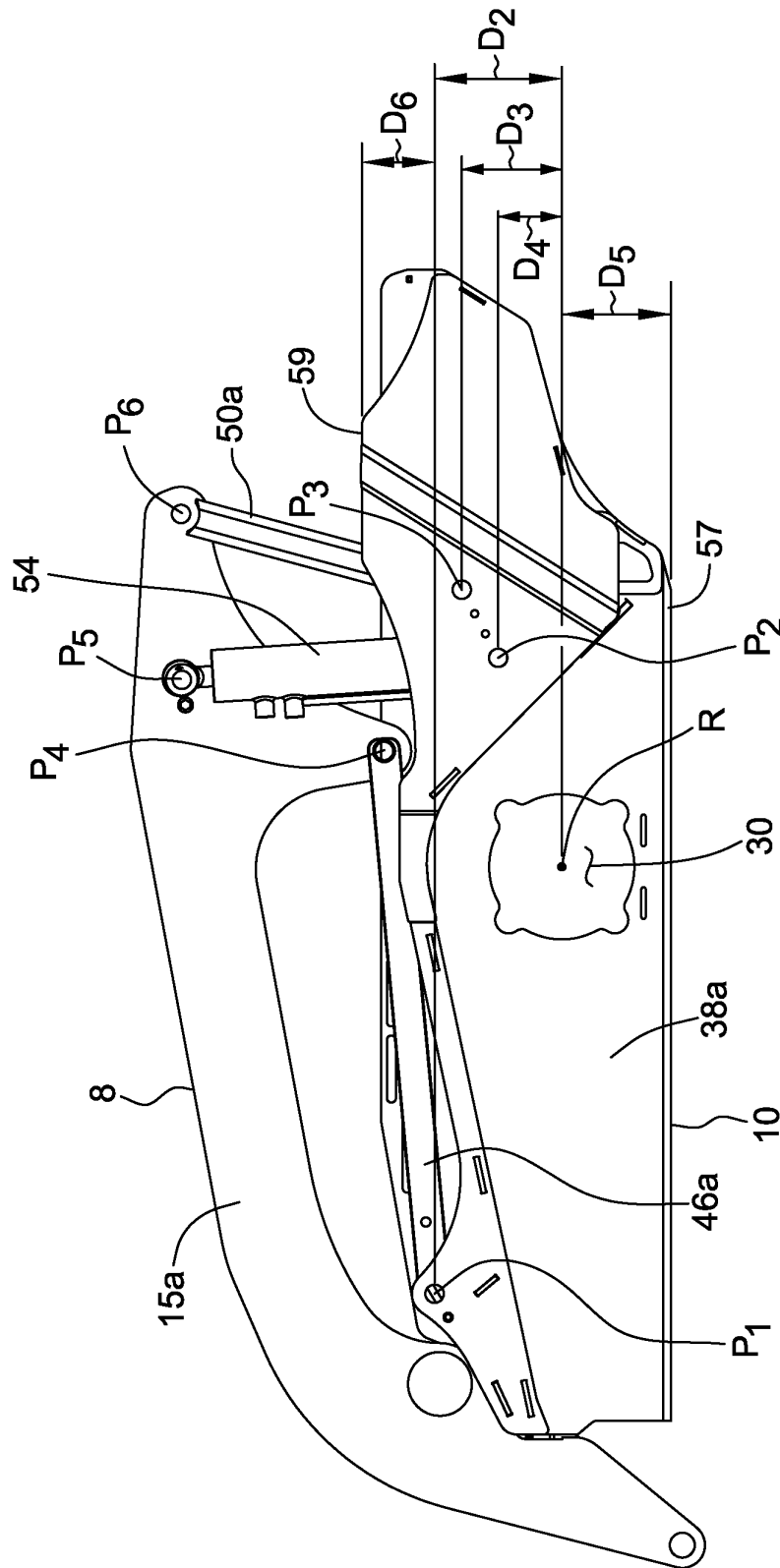


FIG. 5

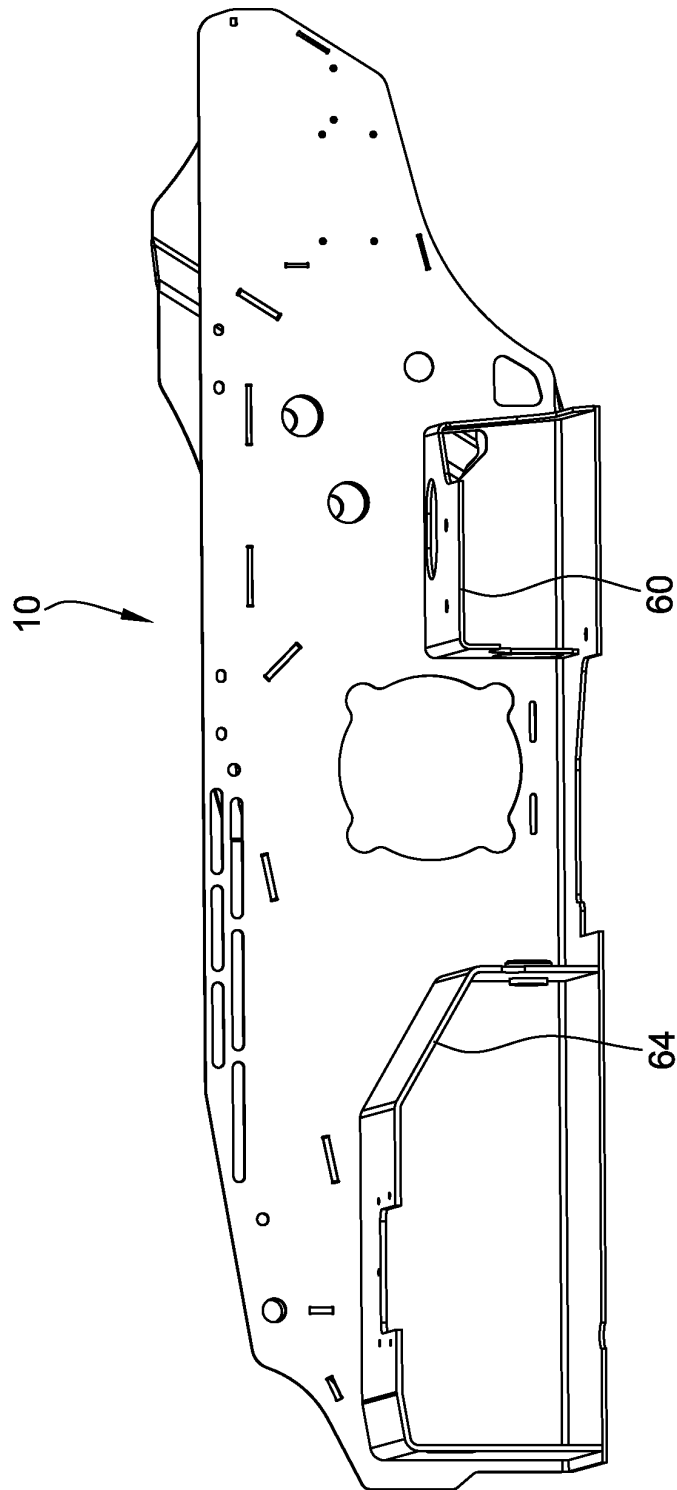


FIG. 6

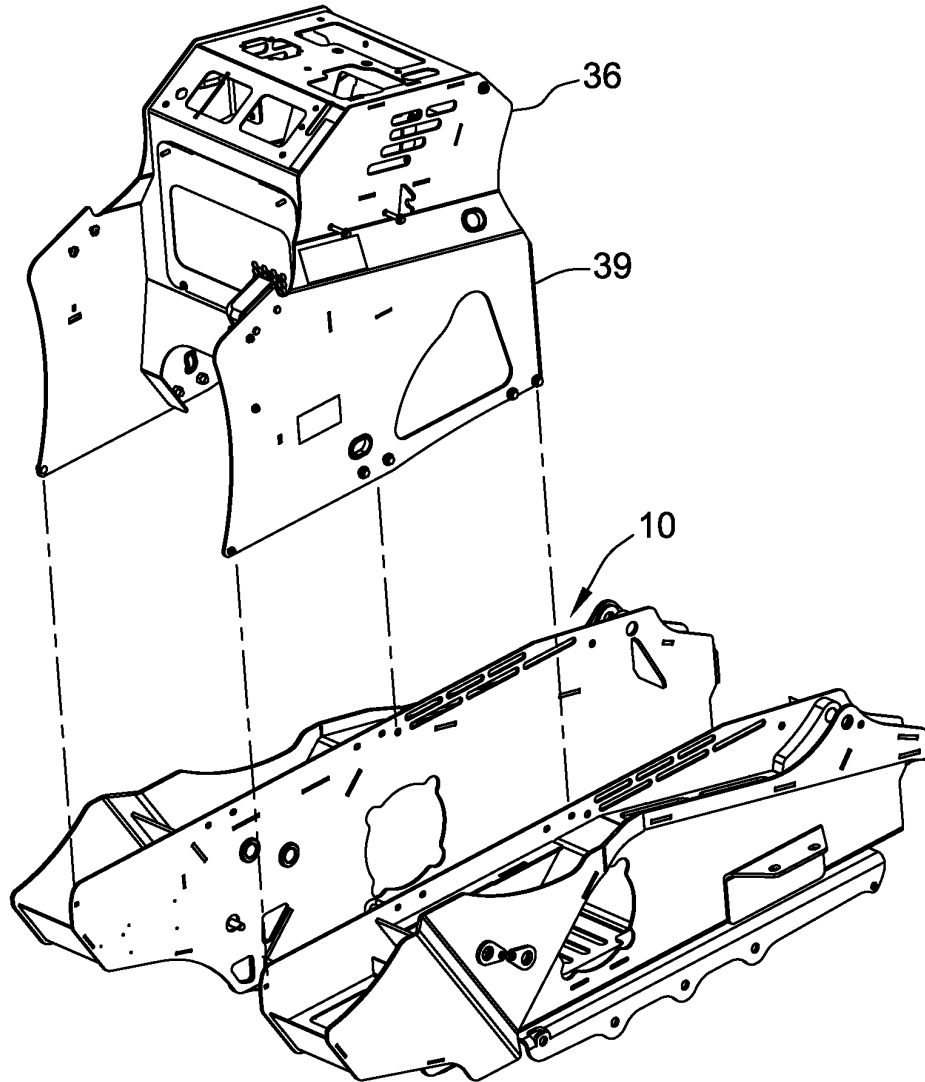


FIG. 7

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LOW PROFILE COMPACT TOOL CARRIERS**CROSS-REFERENCES TO RELATED APPLICATIONS**

This application is a continuation of U.S. patent application Ser. No. 15/062,801, filed Mar. 7, 2016, which is a continuation of Ser. No. 14/691,649, filed Apr. 21, 2015, which issued Apr. 26, 2016 as U.S. Pat. No. 9,321,386, which claims the benefit of U.S. Provisional Patent Application No. 62/118,860, filed Feb. 20, 2015, each of which being 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

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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 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,

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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 **18** 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.

