

(19)



(11)

EP 3 634 903 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
02.08.2023 Bulletin 2023/31

(21) Application number: **18732935.4**

(22) Date of filing: **06.06.2018**

(51) International Patent Classification (IPC):
B66F 9/075^(2006.01)

(52) Cooperative Patent Classification (CPC):
B66F 9/07568; B66F 9/07563

(86) International application number:
PCT/NL2018/050365

(87) International publication number:
WO 2018/226096 (13.12.2018 Gazette 2018/50)

(54) **TRUCK-MOUNTED FORKLIFT TRUCK FOR LOADING AND/OR UNLOADING A CARGO SPACE, AND METHOD THEREFOR**

AN EINEM LASTWAGEN MONTIERTER GABELSTAPLER ZUM BELADEN UND/ODER ENTLADEN EINES FRACHTRAUMS UND VERFAHREN DAFÜR

CHARIOT ÉLEVATEUR À FOURCHE MONTÉ SUR CAMION POUR CHARGER ET/OU DÉCHARGER UN ESPACE DE CHARGEMENT, ET PROCÉDÉ ASSOCIÉ

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **09.06.2017 NL 2019038**

(43) Date of publication of application:
15.04.2020 Bulletin 2020/16

(73) Proprietor: **Terberg Kinglifter B.V.**
3403 NL IJsselstein (NL)

(72) Inventors:
• **VERHOEF, Wouter**
3403 NL IJsselstein (NL)

• **DE RUITER, Martijn**
3403 NL IJsselstein (NL)
• **DE JONG, Marcel**
3403 NL IJsselstein (NL)

(74) Representative: **Verdijck, Gerardus**
Arnold & Siedsma
Bezuidenhoutseweg 57
2594 AC The Hague (NL)

(56) References cited:
EP-A2- 2 653 339 US-A- 4 520 903
US-A1- 2007 251 746

EP 3 634 903 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] The present invention relates to a truck-mounted forklift truck. Such a truck-mounted forklift is usually used in combination with a truck for thereby loading and/or unloading the cargo space of such a truck.

[0002] EP 2 653 339 A2 relates to a piggyback forklift truck and a method of operating same. EP 2 653 339 A2 discloses a truck-mounted forklift truck comprising a frame provided with mounting elements configured to mount the truck-mounted forklift truck on a truck; a set of forks; a number of wheels and a drive to drive at least some of the wheels for the purpose of displacing the truck-mounted forklift truck over a ground surface; a steering mechanism configured to drive at least some of the wheels of the truck-mounted forklift-truck; and a wheel suspension.

[0003] US 4 520 903 A relates to a forklift vehicle.

[0004] US 2007/251746 A1 relates to a truck with at least three steered wheels.

[0005] Truck-mounted forklifts are known in practice which are brought along by a truck in order to enable independent loading and/or unloading. Such a truck-mounted forklift is usually provided here with mounting elements whereby the truck-mounted forklift can be mounted on the cargo space, particularly on a truck, and can be brought along by such a truck. The forks of the truck-mounted forklift serve to pick up and/or set down the cargo.

[0006] In practice, such truck-mounted forklifts are used in different situations. In some of these situations there will be limited available space for manoeuvring with the truck-mounted forklift. This may result in damage to the truck-mounted forklift during use and/or to objects in the immediate vicinity of the loading and unloading, including for instance stored goods.

[0007] The present invention has for its object to provide a truck-mounted forklift truck whereby the above stated problems are obviated or at least reduced, such that the loading and/or unloading of a cargo space using a truck-mounted forklift can be performed more efficiently.

[0008] This object is achieved with a truck-mounted forklift truck for loading and/or unloading a cargo space according to claim 1.

[0009] The truck-mounted forklift can be connected with a truck with cargo space or loading space in simple manner by providing a frame with mounting elements. In this manner a truck-mounted forklift can be brought along during transport and is thereby immediately available for loading and/or unloading using the forks of the truck-mounted forklift. Use need therefore not be made of a forklift truck at the location in question. The truck-mounted forklift is preferably provided here with a mast and associated drive in order to thereby further increase the utility of the truck-mounted forklift. Using the wheels and associated drive the truck-mounted forklift can be displaced over a ground surface, particularly during loading

and/or unloading of a truck.

[0010] The truck-mounted forklift truck according to the invention is provided with a steering mechanism configured to steer at least one of the wheels of the truck-mounted forklift. Providing at least one steerable wheel makes it possible to manoeuvre the truck-mounted forklift and to set down and/or pick up cargo at the desired position. If desired, a plurality of wheels can also be steered with a steering mechanism. The steerable wheel, or the steerable wheels, is/are rotatable through a steering angle. In the context of the invention the steering angle is understood to mean the maximum angle of rotation of the wheel about a rotation axis extending substantially perpendicularly of the ground surface. This means that the steering angle can also be expressed as an angle in a plane equal or parallel to the ground surface over which the truck-mounted forklift is movable.

[0011] According to the invention, the steering mechanism is provided with a steering cylinder which is configured to turn the steered wheel in the desired direction, and thereby to steer the truck-mounted forklift truck in the desired direction.

[0012] According to the invention, the steering cylinder comprises a turning cylinder. Using a steering cylinder embodied as turning cylinder as alternative to a conventional steering mechanism, wherein use is made of arms and cylinders in such a conventional mechanism, provides an effective steering of the steerable wheel. In this way an action of the cylinder can be translated directly into a turn of the steerable wheel in the desired direction. In this way the conventional conversion of a translating movement of a cylinder to a rotation movement of the steerable wheel is avoided, and according to the invention the steerable wheel is controlled directly with a rotation of the turning cylinder.

