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(72) Inventor: **O’Keeffe, Eric**
Monaghan, County Monaghan (IE)

(74) Representative: **Schütte, Gearoid Cruickshank & Co.,**
1 Holles Street
Dublin 2 (IE)

(71) Applicant: **Moffett Research and Development Limited**
Dundalk, County Louth (IE)

(54) **Forklift truck**

(57) A forklift (1) of the type adapted to be transported on a carrying vehicle comprising a wheeled chassis (6) on which are mounted a pair of platform engaging load rest supports (15). The load rest supports (15) comprise a pair of spaced-apart upright bars (20) which have a contact surface for engagement at Y of a platform (2). The forklift truck (1) also has a mast (8) carrying extend-

able forks (9) to allow a load (3) to be placed on and removed from an extended position across the platform. The load rest support (15) allows the mast (8) to be tilted and if the mast (8) can also be side-shifted, then it can be side-shifted without interference with the platform (2). This further prevents tilting of the forklift (1) in the direction of the arrow A.

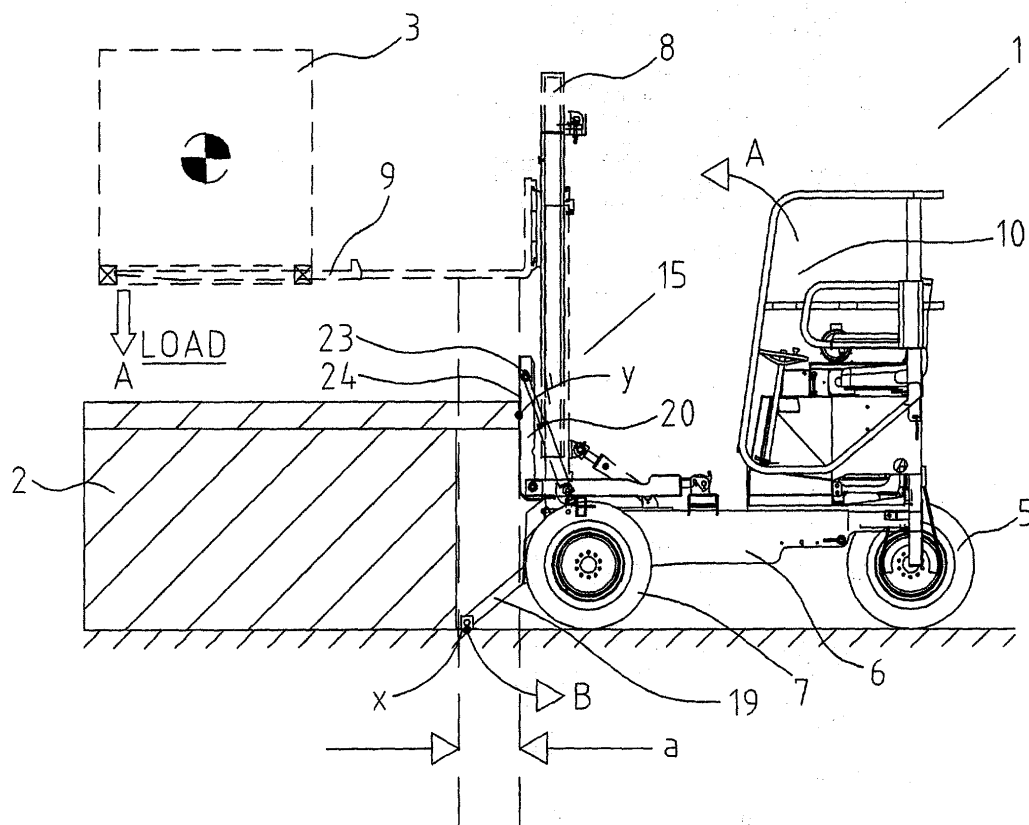


Fig. 9

Description

[0001] The present invention relates to a forklift truck of the type adapted to be transported on a carrying vehicle and comprising a wheeled chassis mounting an upright mast carrying forks and means for altering the reach of the forks relative to the mast to remove and place loads on a raised platform.

[0002] Typically, the chassis is of a U-shape and the upright mast is mounted on a carriage which can be reciprocated forwards and backwards within the chassis frame. The mast can also be shifted sideways relative to the chassis.

[0003] Such forklift trucks are called "piggy-back" forklifts or "truck mounted" forklifts. Because of the fact that they are transported on other vehicles and trailers, they are, of necessity, of lightweight construction. A problem arises when they have to load and unload onto platforms where added reach and capacity is required. It is well known to have forklift trucks with means for altering the reach of the forks relative to the mast, either by providing a pantograph linkage or other mechanism between a fork carriage supporting the forks and the mast. Another arrangement comprises using extendable or telescopic forks to provide the reach. Various other arrangements have been provided.

[0004] However, there are problems associated with this extended reach. Because of the relatively lightweight of the forklift, when the capacity is exceeded by trying to lift something at extended reach, the forklift will overbalance. When extra reach is required, extra forklift capacity is also required. Until now, the extra capacity could only be found by increasing the weight of the forklift. However, the weight of the forklift is critical and so until now, the extended reach across trailers or other platforms with these types of forklift has been limited. In this specification, the term "platform" is used to cover not just simply platforms per se, that is to say, rigid platforms, but indeed trailers, trucks and the like, onto and off which loading is required.

[0005] A further problem with the additional loading is that, when the forks are extended, this causes the mast to bear against the platform making it virtually impossible to tilt or side-shift the mast making it very difficult to remove loads from platforms. Further, any form of side shift of the mast becomes almost impossible because the load is such, very often, to bear the forks down against the platform and effectively jam the forks. Various arrangements have been provided to overcome these problems, including the provision of rollers beneath the forks, however, while these solutions have afforded some advantages, they have not allowed the forklift truck to operate in the correct manner. The problem is that the forklift tends to tip under the load. Anything which would prevent this is desirable.

[0006] The present invention is directed towards overcoming these problems.

Statements of Invention

[0007] According to the invention, there is provided a forklift truck of the type adapted to be transported on a carrying vehicle and comprising a wheeled chassis mounting an upright mast carrying forks and means for altering the reach of the forks relative to the mast to remove and place loads on a raised platform, characterised in that the chassis mounts a platform engaging load rest support having a contact surface for engagement against a facing surface of the platform. Since the mast is no longer in contact with the platform or trailer onto or off which it is moving loads, the mast can tilt and indeed, if it is, for example, a side-shifting mast, it can also shift sideways. This further increases the ease of operation of the forklift. Loads can be relatively easily placed in position and removed without difficulty and much more safely than heretofore.

[0008] In one embodiment of the invention, the contact surface of the rest support is substantially vertically in line with the foremost contact between the chassis and the ground. By having the jack legs that are usually provided with a forklift, effectively in line with the contact between the rest support and the platform, there will be relatively little turning movement to cause the forklift to unbalance.

[0009] In another embodiment of the invention, the contact surface of the rest support is rearward of the foremost contact between the chassis and the ground. When this happens, there is a positive moment preventing toppling of the forklift inwards towards the platform. This will further secure the load, making for much more stable load handling and this added safety.

[0010] The rest support may be tilted slightly forwards so that in the operative position and prior to full contact with the platform, the contact surface is inclined forwardly.

[0011] In one embodiment of the invention, there are a pair of spaced-apart rest supports mounted on the chassis either side of the mast. This leads to added stability.

[0012] In one embodiment of the invention, the rest support comprises an upright bar mounted on the chassis. The rest support may comprises a bar pivotally mounted with the respect to the chassis and a ram connected between the bar and the chassis for raising and lowering the bar.

[0013] In another embodiment of the invention, the rest support comprises:-

a base frame pivotally mounted adjacent one end thereof on the chassis and a bar pivotally mounted at the other end of the base frame; and

a ram connected at one end to the bar and releasably connected at its other end to the chassis for raising and lowering the bar.

[0014] This allows for the unobtrusive mounting of the rest support and ensures that it does not, in any way, interfere with the operation of the forklift and, in particular, the mounting of the forklift onto a carrying vehicle.

[0015] With this latter embodiment of the invention, connection means may be provided for releasably connecting the ram to the chassis, the connection means comprising a hook mounted on the end of the ram for engagement with a transversely arranged frame locking pin mounted above and spaced-apart from the chassis. In this embodiment also, locking means may be provided for retaining the base frame in an upright storage position on the chassis.