As stated in SAE J2752, incorporated herein by reference, the machine structure around the operator's area may be part of a barrier guard. 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**. The upper frame **39** and mainframe **10** define the machine structure

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around the operator's area, wherein the perimeter of the machine structure, defined by the projection of the profile onto a vertical plane passing through the longitudinal axis, forms a barrier guard as shown in FIGS. 2 and 3. 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 **P₁** (FIG. 5) a rear pivot point **P₃** and a central pivot point **P₂** between the forward pivot point **P₁** and the rear pivot point **P₃**. Similarly, the first arm **15a** includes a forward pivot point **P₄**, a rear pivot point **P₆**, positioned within the barrier guard of the perimeter of the machine structure as shown in FIGS. 2 and 3, and a central pivot point **P₅** between the forward pivot point **P₄** and the rear pivot point **P₆**. 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 **P₁** and attached to the first arm **15a** at its forward pivot point **P₄**. A first rear linkage **50a** is attached to the first side **38a** of the mainframe **10** at its rear pivot point **P₃** and is attached to the first arm **15a** of the loader **8** at its rear pivot point **P₆**. 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 **P₂** 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).

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

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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 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 **P₁** 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 **P₃** are separated by a vertical distance **D3**. The rotational axis R and the central pivot point **P₂** are separated by a vertical distance **D4**. Each of **D2**, **D3** and **D4** is less than about 1.5 times **D1** ($1.5 \times D1$). In some embodiments, each of **D2**, **D3** and **D4** is less than **D1** or even less than about 0.75 times **D1** ($0.75 \times D1$).