[0013] Application of the turning cylinder reduces limitations of a conventional steering mechanism relative to the size of the steering angle.

[0014] In addition, the construction of the steering mechanism in the truck-mounted forklift truck according to the invention can be further simplified. From a viewpoint of cost, this has a favourable effect on the construction of the truck-mounted forklift and has the additional advantage that the steering mechanism takes up less space. The truck-mounted forklift can thereby take a more compact form, whereby manoeuvring with the truck-mounted forklift is for instance improved still further. The wheel suspension of the truck-mounted forklift truck according to the invention is here preferably adapted to the steering cylinder of the steering mechanism, such that the steered wheel is rotatable through the steering angle over said substantially vertical axis.

[0015] The steering mechanism of the truck-mounted forklift truck according to the invention preferably enables a rotation through the steering angle of at least 160°, preferably at least 170°. In a currently preferred embodiment of the truck-mounted forklift the steering angle is preferably about 180°. This means that the steerable

wheel can be turned through 180°. This provides a maximum flexibility for the manoeuvring of the truck-mounted forklift truck according to the invention.

[0016] The turning cylinder is preferably provided as a hydraulic turning cylinder. The turning cylinder can here preferably make use of the already present hydraulic system of the truck-mounted forklift. This enables a cost-effective embodiment of the steering mechanism according to the invention. Alternatively, use can for instance be made of an electric turning cylinder.

[0017] Providing the turning cylinder with a rotation axis and having this axis correspond, i.e. substantially coincide, with the substantially vertical axis over which the steered wheel is rotatable in use enables a direct steering of the wheel without transmission and/or arms being required. This enables a compact construction. Also provided hereby is a very small turning circle, which further improves the manoeuvring with the truck-mounted forklift truck in this embodiment according to the invention in a small space. This reduces the risk of damage to the truck-mounted forklift and/or goods or other objects or persons in the vicinity.

[0018] In a further advantageous embodiment according to the invention the wheel suspension is provided integrated with the turning cylinder.

[0019] Providing the wheel suspension integrated with the turning cylinder provides an even more compact construction for the steering mechanism. The number of components required is also further reduced.

[0020] A further advantage of integrating the wheel suspension with the turning cylinder is the relatively simple mounting and dismounting of the wheel suspension relative to the frame of the truck-mounted forklift truck which is made possible. This considerably simplifies maintenance and repairs. It is thus for instance possible to exchange the wheel suspension for a different wheel suspension. Repairs to the relevant component can then be made in a workshop, while the truck-mounted forklift remains operative. This increases the utility of the truck-mounted forklift truck according to the invention.

[0021] The wheel suspension is preferably releasably attached only to the turning cylinder in mechanical manner. Such a simplification enables an even more effective mounting and dismounting of the wheel suspension of the truck-mounted forklift truck.

[0022] In a further embodiment according to the invention at least three wheels of the truck-mounted forklift truck are provided with a steering mechanism for turning the steered wheel through a steering angle in a desired direction about a substantially vertical axis.

[0023] Providing a plurality of steerable wheels, preferably all wheels of the truck-mounted forklift truck, further increases the steerability of the truck-mounted forklift. Use can be made here of separate steering cylinders for the individual wheels, wherein at least some of the steering cylinders comprise a turning cylinder, or of partially different steering mechanisms. All wheels can preferably be steered through a steering angle of at least

160°, preferably at least 170° and more preferably about 180°. It is also possible to provide different steering angles for the different wheels, for instance a steering angle of about 180° for the rear wheel and a smaller steering angle for the front wheel/the front wheels.

[0024] The invention also relates to a truck comprising a cargo space and a truck-mounted forklift as described above, wherein the truck is provided with coupling elements configured to be able to couple the truck-mounted forklift to the truck in co-action with the mounting elements of the truck-mounted forklift.

[0025] Such a truck provides the same effects and advantages as stated for the truck-mounted forklift.

[0026] The invention further also relates to a method for loading and/or unloading a cargo space of a truck, comprising the steps of:

- providing a truck and truck-mounted forklift truck in an embodiment according to the invention;
- uncoupling the truck-mounted forklift truck from the truck;
- loading and/or unloading the truck with the truck-mounted forklift truck, wherein steering of the truck-mounted forklift truck comprises of rotating the steered wheel through a steering angle about a substantially vertical axis using the turning cylinder; and
- coupling the truck-mounted forklift truck to the truck.

[0027] Such a method provides the same effects and advantages as stated for the truck-mounted forklift and/or the truck.

[0028] The manoeuvrability of the forklift truck is in particular greatly improved. The steering thus preferably comprises of being able to rotate the steered wheel through a steering angle of up to at least 160°, preferably at least 170°, and the steering angle most preferably amounts to about 180°. This greatly increases the steerability and manoeuvrability of the truck-mounted forklift truck.

[0029] For maintenance of the truck-mounted forklift truck, comprising mounting and/or dismounting of the wheel suspension of the steered wheel, use is preferably made of a releasable attachment of the wheel suspension with the turning cylinder. This enables effective maintenance through rapid mounting and/or dismounting of the wheel suspension. This also makes it possible to (optionally temporary) exchange the wheel suspension. As stated above, a component can then be repaired in a workshop, while the truck-mounted forklift truck can remain operative. This increases the utility of the truck-mounted forklift.