[0016] Ideally, the chassis is of a U-shape comprising a base frame mounting a rear steering wheel or wheels with a mast carriage containing the mast, and a pair of forwardly projecting side frames, each side frame mounting a front wheel and a rest support.

[0017] Preferably, there is at least one ground engaging stabilising jack leg configured to engage the ground in a position forward of the contact surface of the rest support.

[0018] It is envisaged that the means for altering the reach of the forks may comprise extendable forks, pantograph linkage or any other type of extended reach device which extends the forks away from the mast.

Detailed Description of the Invention

[0019] The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1(a) is a side view of a forklift according to the invention loading a trailer,

Fig. 1(b) is an enlarged view of the circled portion of Fig. 1(a),

Fig. 2 is a plan view of the forklift illustrated in Fig. 1,

Figs. 3(a) to (c) illustrate a platform engaging load rest support forming part of the forklift of Figs. 1 and 2, in three positions of use,

Fig. 4(a) shows portion of the forklift with the load rest raised,

Fig. 4(b) is an enlarged view of the circled portion illustrated in Fig. 4(a),

Fig. 5(a) is a side view of the forklift with the load rest lowered

Fig. 5(b) is an enlarged view of the portion circled in Fig. 5(a),

Fig. 6(a) is a side view of the forklift with the load rest unfolded

Fig. 6(b) is an enlarged view of the circled portion of the forklift illustrated in Fig. 6(a),

Figs. 7 and 8 show the operation of the forklift and the load rest,

Fig. 9 is a diagrammatic view of the forklift in operation,

Fig. 10 illustrates an alternative construction of platform engaging load rest support on portion of a chassis of a forklift in the folded position,

Fig. 11 shows the platform engaging load rest support of Fig. 10 in the operative position, and

Fig. 12 is a view similar to Fig. 1 but showing a pantograph reach device.

[0020] Referring to the drawings and initially to Figs. 1 to 3 thereof, there is provided a forklift truck adapted for carrying on a vehicle, indicated generally by the reference numeral 1, loading a platform, in this case, a trailer 2 with a load 3. The forklift 1 has a U-shaped chassis comprising a base frame 4 mounting a rear steering wheel 5 and a pair of forwardly projecting side frames 6 each mounting a front wheel 7. The forklift 1 mounts an upright mast 8 carrying forks, in this case, extendable forks 9, which allow for the extension of the forks 9 relative to the mast 8 to be altered. A drive station 10 and a motor 11 are also shown. The upright mast 8 is mounted on a mast carriage 12 which is movable forwards and backwards within the U-shaped chassis. A side-shift mechanism, namely a hydraulic ram 13, is provided to side-shift the mast 8 on the carriage 12. The mast 8 is shown in its extended position in all the Figs., except Figs. 7 and 8, where it is shown extended and retracted to lie rearwardly of the position, illustrated in Figs. 1 and 2, to rest between the side frames 6. Mounted on each side frame 6 is a platform engaging load rest support, indicated generally by the reference numeral 15. Ground engaging stabilising jack legs 19 are provided. Ideally, the jack legs 19 are configured to engage the ground in a position forward of the contact surface of the rest support with the platform.

[0021] Referring now specifically to Fig. 3, the rest support 15 comprises a base frame 16 mounted by a pivot mount 17 having a locking pin 18 (shown in more detail in Fig. 4(b)) for storing the rest support 15 in an upright position. A bar 20 is pivotally mounted at 21 on the base frame 16 and in turn mounts a ram 22 pivotally connected thereto at 23. The bar 20 of the rest support 15 provides a contact surface 24 for the rest support 15. The ram 22 mounts at its other end a hook 25, shown in more detail in Figs. 5 and 6, for engagement with a

frame locking pin 27 on the side frame 6. The hook 25 and pin 27 form a connection means, indicated generally by the reference numeral 26. The platform, namely, the trailer 2 also offers or provides a facing surface to engage against the contact surface 24. This facing surface is identified by the letter Y as it is not a fixed surface but depends on the position of the forklift 1 relative to the platform and can vary in use.

[0022] In operation, to erect the rest support 15, the locking pin 18 is released and the rest support 15, which is in the position illustrated in Fig. 3(a) and in Fig. 4, is pivoted downwards to lie in the position illustrated in Fig. 3(a) and in Fig. 5. Then, the ram 22 is operated to extend itself which causes the bar 20 to pivot upwards and for the hook 25 to engage the pin 27 and to lock firmly in the upright position.

[0023] Now referring to Figs. 7 and 8, there is illustrated the various steps of the operation of the forklift. Each of the positions is identified by a circled numeral in the drawing.

[0024] In step No. 1, the forklift 1 is driven in the direction of the platform, namely, the trailer 2. In step No. 2, the side rests 15 are shown being raised. In step No. 3, the side rests 15 are shown fully raised. In step No. 4, the mast carriage 12 is moved out, the forklift 1 is offered up against the platform 2 and the jack legs 19 are lowered. Then, in step No. 5, the forks 9 are extended under the load 3. The forks 9 are raised and in step No. 6, the load 3 is retracted by contracting the forks 9. In step No. 7, the mast 8 is retracted within the chassis. The rest supports 15 are lowered in step No. 8. The jack legs 19 are raised in step No. 9 and then, in step No. 10, the forklift 1 is driven away from the platform 2 for transport of the load 3.

[0025] Referring now to Fig. 9, in which parts similar to those described, with reference to the previous drawings, are identified by the same reference numerals, however, substantial portions of both the platform, namely the trailer 2 and the forklift 1, are not shown. It will be seen that the contact surface 24 makes contact with the platform 2 along a line or contact area, namely the facing surface Y. The jack leg 19 contacts the ground along another contact area, identified by the reference letter X. There is a spacing or offset a between the two contact surfaces X and Y.

[0026] It will be appreciated that the contact surface at X is forward of the contact surface at Y. Thus, if a load 3, which would tend to cause the forklift 1 to pivot in the direction of the arrow A, acts on the forklift 1, the resultant reaction, identified by the arrow B, which will be about the contact at Y, will be to lock the forklift 1 against the platform 2 and thus prevent the forklift 1 from tipping. Now, both the weight of the forklift 1 and the platform 2 counteract tipping of the forklift 1. Where the platform 2 is a trailer, then this is just simply the weight of the trailer about the wheels most remote from the forklift 1 or where it is a rigid platform, it is the whole platform itself. Thus, everything prevents the forklift from tipping which

will allow the mast of the forklift to be tilted and, if side shift is provided, to be easily shifted sideways because there will be no load on the mast or the forks other than that of the load.

[0027] Needless to say, it is not necessary that the jack legs 19 be always placed so that their contact surface engages a ground at a position forward of the contact surface of the rest support with the platform 2 as the force of the rest support 15 against the platform will lock them together which would be contrary to best practice. However, it is preferable that it should do so. In many instances, it will be more than likely almost coincident therewith which will, in practice, due to unevenness of grounds, etc., cause the forklift 1 to be rigidly held in position. When the jack leg 19 is somewhat behind the contact surface of the rest support with the platform, for example, where there were no jack legs 19 used and one is depending on the wheels of the forklift 1, the contact surface would provide additional support. It will be appreciated that in many instances, it will not be possible to achieve the ideal location of the jack legs because, very often, the platform being loaded will be a trailer or a truck, the tyres of which may prevent the jack legs being placed in the optimum position. Thus, very often, the jack legs will only be level with the tyres.

[0028] It will be appreciated that the construction of rest support can be of many forms. Referring to Figs. 10 and 11, there is illustrated an alternative construction of load rest support, again indicated generally by the reference numeral 15, in which parts similar to those described with reference to the previous drawings, are identified by the same reference numerals. In this embodiment, the bar 20 is pivotally mounted at 28 on the side frame 6 and the ram 22 is now pivotally mounted at 29, also on the side frame 6. In this way, the rest supports are permanently mounted in position. This construction can only be used when a particular form of mounting on the carrying truck allows this. It will be appreciated that it is a simpler construction than the embodiment previously described. It will be noted that in this embodiment, the bar 20 is inclined or tilted slightly forwards, in practice, of the order of 2° to the vertical. In use, the operation of the jack legs tilt the machine slightly and this inclination of the bar ensures better contact with the platform.

