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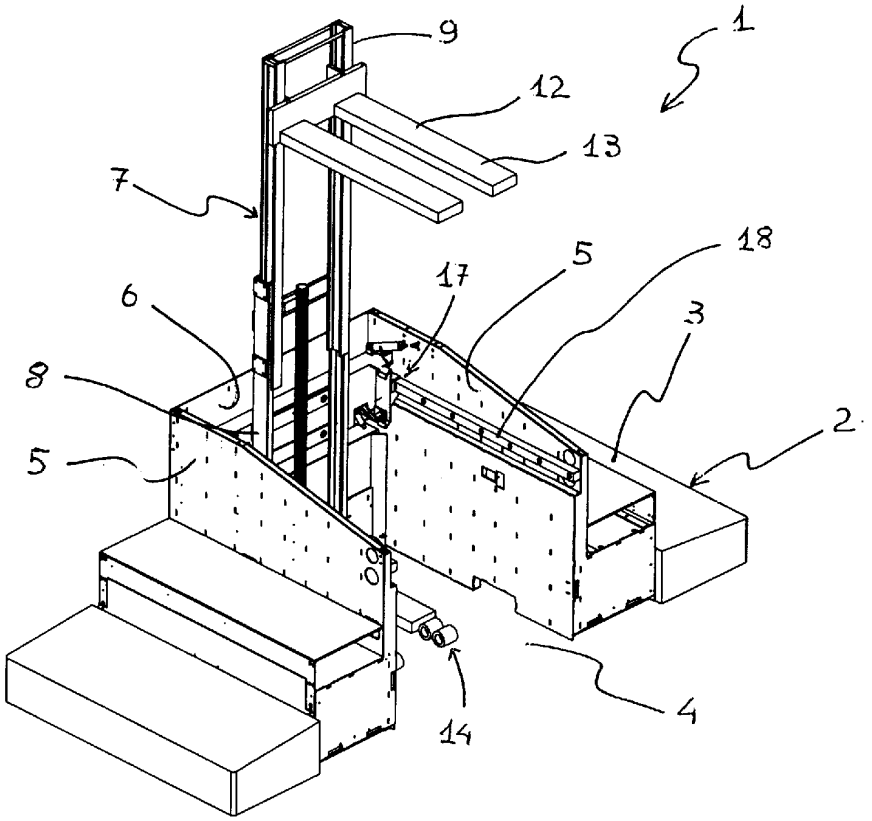
(54) **Lift truck**

(57) A lift truck comprises at least one frame (2) movable on a work plane (P), at least one upright (7) slidably associated with the movable frame (2); the upright (7) being movable between a first operating position, corresponding to a movement step of the lift truck (1), and a second operating position, corresponding to a step of loading and/or unloading goods; said upright (7) comprising direct-support means (14) resting on the work plane (P) and contained in the plan of the upright (7); and grip means (12) associated with the upright (7) to grasp a load. The lift truck also comprises indirect-support means (17) contained in the plan of the upright (7) and connecting the upright (7) with the frame (2).

Fig. 1



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Description

[0001] The present invention relates to a lift truck. The invention applies to handling of containers, palletised goods, paper reels or fabric rolls and the like, disposed by way of example on shelves placed inside warehouses or on the ground.

[0002] It is known that lift trucks comprise a frame moving inside the warehouse. The frame comprises at least three wheels at least one of which is a rotatable wheel, and at least one motor to allow movement of the frame.

[0003] Trucks of known type further comprise an upright that is slidable relative to the frame in a direction parallel to a work plane. During movement of the truck, the upright is movable between a first operating position at which it is retracted relative to the frame, and a second operating position, during loading and unloading of the goods, at which the upright is drawn out at least partly relative to the frame.

[0004] In addition, trucks of known type comprise grip means to grasp the load. This means is vertically movable and can reach locations at different heights. The grip means comprises either a fork to grasp the containers or palletised goods, or pliers.

[0005] In lift trucks of known type, the upright fully rests on the work plane through at least three support points. Preferably, the upright rests thereon through four support points. In addition, the upright is associated with the frame so that it can be guided during movement from the first operating position to the second operating position and vice versa.

[0006] Known lift trucks comprise suitable balance weights for balancing the upright and frame. In addition, the lift trucks comprise a trolley that is drawn out when the upright is in its second operating position and carries a load. In this step, the trolley is drawn out so as to balance the action of the load weight.

[0007] Lift trucks of known type have some drawbacks.