[0030] Further features, advantages and details of the invention are described on the basis of preferred embodiments thereof, wherein reference is made to the accompanying drawings, in which:

- figure 1 shows a view of a truck-mounted forklift truck in an embodiment according to the invention;

- figures 2 and 3 show views of a position of a steered wheel of the truck-mounted forklift truck according to figure 1 in an extreme position with a steering angle of about 180°; and
- figures 4 and 5 show views of steerable front wheels in an embodiment of the truck-mounted forklift truck according to the invention.

[0031] Truck-mounted forklift truck 2 (figure 1) is provided with frame 4, wherein front wheel 6 and second front wheel 8 are arranged on the front side. Steered wheel 10 is provided on the rear side. In a first embodiment front wheels 6, 8 are provided fixedly and in a second embodiment also provided steerably.

[0032] In the shown embodiment truck-mounted forklift truck 2 is provided with mast construction 12 with forks for picking up and setting down cargo. In the shown embodiment truck-mounted forklift truck 2 is further provided with cab 14 with seat 16 and steering wheel 18. Using steering mechanism 20 a movement of steering wheel 18 is converted to a movement of steered wheel 10 using a hydraulic transmission.

[0033] Steered wheel 10 is connected to frame 4 using suspension 22. Wheel 10 is here rotatable around wheel axle 24 during manoeuvring with truck-mounted forklift truck 2 over a ground surface. In the shown embodiment steered wheel 10 is largely arranged in chamber 26 formed by wheel frame 28 as part of frame 4 of truck-mounted forklift truck 2.

[0034] In the shown embodiment of truck-mounted forklift truck 2 turning cylinder 30 with rotation axis 32 provides for the movement of steered wheel 10. In the shown embodiment turning cylinder 30 is arranged in housing 34 with integrated bearing 36. In the first embodiment turning cylinder 30 is only provided at rear wheel 10 and in the second embodiment a respective turning cylinder is likewise provided at front wheels 6, 8.

[0035] Suspension 22 is provided in or on wheel frame 28 (figures 2 and 3). In the shown embodiment wheel suspension 22 is provided with a substantially vertical carrier 38 and a substantially horizontal carrier 40, wherein carriers 38, 40 are mutually connected with corner profile 42. It will be apparent that other embodiments are also possible for suspension 22.

[0036] In the shown embodiment rotation axis 32 of turning cylinder 30 corresponds to the rotation axis of steered wheel 10 which enables turning of steered wheel 10 in direction A through the steering angle. In the shown embodiment wheel axle 24 is connected to wheel suspension 22. Vertical carrier 38 is provided for this purpose with recess 44 so as to enable a compact construction method. In the shown embodiment sensor or stop 46 is further provided for further controlling rotation of steered wheel 10. Physical stop member 46 is preferably provided in cylinder 30 itself.

[0037] Steered wheel 10 can rotate to the left or to the right around rotation axis 32. Rotating steered wheel 10 to the left or to the right in direction A enables manoeuvring of truck-mounted forklift truck 2.

In the shown embodiment of truck-mounted forklift truck 2 the steering angle in rotation direction A between a first extreme position (figure 2) and a second extreme position (figure 3) amounts to about 180°. It will be apparent that a different steering angle can also be realized with a truck-mounted forklift truck according to the invention.

[0038] During transport truck-mounted forklift 2 is usually connected to the rear side of a truck and/or mounted on or onto the loading floor thereof in a manner known in practice. This is usually possible without loss of cargo space or loading space of the relevant truck or trailer. The forks of mast construction 12 are herein for instance inserted into box beams of trucks. Optionally, support is found here on an additional frame and/or truck-mounted forklift 2 is fastened to the truck using chains.

[0039] When the desired location is reached, truck-mounted forklift 2 is uncoupled from the truck in known manner and then used to load and/or unload goods from the cargo space of the truck. During use a user steers truck-mounted forklift truck 2 using steering wheel 18, whereby turning cylinder 30 is rotated around rotation axis 32. Steerable wheel 10 moves in direction A (figure 1) as a result of the rotation movement of cylinder 30. In the shown embodiment steerable wheel 10 can here be moved between the two extreme positions (figures 2 and 3) through a steering angle of about 180°. An optimal manoeuvrability of truck-mounted forklift 2 is hereby provided. This manoeuvrability is further increased by having rotation axis 32 of turning cylinder 30 and the axis of rotation of steerable wheel 10, around which wheel 10 can turn in direction A, substantially coincide.

[0040] In the shown embodiment of truck-mounted forklift 2 mounting/dismounting of steered wheel 10 with suspension 22 requires only the dismounting of suspension 22 relative to turning cylinder 30. Wheel suspension 22 is here preferably fixed directly or indirectly to turning cylinder 30 with a number of bolts. This enables a relatively simple mounting and dismounting.

[0041] It will be apparent that different embodiments of truck-mounted forklift 2 are possible. As stated, it is for instance possible to provide a plurality of steerable wheels 10, for instance also on the front side, in combination with shown wheels 6, 8. All wheels are hereby preferably steerable. In such an embodiment front wheel 8 (figure 4) is for instance turned using cylinder 48 or, alternatively, with a separate turning cylinder 30. Wheel 6, 8 is here operatively connected to frame part 50, which is rotatable round a substantially vertical axis, or a rotation axis having at least a relatively large vertical component. This also applies to front wheel 6 (figure 5, shown at an angle of about 45°).