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** ($2 \times D5$). In some embodiments, each of **D2**, **D3** and **D4** is less than about 1.75 times **D5** ($1.75 \times D5$) or less than about 1.5 times **D5** ($1.5 \times D5$). **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** ($1.25 \times D5$). The distance **D6** between the top **59** of the first side **38a** of the mainframe **10** and the highest pivot point (**P₁** 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** ($1.5 \times D1$) or less than **D1** or even less than about 0.75 times **D1** ($0.75 \times D1$). 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'** ($2 \times D5'$) or less than about 1.75 times **D5'** ($1.75 \times D5'$) or less than about 1.5 times **D5'** ($1.5 \times D5'$). **D3'** and **D4'** may be even less than about 1.25 times **D5'** ($1.25 \times D5'$). 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)

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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 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 loader apparatus configured for standing operator control and comprising:

- a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position;
- a loader support for supporting the loader, the loader support having a first side and a second side, the loader being free from direct attachment to the loader support;
- a first linkage pivotally attached to the first side of the loader support at a first linkage pivot point;
- a second linkage pivotally attached to the first side of the loader support at a second linkage pivot point;
- an actuator pivotally attached to the first side of the loader support at an actuator pivot point;
- a control station having operator controls for propelling the loader apparatus forward and for raising and lowering the loader; and
- an operator platform for standing operation of the operator controls of the control station, the operator platform being located toward a rear of the loader apparatus such that the first linkage pivot point, second linkage pivot

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point, and the actuator pivot point are disposed forward of the operator platform, the first linkage pivot point, second linkage pivot point, and the actuator pivot point being disposed below the operator controls of the control station.

2. The loader apparatus as set forth in claim 1 wherein the loader support comprises a lower frame and an upper frame, the control station being mounted to the upper frame.

3. The loader apparatus as set forth in claim 1 wherein the loader support incorporates a single weldment.

4. The loader apparatus as set forth in claim 1 wherein the loader comprises a loader arm, the loader arm being pivotally connected to the first side of the loader support.

5. The loader apparatus as set forth in claim 4 wherein the first and second linkages are pivotally attached to the loader arm.

6. The loader apparatus as set forth in claim 4 wherein the loader arm is a first loader arm, the loader comprising a second loader arm, the second loader arm being pivotally connected to the second side of the loader support.

7. A loader apparatus for standing or walk-behind operator control and comprising:

a control station having operator controls toward a rear of the loader apparatus;

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

a rigid frame for supporting the control station and the loader, the rigid frame having a first side, a second side, a top, and a bottom;

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

an actuator pivotally attached to the first side of the rigid frame at a third pivot point and pivotally attached to the loader at a fourth pivot point; and

a second linkage pivotally attached to the first side of the rigid frame at a fifth pivot point and pivotally attached to the loader at a sixth pivot point, wherein, as the loader travels from the down position to the vertically raised position, the first, second, third, fourth, fifth and sixth pivot points are (1) disposed between the operator controls and the bottom of the rigid frame and/or (2) disposed forward of the control station.

8. The loader apparatus as set forth in claim 7 wherein the rigid frame defines a pocket toward a rear of the rigid frame to partially surround an operator.

9. The loader apparatus as set forth in claim 8 further comprising an operator platform at least partially within the pocket.

10. The loader apparatus as set forth in claim 7 wherein, in the vertically raised position, the first and second pivot points are disposed forward of the control station and the third, fourth, fifth and sixth pivot points are disposed between the operator controls and the bottom of the rigid frame.

11. The loader apparatus as set forth in claim 7 wherein the rigid frame comprises a lower portion and an upper portion attached to the lower portion, the first linkage, the second linkage and the actuator each being pivotally attached to the lower portion, the upper portion supporting the control station.

12. The loader apparatus as set forth in claim 7 wherein the rigid frame comprises a lower frame and an upper frame, the control station being attached to the upper frame.

13. The loader apparatus as set forth in claim 7 wherein the rigid frame incorporates a single weldment.

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14. A loader apparatus for standing or walk-behind operator control and comprising:

a loader adapted to carry a tool;

a loader support for supporting the loader, the loader support having a first side and a second side, the loader being free from direct attachment to the loader support;

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

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

a drive mechanism for propelling the loader apparatus over a supporting surface, the drive mechanism having a drive sprocket defining a rotational axis R, the rotational axis R and a bottom of the first side of the loader support being separated by a vertical distance D5, the loader support comprising a forward-most pivot point with the first pivot point or the third pivot point being the forward-most pivot point, a vertical distance between the rotational axis R and the forward-most pivot point being less than 0.75 D5.