[0029] Referring to Fig. 12, there is illustrated an alternative construction of forklift, indicated generally by the reference numeral 30, in which parts similar to those described, with reference to the previous drawings, are identified by the same reference numerals. In this embodiment, the means for altering the reach of the forks 9 relative to the mast 8 are provided by a pantograph linkage, indicated generally by the reference numeral 31. The forks 9 are mounted on a carriage 32 which is supported by the pantograph linkage 31.

[0030] In the specification the terms "comprise, comprises, comprised and comprising" or any variation thereof and the terms "include, includes, included and

including" or any variation thereof are considered to be totally interchangeable and they should all be afforded the widest possible interpretation and vice versa.

[0031] The invention is not limited to the embodiment hereinbefore described, but may be varied in both construction and detail within the scope of the appended claims.

Claims

1. A forklift truck (1) of the type adapted to be transported on a carrying vehicle and comprising a wheeled chassis (4, 5) mounting an upright mast (8) carrying forks (9) and means for altering the reach of the forks relative to the mast (8) to remove and place loads (3) on a raised platform (2), **characterised in that** the chassis (4, 5) mounts a platform engaging load rest support (15) having a contact surface (24) for engagement against a facing surface of the platform.

2. A forklift (1) as claimed in claim 1, in which the contact surface (26) of the rest support (15) is substantially vertically in line with the foremost contact (X) between the chassis (4, 6) and the ground.

3. A forklift (1) as claimed in claim 1, in which the contact surface (24) of the rest support (15) is rearward of the foremost contact (X) between the chassis (4, 6) and the ground.

4. A forklift (1) as claimed in any preceding claim, in which the rest support (15) is tilted slightly forwards so that in the operative position and prior to full contact with the platform (2), the contact surface (24) is inclined forwardly.

5. A forklift (1) as claimed in any preceding claim, in which there are a pair of spaced-apart rest supports (15) on either side of the mast (8).

6. A forklift (1) as claimed in any preceding claim, in which the rest support (15) comprises an upright bar (20) mounted on the chassis (4, 6).

7. A forklift (1) as claimed in any preceding claim, in which the rest support (15) comprises a bar (20) pivotally mounted with the respect to the chassis (4, 6) and a ram (22) connected between the bar (20) and the chassis (4, 6) for raising and lowering the bar (20).

8. A forklift (1) as claimed in any of claims 1 to 6, in which the rest support (15) comprises:-

a base frame (16) pivotally mounted adjacent one end thereof on the chassis (4, 6) and a bar

(20) pivotally mounted at the other end of the base frame (16); and

a ram (22) connected at one end (23) to the bar (20) and releasably connected at its other end to the chassis (4, 6) for raising and lowering the bar (20).

9. A forklift (1) as claimed in claim 8, in which connection means (26) are provided for releasably connecting the ram (22) to the chassis (4, 6), the connection means (26) comprising a hook (25) mounted on the end of the ram (22) for engagement with a transversely arranged frame locking pin (27) mounted above and spaced-apart from the chassis (4, 6).

10. A forklift (1) as claimed in claim 8 or 9, in which locking means are provided for retaining the base frame (16) in an upright storage position on the chassis - (4, 6).

11. A forklift (1) as claimed in any preceding claim, in which the chassis is of a U-shape comprising a base frame (4) mounting a rear steering wheel (5) and the mast (8), and a pair of forwardly projecting side frames (6), each side frame (6) mounting a front wheel (7) and a rest support (15).

12. A forklift (1) as claimed in any preceding claim, in which at least one ground engaging stabilising jack leg (19) is configured to engage the ground in a position (Y) forward of the contact surface (26) of the rest support (15).

13. A forklift (1) as claimed in any preceding claim, in which the means for altering the reach of the forks (9) comprises extendable forks.

14. A forklift (30) as claimed in any of claims 1 to 12, in which the means for altering the reach of the forks (9) comprises a pantograph linkage (31) between a fork carriage supporting the forks (9) and the mast (8).

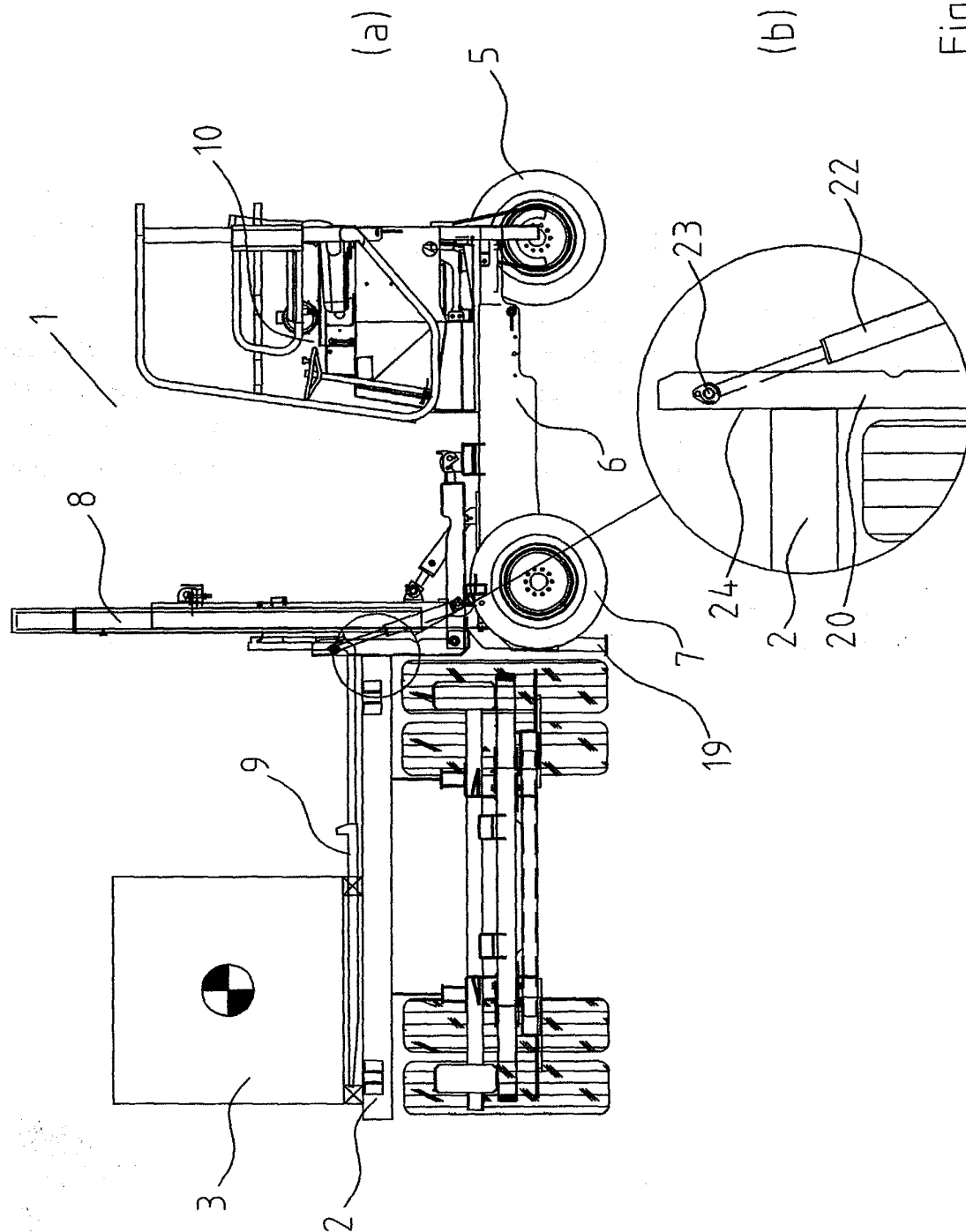
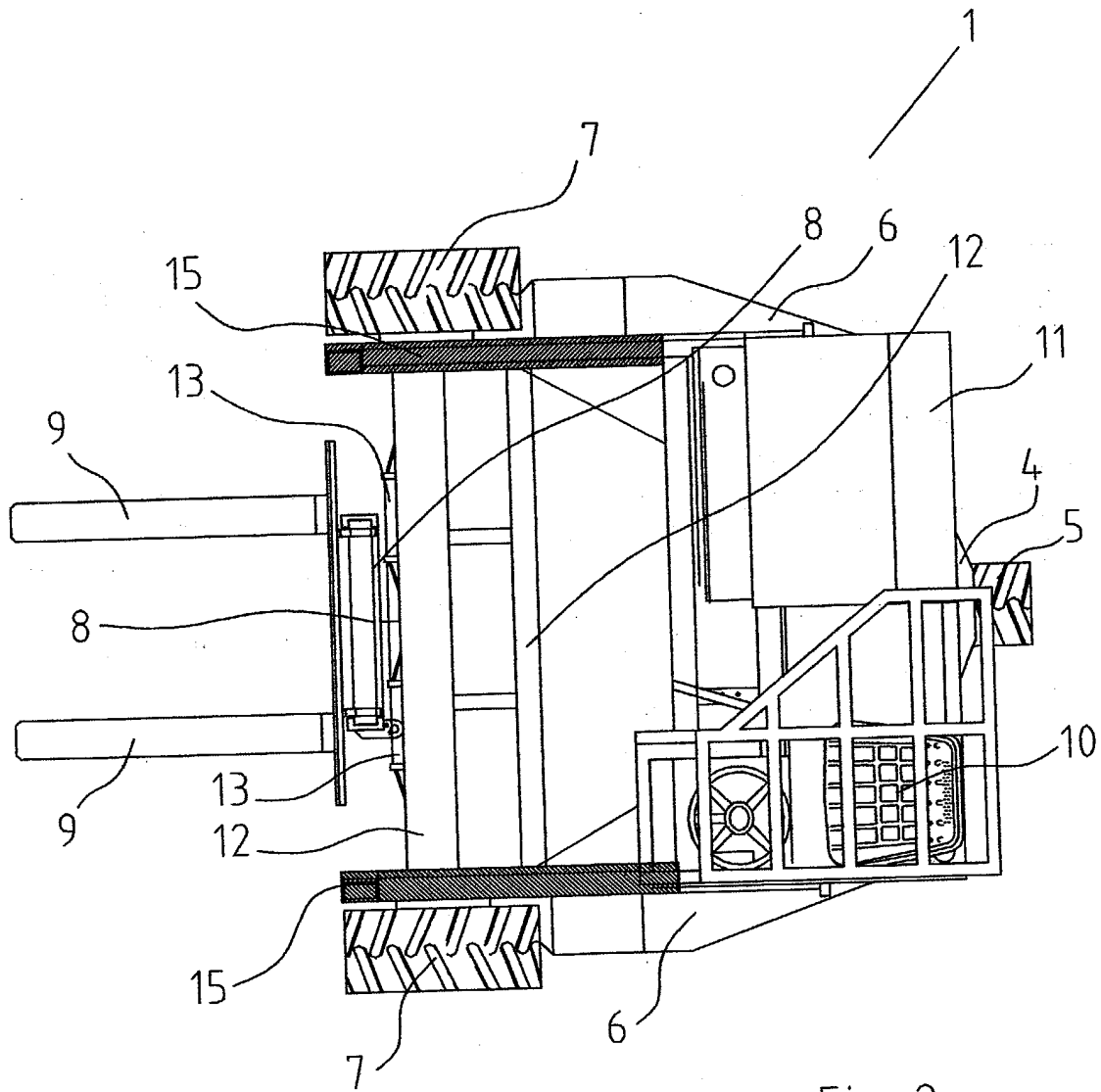