[0042] It is further possible to provide mast construction 12 in other embodiments, for instance with a so-called scissor mast.

[0043] The present invention is by no means limited to the above described preferred embodiments thereof. The rights sought are defined by the following claims,

within the scope of which many modifications can be envisaged. It is thus for instance possible to manufacture parts of truck-mounted forklift 2 from plastic and/or metal. It is also possible to give truck-mounted forklift 2 a different lifting capacity, depending on the intended application.

Claims

1. Truck-mounted forklift truck (2) for loading and/or unloading a cargo space, the truck-mounted forklift truck comprising:

- a frame (4) provided with mounting elements configured to mount the truck-mounted forklift on a truck provided with the cargo space;
- a set of forks for picking up and/or setting down a cargo during the loading and/or unloading;
- a number of wheels (6, 8, 10) and a drive configured to drive at least some of the wheels for the purpose of displacing the truck-mounted forklift truck (2) over a ground surface; and
- a steering mechanism (20) configured to steer at least one of the wheels of the truck-mounted forklift truck (2), wherein the steering mechanism (20) is provided with:

- a steering cylinder (30) configured to turn the steered wheel (10) in a desired direction for the purpose of steering the truck-mounted forklift truck (2) in the desired direction; and
- a wheel suspension (22) configured to rotate the steered wheel (10) through a steering angle about a substantially vertical axis in co-action with the steering cylinder (30),

wherein the steering cylinder (30) comprises a turning cylinder, and wherein the turning cylinder is provided with a rotation axis (32) that substantially coincides with the vertical axis about which the steered wheel (10) rotates.

2. Truck-mounted forklift truck (2) as claimed in claim 1, wherein the steering mechanism enables a rotation of the steered wheel (10) through the steering angle of at least 160°.
3. Truck-mounted forklift truck (2) as claimed in claim 2, wherein the steering angle amounts to at least 170° and is preferably about 180°.
4. Truck-mounted forklift truck (2) as claimed in claim 1, 2 or 3, wherein the turning cylinder comprises a hydraulic turning cylinder.
5. Truck-mounted forklift truck (2) as claimed in any

one of the foregoing claims, wherein the wheel suspension (22) is provided integrated with the turning cylinder (30).

6. Truck-mounted forklift truck (2) as claimed in claim 5, wherein the wheel suspension (22) is releasably attached only to the turning cylinder (30) in mechanical manner.
7. Truck-mounted forklift truck (2) as claimed in any one of the foregoing claims, wherein at least three wheels (6, 8, 10) are provided with a steering mechanism (20) for turning the steered wheel through a steering angle in a desired direction about a substantially vertical axis.
8. Truck comprising a cargo space and a truck-mounted forklift truck (2) as claimed in any one of the foregoing claims, and further provided with coupling elements configured to couple the truck-mounted forklift to the truck in co-action with the mounting elements of the truck-mounted forklift truck.
9. Method for loading and/or unloading a cargo space of a truck, comprising the steps of:
- providing a truck and truck-mounted forklift truck (2) as claimed in any one of the foregoing claims;
 - uncoupling the truck-mounted forklift truck (2) from the truck;
 - loading and/or unloading the truck with the truck-mounted forklift truck (2), wherein steering of the truck-mounted forklift truck (2) comprises of rotating the steered wheel (10) through a steering angle about a substantially vertical axis using the turning cylinder (30); and
 - coupling the truck-mounted forklift truck (2) to the truck.
10. Method as claimed in claim 9, wherein the steering comprises of rotating the steered wheel (10) through a steering angle of up to at least 160°, preferably at least 170°, the steering angle most preferably amounting to about 180°.
11. Method as claimed in claim 9 or 10, further comprising of performing maintenance on the truck-mounted forklift truck (2) by mounting and/or dismounting the wheel suspension (22) of the steered wheel using a releasable attachment of the wheel suspension (22) with the turning cylinder (30).

Patentansprüche

1. Mitnahme-Gabelstapler (2) zum Be- und/oder Entladen eines Laderaums, wobei der Mitnahme-Ga-

belstapler aufweist:

einen Rahmen (4), der mit Befestigungselementen versehen ist, die so ausgebildet sind, dass sie den Mitnahme-Gabelstapler auf einem mit dem Laderaum versehenen Lastwagen befestigen;

einen Satz von Gabeln zum Aufnehmen und/oder Absetzen einer Ladung während des Be- und/oder Entladens;

eine Anzahl von Rädern (6, 8, 10) sowie einen Antrieb, der so ausgebildet ist, dass er zumindest einige der Räder antreibt, um den Mitnahme-Gabelstapler (2) über eine Bodenfläche zu bewegen; und

einen Lenkmechanismus (20), der so ausgebildet ist, dass er mindestens eines der Räder des Mitnahme-Gabelstaplers (2) lenkt, wobei der Lenkmechanismus (20) aufweist:

einen Lenkzylinder (30), der so ausgebildet ist, dass er das lenkbare Rad (10) in eine gewünschte Richtung dreht, um den Mitnahme-Gabelstapler (2) in die gewünschte Richtung zu lenken; und

eine Radaufhängung (22), die so ausgebildet ist, dass sie durch Zusammenwirken mit dem Lenkzylinder (30) das lenkbare Rad (10) um einen Lenkwinkel um eine im Wesentlichen vertikale Achse dreht,

wobei der Lenkzylinder (30) einen Drehzylinder umfasst, und wobei der Drehzylinder eine Drehachse (32) definiert, die im Wesentlichen der vertikalen Achse, um die sich das lenkbare Rad (10) dreht, entspricht.