15. The loader apparatus as set forth in claim 14 wherein the loader support comprises a lower frame and an upper frame, the loader apparatus further comprising a control station having operator controls for propelling the loader apparatus forward and for raising and lowering the loader, the control station being attached to the upper frame.

16. The loader apparatus as set forth in claim 14 wherein the loader support incorporates a single weldment.

17. The loader apparatus as set forth in claim 14 wherein the linkage is a first linkage, the loader apparatus comprising a second linkage pivotally attached to the first side of the loader support at a fifth pivot point and pivotally attached to the loader at a sixth pivot point, the loader apparatus having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis R and the bottom of the loader apparatus being separated by a vertical distance D1, the rotational axis R and each of the first, third and fifth pivot points being separated by a vertical distance, the vertical distance between the rotational axis R and the first pivot point being less than 1.5 times D1, the vertical distance between the rotational axis R and the third pivot point being less than 1.5 times D1, and the vertical distance between the rotational axis R and the fifth pivot point being less than 1.5 times D1.

18. The loader apparatus as set forth in claim 14 wherein the loader apparatus has a bottom at which the drive mechanism contacts the supporting surface, the rotational axis R and the bottom of the loader apparatus being separated by a vertical distance D1, the rotational axis R and each of the first and third pivot points being separated by a vertical distance, the loader support comprising a forward-most pivot point with the first pivot point or the third pivot point being the forward-most pivot point, the vertical distance between the rotational axis R and the forward-most pivot point being less than 1.5 times D1.

19. A loader apparatus for standing or walk-behind operator control and comprising:

a machine structure comprising a mainframe and an upper frame, the machine structure defining a barrier guard;

a control station having operator controls toward a rear of the loader apparatus;

an actuator pivotally attached to the mainframe;

a front linkage pivotally attached to the mainframe;

a rear linkage pivotally attached to the mainframe; and

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a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position, the front linkage being pivotally attached to the loader at a front linkage pivot point, the rear linkage being pivotally attached to the loader at a rear linkage pivot point, wherein:

in the down position, the front linkage pivot point is (1) disposed within the barrier guard and/or (2) disposed forward of the barrier guard; and

as the loader travels from the down position to the vertically raised position, the rear linkage pivot point is (1) disposed within the barrier guard and/or (2) disposed forward of the barrier guard.

20. The loader apparatus as set forth in claim **19** wherein, in the down position, the rear linkage pivot point is disposed within the barrier guard.

21. The loader apparatus as set forth in claim **19** wherein the actuator is pivotally attached to the loader at an actuator pivot point, wherein, in the down position, the actuator pivot point is (1) disposed within the barrier guard and/or (2) disposed forward of the barrier guard.

22. The loader apparatus as set forth in claim **21** wherein the mainframe has a first side and a second side, the rear linkage, actuator and front linkage each being pivotally attached to the first side of the mainframe.

23. The loader apparatus as set forth in claim **19** wherein the loader is free from direct attachment to the mainframe.

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24. The loader apparatus as set forth in claim **19** wherein the mainframe incorporates a single weldment.

25. A loader apparatus for standing or walk-behind operator control and comprising:

a machine structure comprising a mainframe and an upper frame, the machine structure defining a barrier guard; a control station having operator controls toward a rear of the loader apparatus;

an actuator pivotally attached to the mainframe;

a linkage pivotally attached to the mainframe; and

a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position, the linkage being pivotally attached to the loader at a linkage pivot point, wherein:

in the down position, the linkage pivot point is disposed within the barrier guard; and

as the loader travels from the down position to the vertically raised position, the linkage pivot point is (1) disposed within the barrier guard and/or (2) disposed forward of the barrier guard.

26. The loader apparatus as set forth in claim **25** wherein the mainframe incorporates a single weldment.

27. The loader apparatus as set forth in claim **25** wherein the loader is free from direct attachment to the mainframe.

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US010202266C1

(12) **EX PARTE REEXAMINATION CERTIFICATE** (11730th)
United States Patent
Thomas et al.

(10) **Number:** **US 10,202,266 C1**(45) **Certificate Issued:** ***Sep. 18, 2020**(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)**Reexamination Request:**

No. 90/014,269, Feb. 26, 2019

Reexamination Certificate for:Patent No.: **10,202,266**
Issued: **Feb. 12, 2019**
Appl. No.: **15/704,685**
Filed: **Sep. 14, 2017**

(*) Notice: This patent is subject to a terminal disclaimer.