Fig. 1



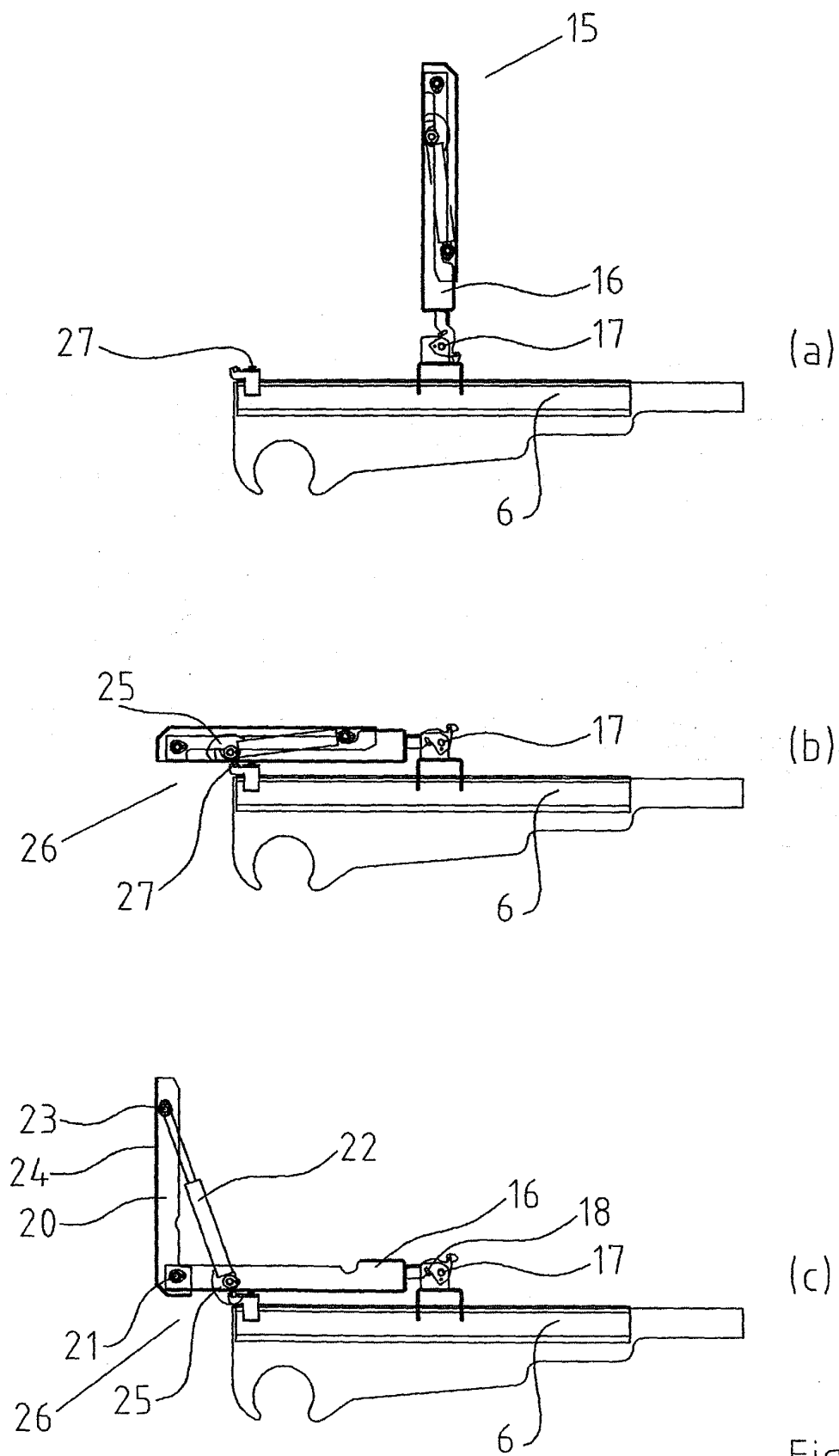


Fig. 3

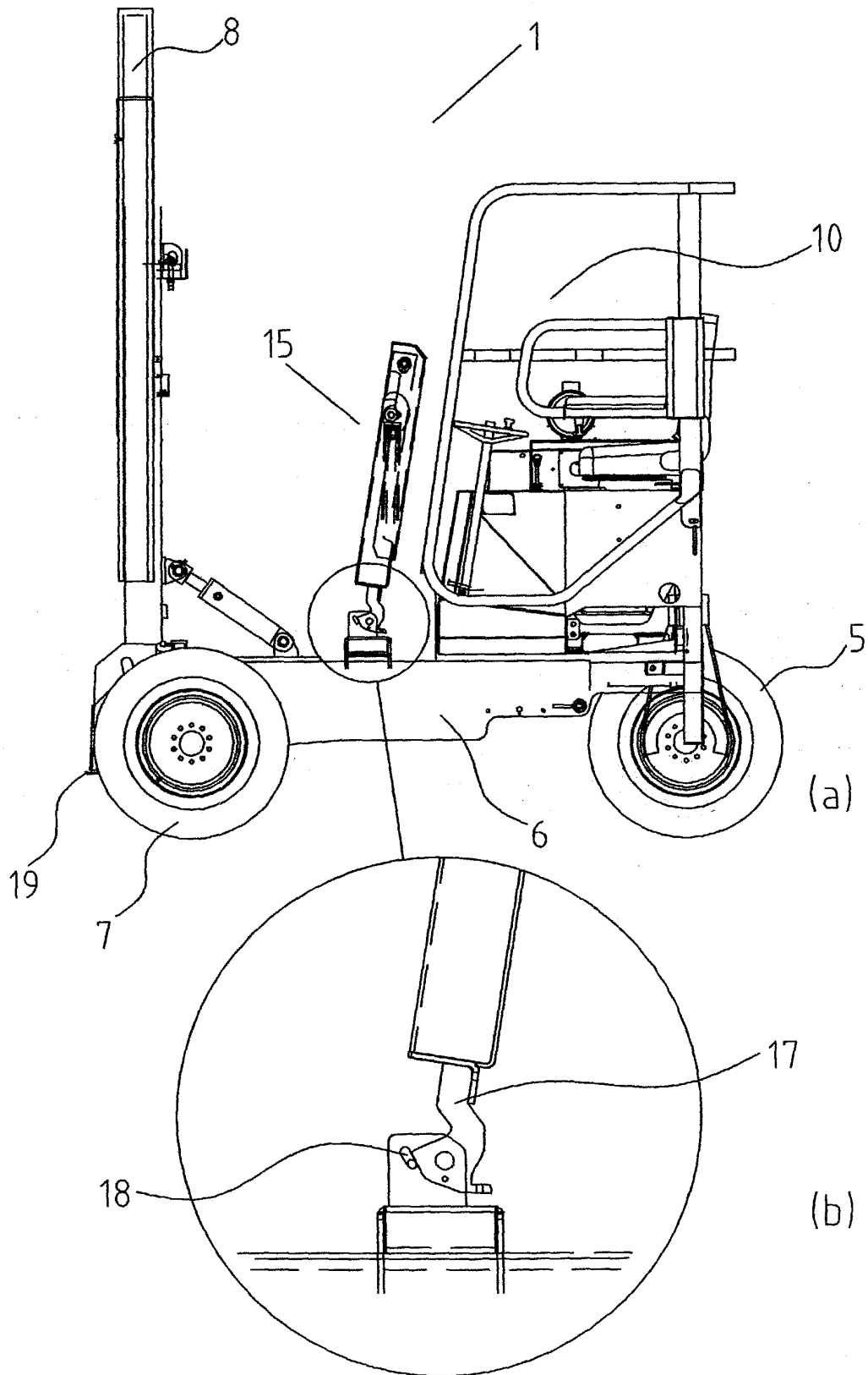