2. Mitnahme-Gabelstapler (2) nach Anspruch 1, wobei der Lenkmechanismus eine Drehung des lenkbaren Rades (10) um den Lenkwinkel von mindestens 160° ermöglicht.

3. Mitnahme-Gabelstapler (2) nach Anspruch 2, wobei der Lenkwinkel mindestens 170° und vorzugsweise etwa 180° beträgt.

4. Mitnahme-Gabelstapler (2) nach Anspruch 1, 2 oder 3, wobei der Drehzylinder einen hydraulischen Drehzylinder umfasst.

5. Mitnahme-Gabelstapler (2) nach einem der vorherigen Ansprüche, wobei die Radaufhängung (22) mit dem Drehzylinder (30) integriert vorgesehen ist.

6. Mitnahme-Gabelstapler (2) nach Anspruch 5, wobei die Radaufhängung (22) lediglich an dem Drehzylinder (30) mechanisch lösbar befestigt ist.

7. Mitnahme-Gabelstapler (2) nach einem der vorherigen Ansprüche, wobei zum Drehen des lenkbaren Rades um einen Lenkwinkel in eine gewünschte Richtung um eine im wesentlichen vertikale Achse zumindest drei Räder (6, 8, 10) mit einem Lenkmechanismus (20) versehen sind.

8. Lastkraftwagen mit einem Laderaum und einem Mitnahme-Gabelstapler (2) nach einem der vorherigen Ansprüche, der ferner Kupplungselemente aufweist, die so ausgebildet sind, dass sie zusammen mit den Befestigungselementen des Mitnahme-Gabelstaplers den Mitnahme-Gabelstapler mit dem Lastkraftwagen koppeln.

9. Verfahren zum Be- und/oder Entladen eines Laderaums eines Lastkraftwagens, aufweisend die folgenden Schritte:

Bereitstellen eines Lastkraftwagens und eines Mitnahme-Gabelstaplers (2) nach einem der vorherigen Ansprüche;

Abkoppeln des Mitnahme-Gabelstaplers (2) von dem Lastkraftwagen;

Beladen und/oder Entladen des Lastwagens mithilfe des Mitnahme-Gabelstaplers (2), wobei das Lenken des Mitnahme-Gabelstaplers (2) durch das Drehen des lenkbaren Rades (10) um einen Lenkwinkel um eine im Wesentlichen vertikale Achse unter Verwendung des Drehzylinders (30) bewirkt wird; und

Ankuppeln des Mitnahme-Gabelstaplers (2) an den Lastwagen.

10. Verfahren nach Anspruch 9, wobei das Lenken darin besteht, das lenkbare Rad (10) um einen Lenkwinkel von bis zu mindestens 160°, vorzugsweise mindestens 170°, zu drehen, wobei der am meisten bevorzugte Lenkwinkel etwa 180° beträgt.

11. Verfahren nach Anspruch 9 oder 10, ferner aufweisend das Durchführen von Wartungsarbeiten an dem Mitnahme-Gabelstapler (2) durch Montage und/oder Demontage der Radaufhängung (22) des lenkbaren Rades unter Verwendung einer lösbaren Befestigung der Radaufhängung (22) mit dem Drehzylinder (30).

Revendications

1. Chariot élévateur à fourche monté sur camion (2) destiné à assurer le chargement et/ou le déchargement d'un espace de cargaison, le chariot élévateur à fourche monté sur camion comprenant :

un châssis (4) comportant des éléments de montage configurés de manière à monter le cha-

- riot élévateur à fourche monté sur camion sur un camion comportant l'espace de cargaison ; un jeu de fourches destiné à reprendre et/ou à déposer une cargaison pendant le chargement et/ou le déchargement ;
un certain nombre de roues (6, 8, 10) et un dispositif d'entraînement configuré de manière à entraîner au moins certaines des roues dans le but de déplacer au sol le chariot élévateur à fourche monté sur camion (2) ; et
un mécanisme de direction (20) configuré de manière à orienter au moins l'une des roues du chariot élévateur à fourche monté sur camion (2), dans lequel le mécanisme de direction (20) comporte :
- un vérin de direction (30) configuré de manière à faire tourner la roue directrice (10) dans une direction désirée dans le but de diriger le chariot élévateur à fourche monté sur camion (2) dans la direction désirée ; et une suspension de roue (22) configurée de manière à faire tourner la roue directrice (10) suivant un angle de direction autour d'un axe sensiblement vertical coopérant avec le vérin de direction (30), dans lequel le vérin de direction (30) comprend un vérin rotatif, et dans lequel le vérin rotatif comporte un axe de rotation (32) qui coïncide sensiblement avec l'axe vertical autour duquel tourne la roue directrice (10).
2. Chariot élévateur à fourche monté sur camion (2) selon la revendication 1, dans lequel le mécanisme de direction permet une rotation de la roue directrice (10) suivant un angle de direction d'au moins 160°.
 3. Chariot élévateur à fourche monté sur camion (2) selon la revendication 2, dans lequel l'angle de direction est supérieur ou égal à 170° et est, de préférence, égal à 180° environ.
 4. Chariot élévateur à fourche monté sur camion (2) selon la revendication 1, 2 ou 3, dans lequel le vérin rotatif comprend un vérin rotatif hydraulique.
 5. Chariot élévateur à fourche monté sur camion (2) selon l'une quelconque des revendications précédentes, dans lequel la suspension de roue (22) est formée de manière intégré au vérin rotatif (30).
 6. Chariot élévateur à fourche monté sur camion (2) selon la revendication 5, dans lequel la suspension de roue (22) est fixée mécaniquement de manière amovible uniquement au vérin rotatif (30).
 7. Chariot élévateur à fourche monté sur camion (2) selon l'une quelconque des revendications précé-
- dentes, dans lequel au moins trois roues (6, 8, 10) comportent un mécanisme de direction (20) afin de faire tourner la roue directrice suivant un angle de direction dans une direction désirée autour d'un axe sensiblement vertical.
8. Camion comprenant un espace de cargaison et un chariot élévateur à fourche monté sur camion (2) selon l'une quelconque des revendications précédentes, et comportant, en outre, des éléments de couplage configurés de manière à coupler le chariot élévateur à fourche monté sur camion au camion en coopérant avec les éléments de montage du chariot élévateur à fourche monté sur camion.
 9. Procédé de chargement et/ou de déchargement d'un espace de cargaison d'un camion, comprenant les étapes de :