Related U.S. Application Data

(63) Continuation of application No. 15/062,801, filed on Mar. 7, 2016, now Pat. No. 9,975,750, which is a continuation of application No. 14/691,649, filed on Apr. 21, 2015, now Pat. No. 9,321,386.

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

(51) **Int. Cl.**
E02F 3/34 (2006.01)
B66F 9/075 (2006.01)**B66F 9/065** (2006.01)**E02F 9/20** (2006.01)**B66F 9/22** (2006.01)**B66F 9/06** (2006.01)**B60P 1/48** (2006.01)**E02F 3/96** (2006.01)**E02F 9/08** (2006.01)(52) **U.S. Cl.**CPC **B66F 9/065** (2013.01); **B60P 1/483**
(2013.01); **B66F 9/06** (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)(58) **Field of Classification Search**

None

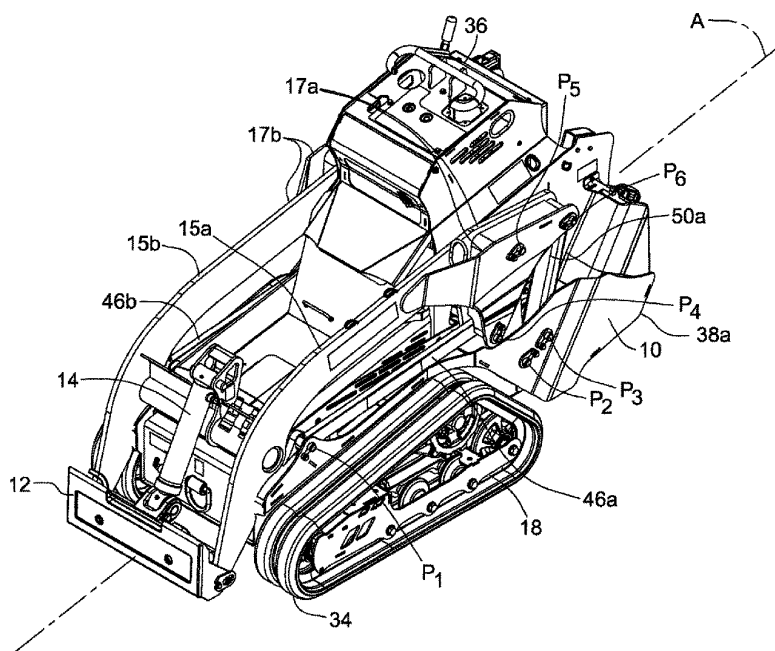
See application file for complete search history.

(56) **References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/014,269, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — Russell D Stormer(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.



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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, 4, 5 and 6 is confirmed.
Claims 17 and 18 are cancelled.

Claims 7, 14, 19 and 25 are determined to be patentable as amended.

Claims 8, 9, 20, 21, 22, 23 and 27, dependent on an amended claim, are determined to be patentable.

New claim 28 is added and determined to be patentable.

Claims 2, 3, 10, 11, 12, 13, 15, 16, 24 and 26 were not reexamined.

7. A loader apparatus for standing or walk-behind operator control and comprising:

a control station having operator controls toward a rear of the loader apparatus;

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

a rigid frame for supporting the control station and the loader, the rigid frame having a first side, a second side, a top, and a bottom;

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

an actuator pivotally attached to the first side of the rigid frame at a third pivot point and pivotally attached to the loader at a fourth pivot point; and

a second linkage pivotally attached to the first side of the rigid frame at a fifth pivot point and pivotally attached to the loader at a sixth pivot point, wherein, as the loader travels from the down position to the vertically raised position, the first, second, third, fourth, fifth and sixth pivot points are (1) disposed between the operator controls and the bottom of the rigid frame and/or (2) disposed forward of the control station; and

wherein the loader apparatus does not include an operator's seat.