Fig. 4

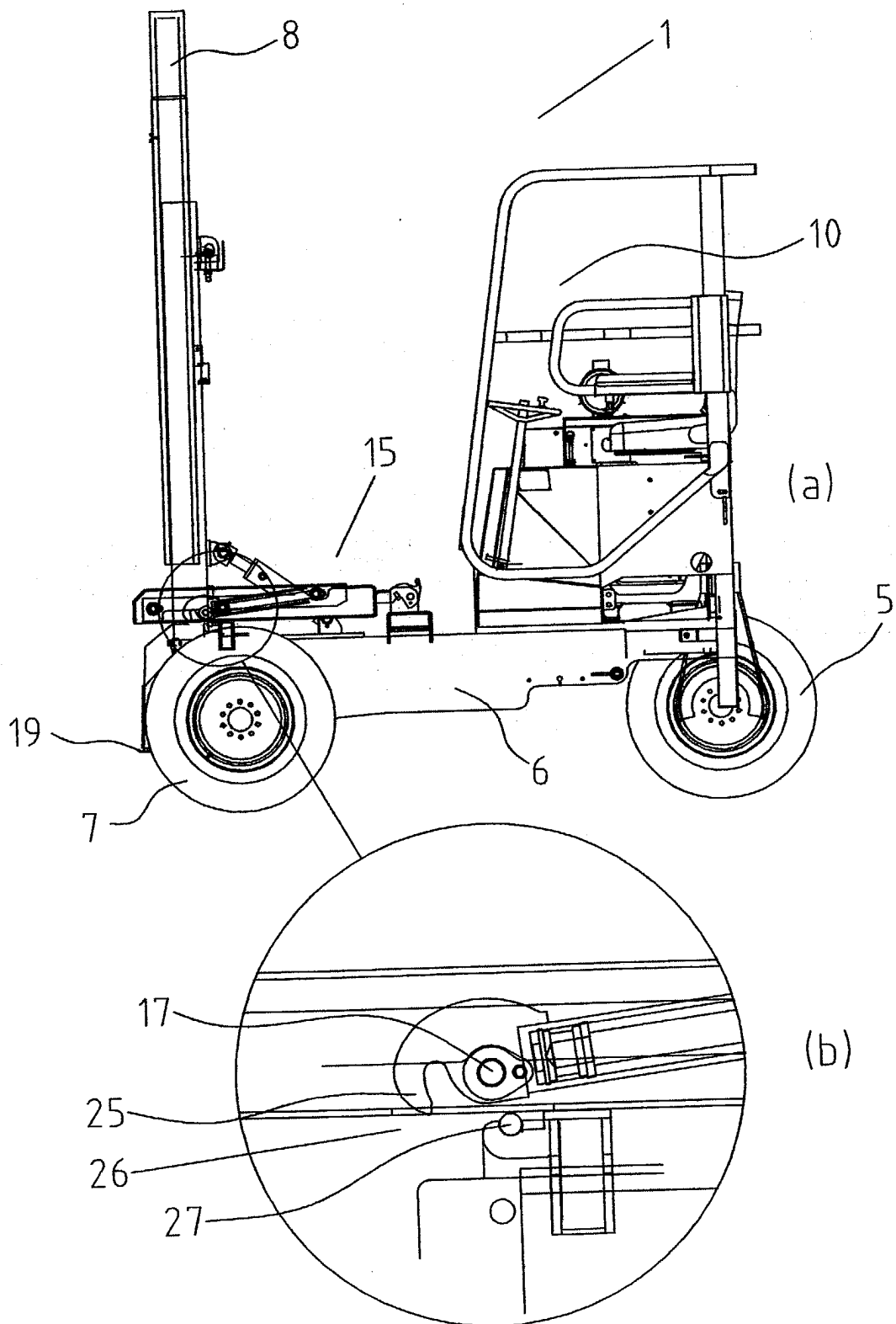
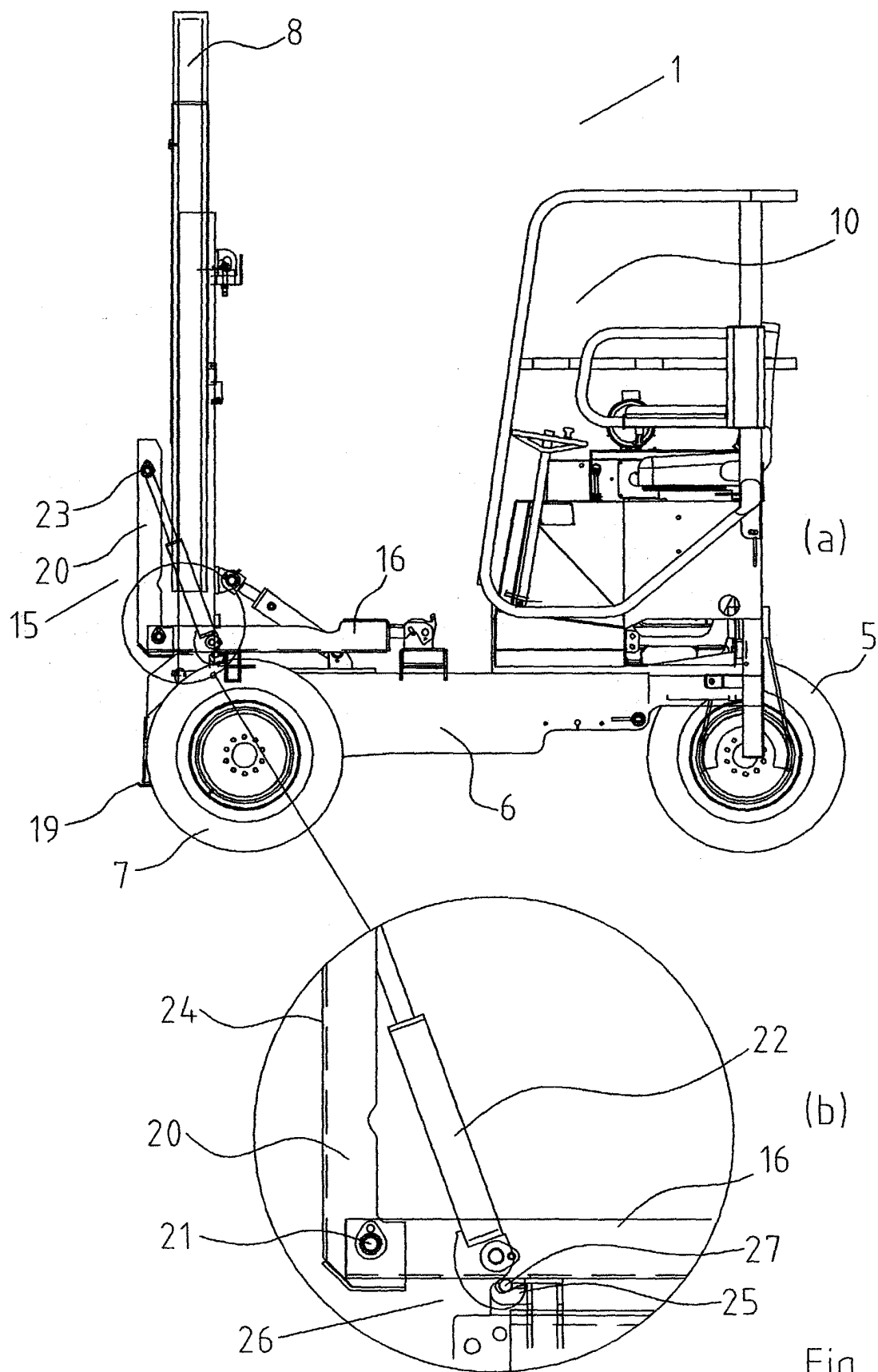