préparation d'un camion et d'un chariot élévateur à fourche monté sur camion (2) selon l'une quelconque des revendications précédentes ; découplage du chariot élévateur à fourche monté sur camion (2) par rapport au camion ; chargement et/ou déchargement du camion avec le chariot élévateur à fourche monté sur camion (2), dans lequel le guidage du chariot élévateur à fourche monté sur camion (2) comprend la rotation de la roue directrice (10) suivant un angle de direction autour d'un axe sensiblement vertical en utilisant le vérin rotatif (30) ; et le couplage du chariot élévateur à fourche monté sur camion (2) au camion.
 10. Procédé selon la revendication 9, dans lequel le guidage comprend la rotation de la roue directrice (10) suivant un angle de direction pouvant être supérieur ou égal à 160°, de préférence, supérieur ou égal à 170°, l'angle de direction étant plus préférentiellement égal à 180° environ.
 11. Procédé selon la revendication 9 ou 10, comprenant, en outre, l'exécution d'une maintenance sur le chariot élévateur à fourche monté sur camion (2) en montant et/ou en démontant la suspension de roue (22) de la roue directrice en utilisant une fixation amovible de la suspension de roue (22) avec le vérin rotatif (30).

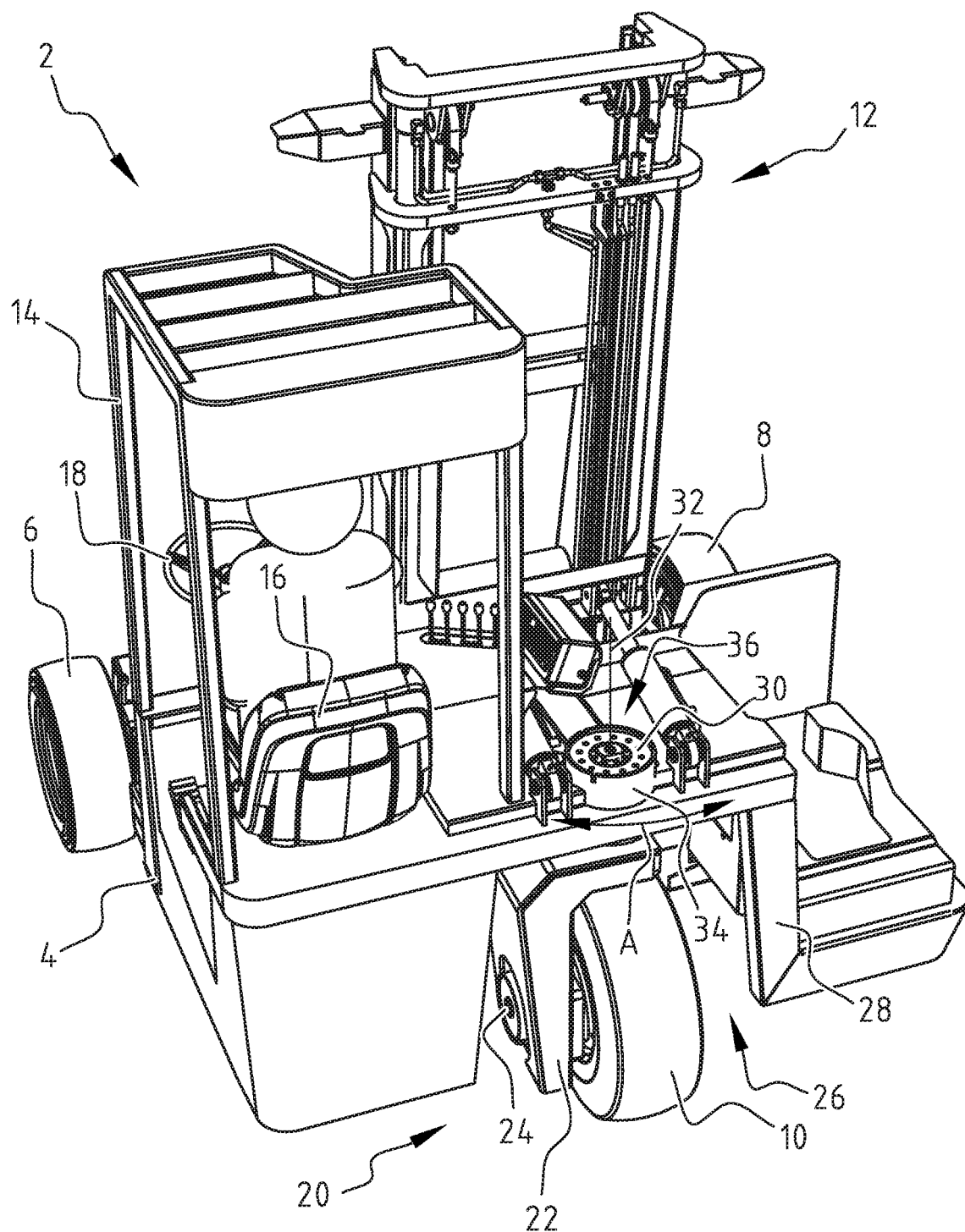
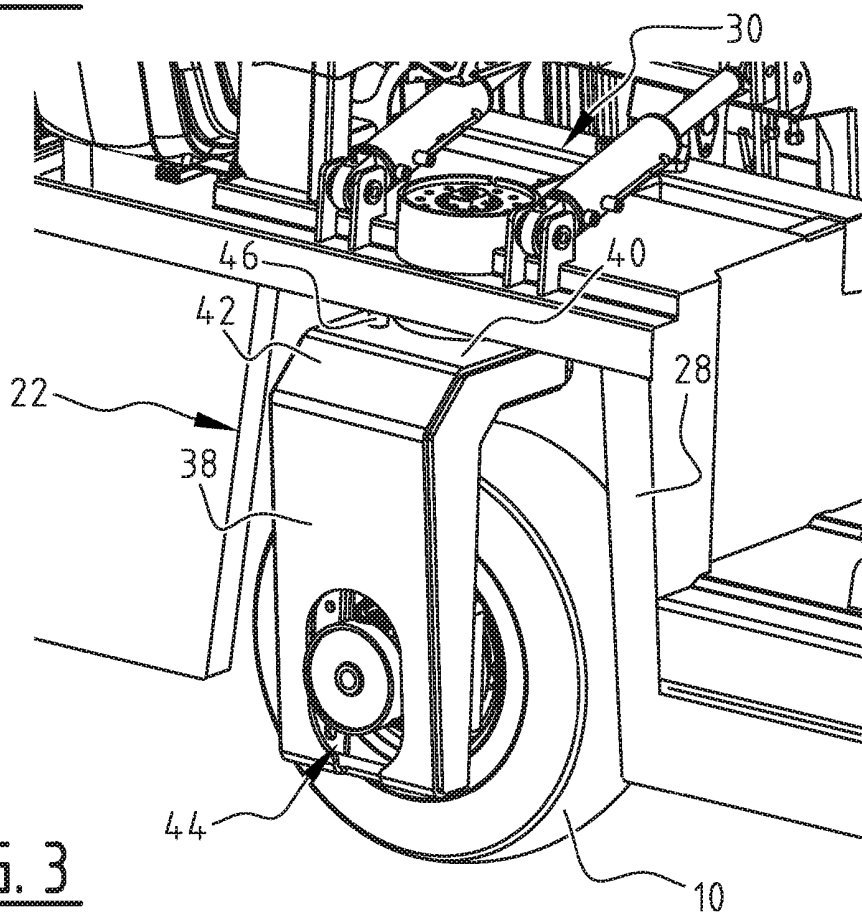
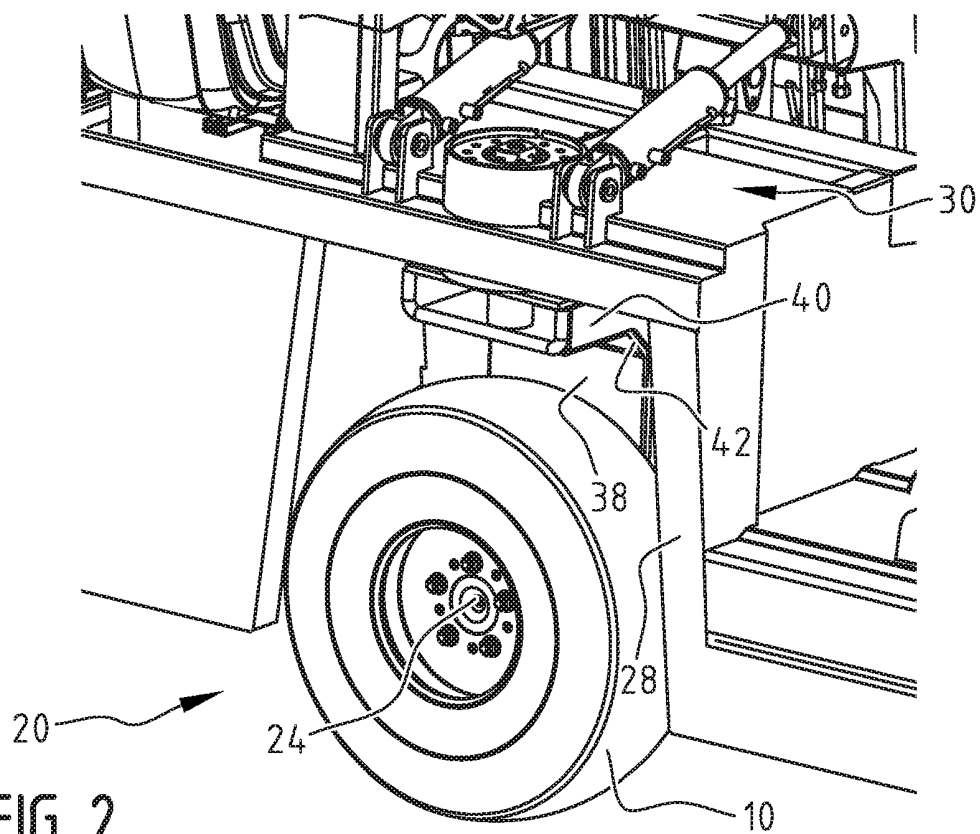