14. A loader apparatus for standing or walk-behind operator control and comprising:

a loader adapted to carry a tool;

a loader support for supporting the loader, the loader support having a first side and a second side, the loader being free from direct attachment to the loader support;

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

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

a second linkage pivotally attached to the first side of the loader support at a fifth pivot point and pivotally attached to the loader at a sixth pivot point; and

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a drive mechanism for propelling the loader apparatus over a supporting surface, the drive mechanism having a drive sprocket defining a rotational axis R, the rotational axis R and a bottom of the first side of the loader support being separated by a vertical distance D5, the loader support comprising a forward-most pivot point with the first pivot point or the third pivot point being the forward-most pivot point, a vertical distance between the rotational axis R and the forward-most pivot point being less than 0.75 D5, *the loader apparatus having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis R and the bottom of the loader apparatus being separated by a vertical distance D1, the rotational axis R and each of the first, third and fifth pivot points being separated by a vertical distance, the vertical distance between the rotational axis R and the first pivot point being less than 1.5 times D1, the vertical distance between the rotational axis R and the third pivot point being less than 1.5 times D1, and the vertical distance between the rotational axis R and the fifth pivot point being less than 1.5 times D1.*

19. A loader apparatus for standing or walk-behind operator control and comprising:

a machine structure comprising a mainframe and an upper frame, the machine structure defining a barrier guard; a control station having operator controls toward a rear of the loader apparatus;

an actuator pivotally attached to the mainframe;

a front linkage pivotally attached to the mainframe;

a rear linkage pivotally attached to the mainframe; [and]

a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position, the front linkage *being pivotally attached to the mainframe at a first pivot point and being pivotally attached to the loader at a front linkage pivot point, the front linkage pivot point being a second pivot point, the rear linkage being pivotally attached to the mainframe at a third pivot point and being pivotally attached to the loader at a rear linkage pivot point, the rear linkage pivot point being a fourth pivot point, the actuator being pivotally attached to the mainframe at a fifth pivot point and being pivotally attached to the loader at a sixth pivot point, wherein:*

in the down position, the front linkage pivot point is (1) disposed within the barrier guard and/or (2) disposed forward of the barrier guard; and

as the loader travels from the down position to the vertically raised position, the rear linkage pivot point is (1) disposed within the barrier guard and/or (2) disposed forward of the barrier guard; and

a drive mechanism for propelling the loader apparatus over a supporting surface, the drive mechanism having a drive sprocket defining a rotational axis R, the loader apparatus having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis R and the bottom of the loader apparatus being separated by a vertical distance D1, the rotational axis R and each of the first, third and fifth pivot points being separated by a vertical distance, the vertical distance between the rotational axis R and the first pivot point being less than 1.5 times D1, the vertical distance between the rotational axis R and the third pivot point being less than 1.5 times D1, and the vertical distance between the rotational axis R and the fifth pivot point being less than 1.5 times D1.

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25. A loader apparatus for standing or walk-behind operator control and comprising:

a machine structure comprising a mainframe and an upper frame, the machine structure defining a barrier guard;

a control station having operator controls toward a rear of the loader apparatus;

an actuator pivotally attached to the mainframe;

a *first* linkage pivotally attached to the mainframe; [and]

a *second* linkage pivotally attached to the mainframe;

a loader adapted to carry a tool, the loader being moveable

between a down position and a vertically raised position,

the *first* linkage being pivotally attached to the mainframe at a *first* pivot point and being pivotally

attached to the loader at a *first* linkage pivot point, the

first linkage pivot point being a *second* pivot point, the

actuator being pivotally attached to the mainframe at a

third pivot point and being pivotally attached to the

loader at a *fourth* pivot point, the *second* linkage being

pivotally attached to the mainframe at a *fifth* pivot point

and being pivotally attached to the loader at a *sixth*

pivot point, wherein:

in the down position, the *first* linkage pivot point is disposed within the barrier guard; and

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as the loader travels from the down position to the vertically raised position, the *first* linkage pivot point is (1) disposed within the barrier guard and/or (2) disposed forward of the barrier guard; and

a drive mechanism for propelling the loader apparatus over a supporting surface, the drive mechanism having a drive sprocket defining a rotational axis R, the loader apparatus having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis R and the bottom of the loader apparatus being separated by a vertical distance D1, the rotational axis R and each of the *first*, *third* and *fifth* pivot points being separated by a vertical distance, the vertical distance between the rotational axis R and the *first* pivot point being less than 1.5 times D1, the vertical distance between the rotational axis R and the *third* pivot point being less than 1.5 times D1, and the vertical distance between the rotational axis R and the *fifth* pivot point being less than 1.5 times D1.

28. The loader apparatus as set forth in claim 1 wherein the loader apparatus does not include an operator's seat.

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