Fig. 5



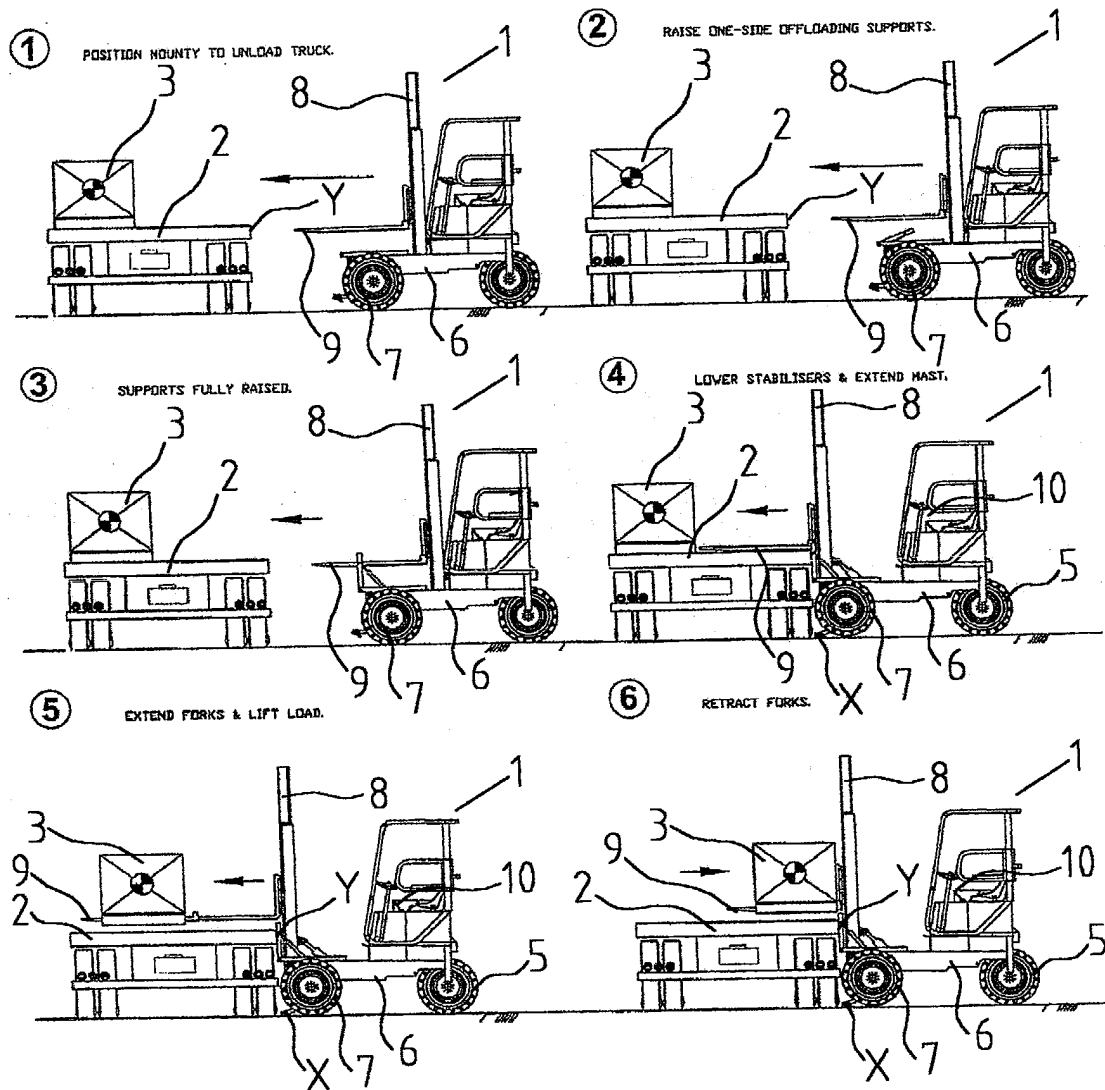


Fig. 7

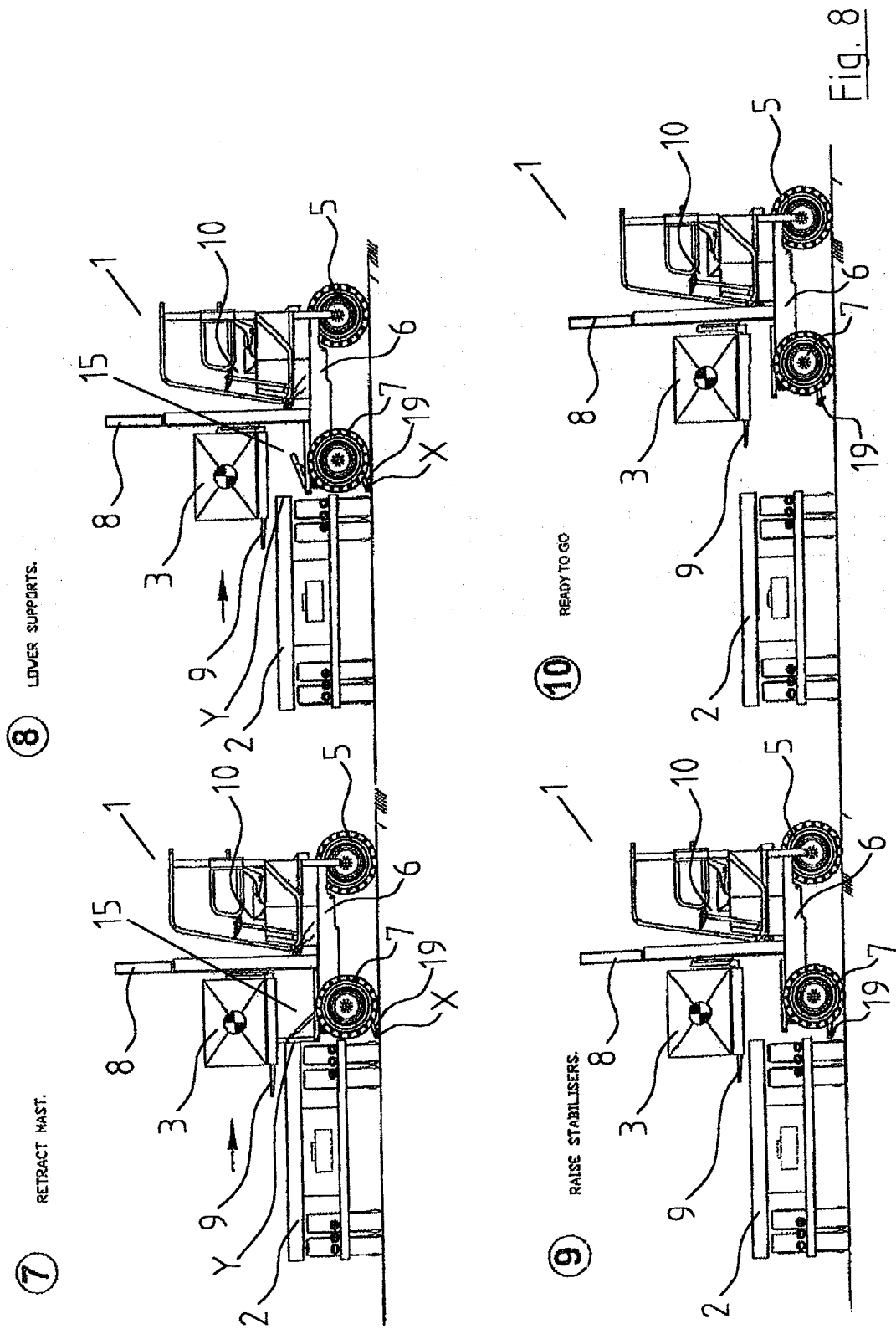


Fig. 8

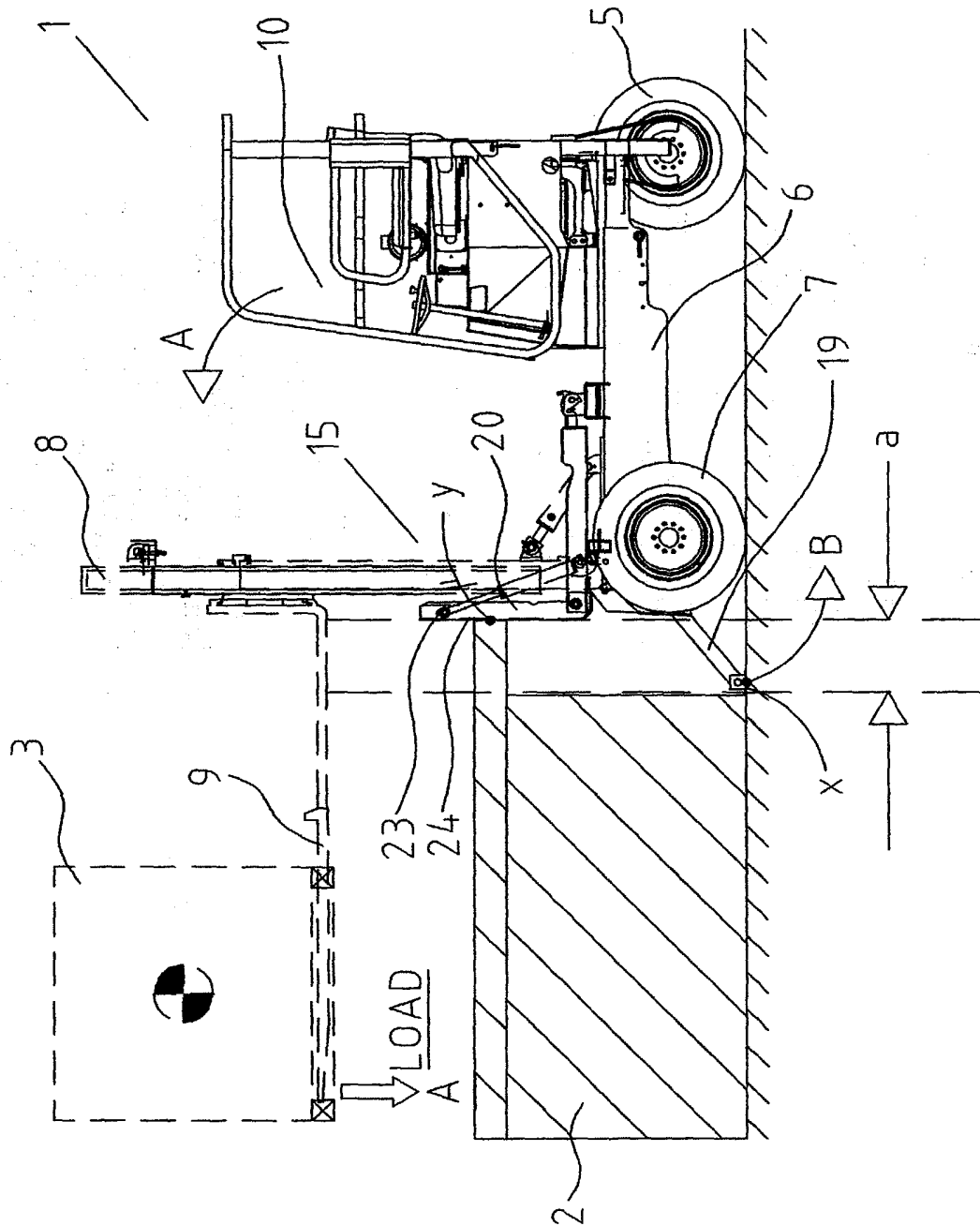


Fig. 9

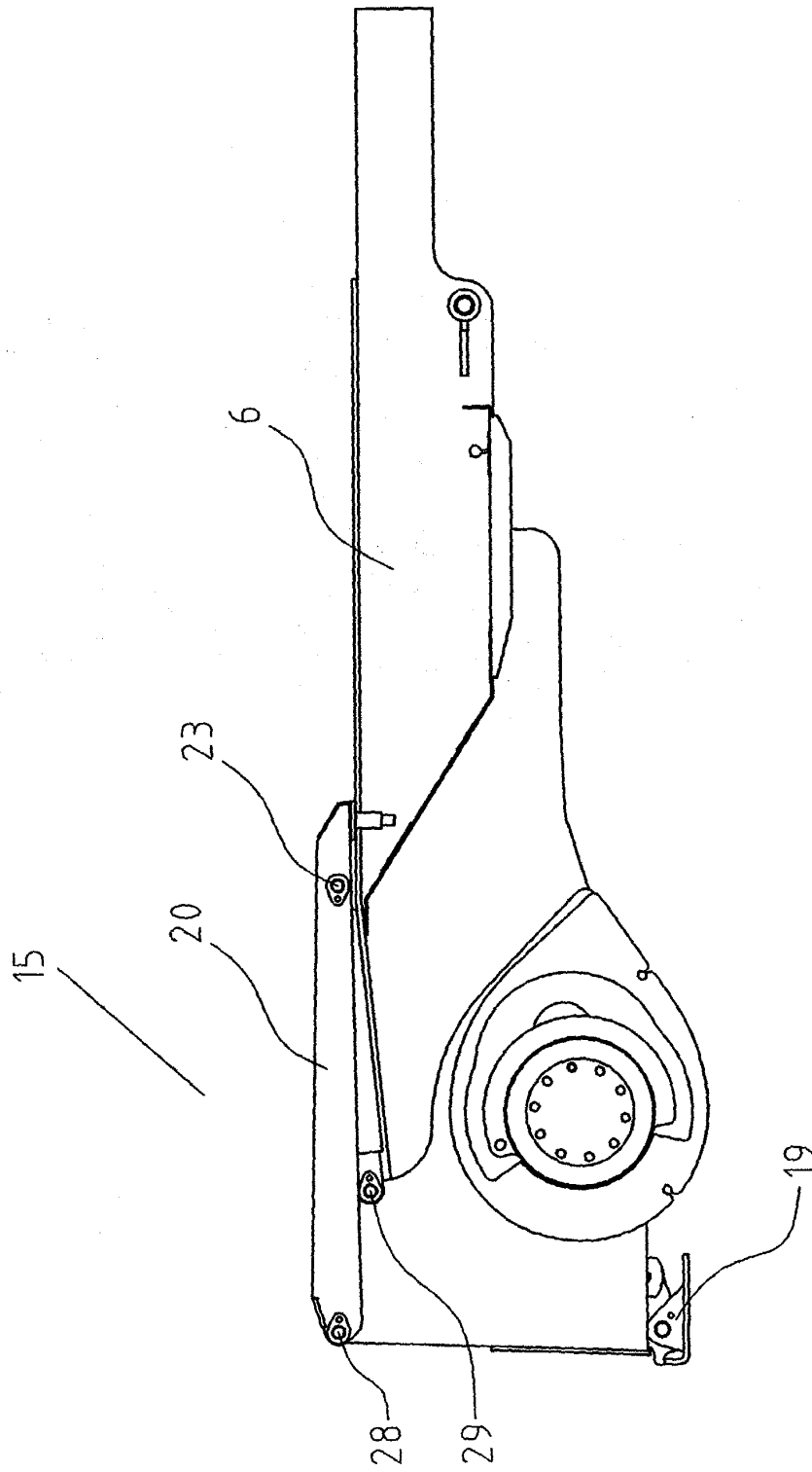


Fig. 10

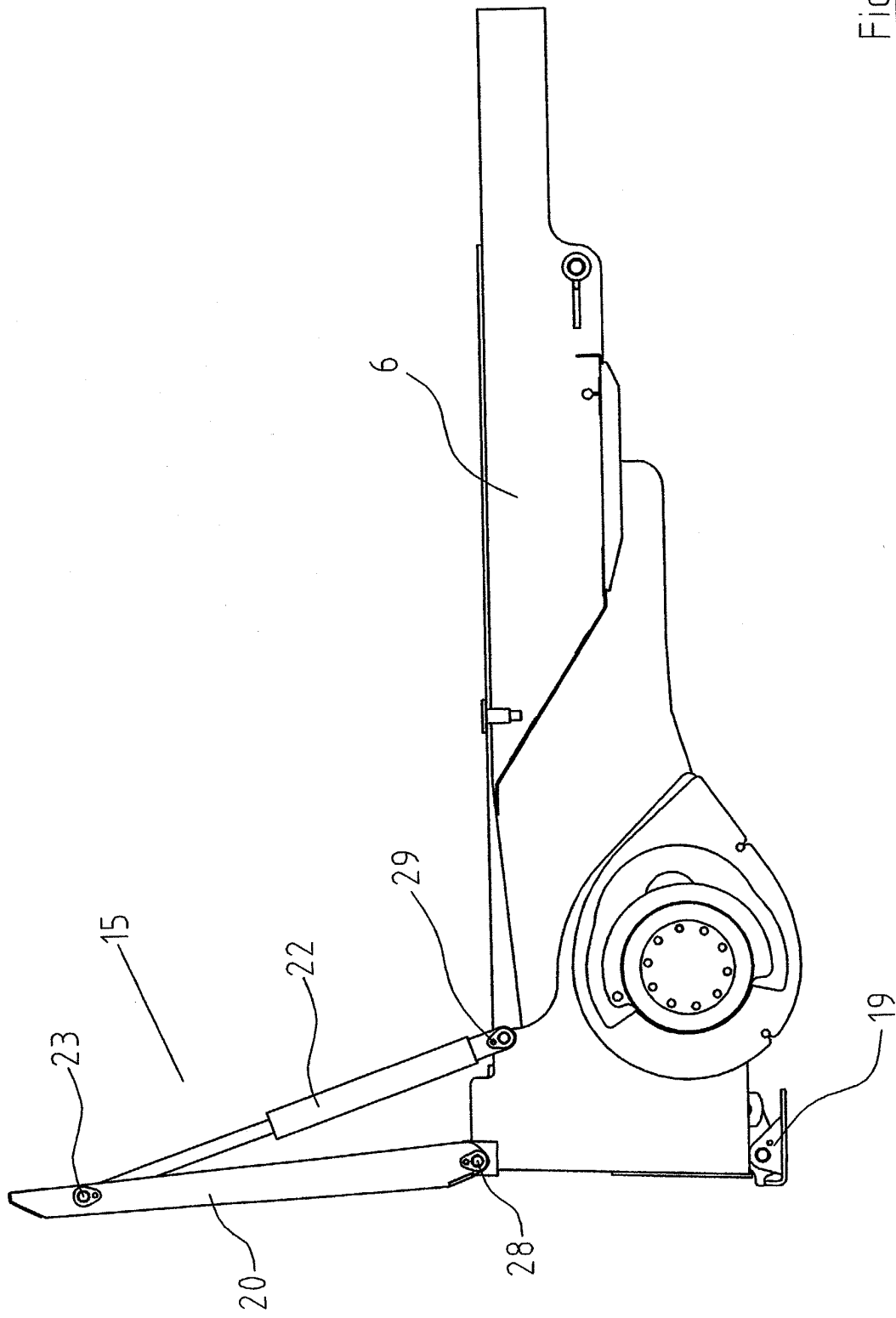