FIG. 1



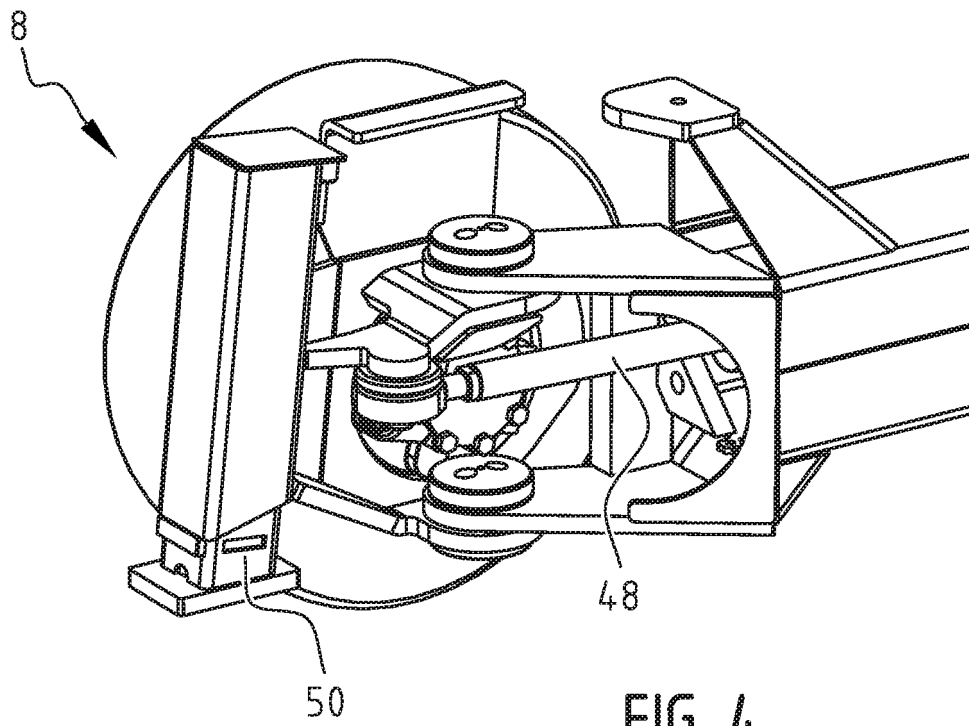


FIG. 4

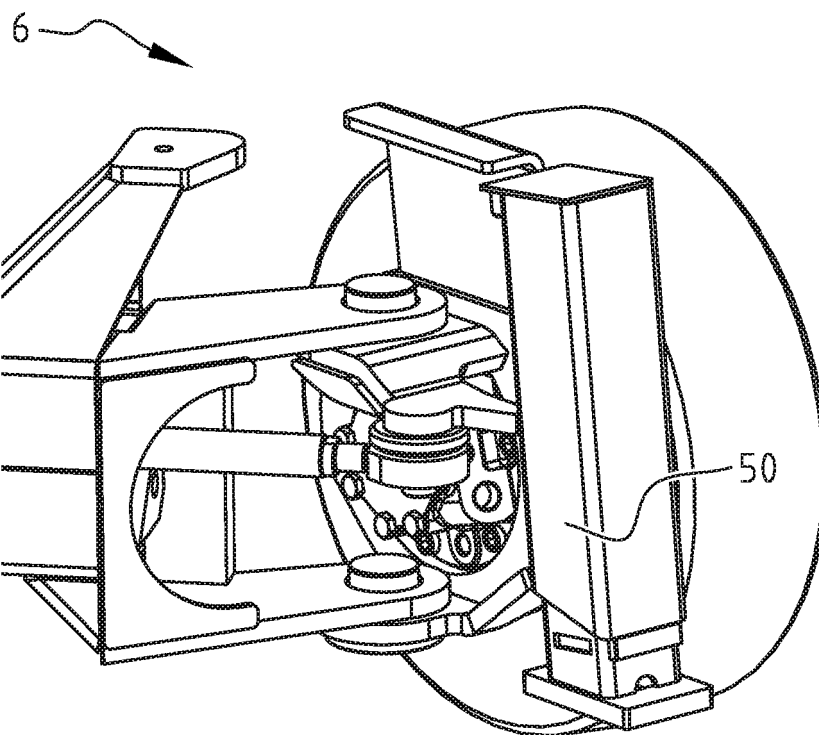


FIG. 5

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 2653339 A2 [0002]
- US 4520903 A [0003]
- US 2007251746 A1 [0004]