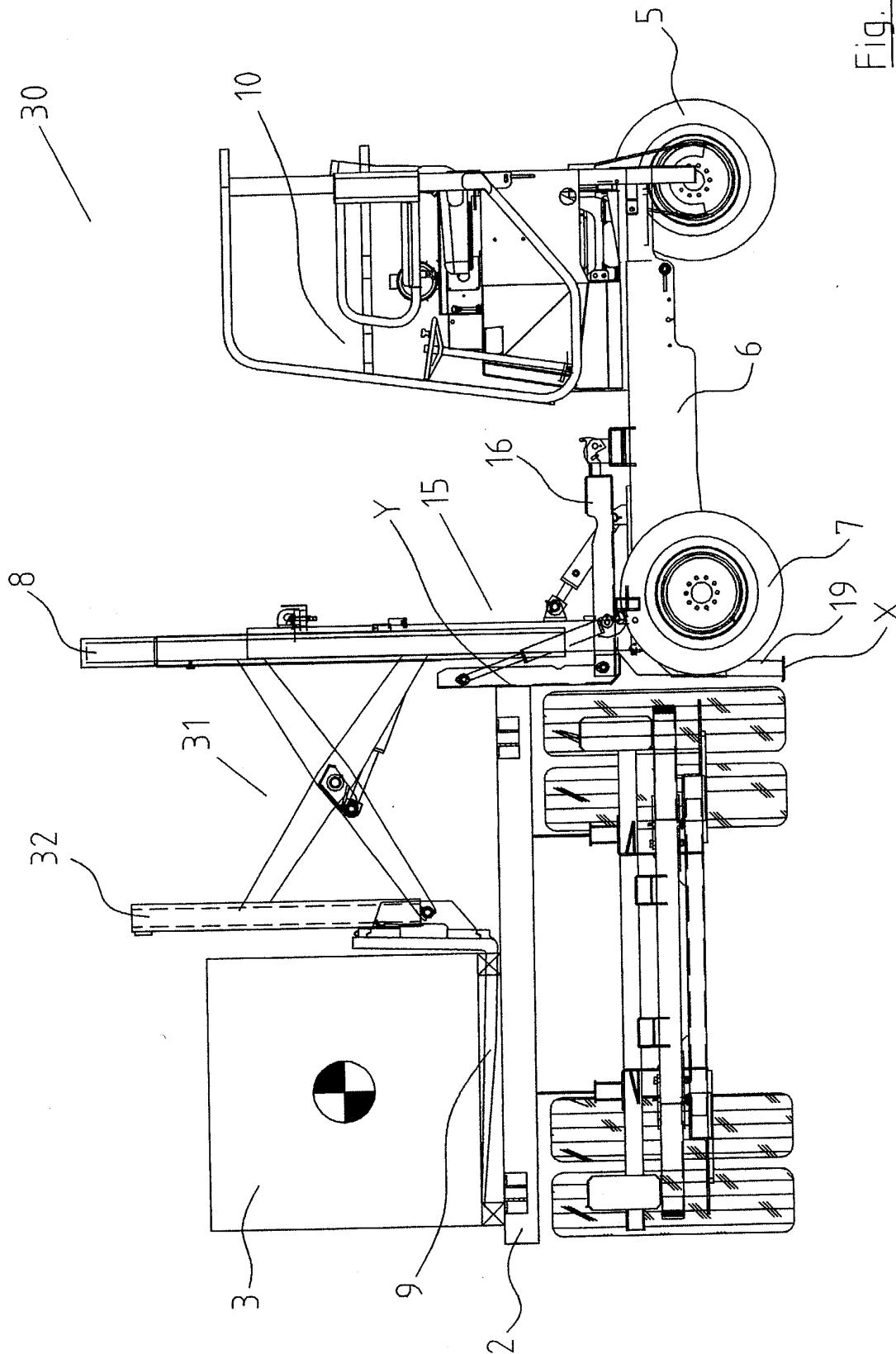


Fig. 11

Fig. 12



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 03 39 4029

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B66F
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 29 July 2003	Examiner Masset, M
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 39 4029

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The members are as contained in the European Patent Office EDP file on
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