[0008] First of all, in order to prevent overturning of the upright or of the whole lift truck, the truck must necessarily be provided with said balance weights and the trolley so as to make the extractable lift truck of known type heavier.

[0009] In addition, the presence of the trolley gives rise to an extension of the overall dimensions of the trucks of the known art.

[0010] Accordingly, the present invention aims at providing a lift truck solving the above mentioned drawbacks.

[0011] In particular, it is an aim of the present invention to propose a lift truck of light weight and with reduced bulkiness.

[0012] It is a further aim of the invention to propose a lift truck capable of carrying out quick and easy displacements as far as both the overall truck and the upright are concerned.

[0013] Further features and advantages will become more apparent from the description of a preferred, but not exclusive, embodiment of a lift truck in accordance with the present invention. This description will be set out hereinafter with reference to the accompanying drawings given by way of non-limiting example in which:

- Fig. 1 is a perspective view of the lift truck in accordance with the invention, in a first operating position;
- Fig. 2 is a perspective view of the lift truck seen in Fig. 1, in a second operating position;
- Fig. 3 shows a detail of the lift truck seen in Fig. 1 in a perspective view; and
- Fig. 4 shows the lift truck detail seen in Fig. 3, in a side view.

[0014] With reference to the drawings, a lift truck in accordance with the invention has been generally identified with reference numeral 1.

[0015] Truck 1 comprises a frame 2 movable in a work plane "P". Frame 2 constitutes a main portion of truck 1 and comprises a bearing structure 3 inside which at least one motor (not shown in the figures) is contained, said motor enabling movement of frame 2 in the work plane "P".

[0016] In addition, the movable frame 2 comprises at least three wheels (not shown in the figures) defining at least three supports on the work plane "P". In particular, at least one of said wheels is a steering wheel to allow frame 2 to follow curved trajectories. Furthermore, at least one of the wheels is connected to the motor for operation.

[0017] In particular, frame 2 has a niche 4 defined by two parallel side walls 5 facing each other and by a central shoulder 6 connecting the two walls 5.

[0018] Truck 1 further comprises an upright 7 slidably associated with frame 2. In particular, the upright 7 is housed in the frame niche 4.

[0019] The upright 7 is movable between a first operating position at which it is located close to the frame shoulder 6 and is fully contained in the frame niche 4, and a second operating position at which it is moved away from the shoulder 6 of frame 2 and is partly outside said niche 4. In use, the first operating position corresponds to a movement step of the whole lift truck 1 until a desired location, while the second operating position corresponds to a step of loading and/or unloading the goods.

[0020] The upright 7 comprises a first pair of parallel longitudinal members 8 associated with frame 2 and a second pair of longitudinal members 9 telescopically coupled to the first pair 8. Suitable actuating means (not shown) enables translation of the second pair of longitudinal members 9 relative to the first pair 8.

[0021] In addition, the upright 7 comprises a base 10 consisting of two parallel rods 11 disposed along a direction substantially parallel to the work plane "P". Each rod 11 comprises a first end 11a linked to the first pair of longitudinal members 9.

[0022] The lift truck 1 further comprises grip means 12 slidably associated with the upright 7 to grasp a load.

[0023] In the embodiment shown, the grip means 12 comprises a fork 13 slidably secured to the second pair

of longitudinal members 9 of the upright 7 to grasp an item or a plurality of items supported by a pallet. The fork 13 can comprise flat prongs for transport of palletised goods or tubular prongs for getting hold of roll-shaped goods.

[0024] In an alternative embodiment, the grip means 12 comprises a fork 13 with tubular prongs while a further fork 13 with flat prongs can be disposed on top of it or fitted thereon.

[0025] The upright 7 further comprises means 14 for direct support on the work plane "P". More specifically, the direct-support means 14 lies within the plan of the upright 7 and preferably inside the plan development of niche 4.

[0026] The direct-support means 14 comprises rolling means 15 connected to upright 7 and brought into contact with the work plane "P".

[0027] In the embodiment herein described, the rolling means 15 comprises a plurality of rollers 16 disposed with the respective rotation axis parallel to the work plane "P". In detail, said rollers 16 are disposed close to a second end 11b of rods 11 constituting the upright base 10.

[0028] The lift truck 1 further comprises indirect-support means 17 included in the upright plan of the upright 7, preferably inside the plan development of niche 4, and connecting upright 7 with frame 2.

[0029] In the embodiment herein described, the indirect-support means 17 comprises two preferably rectilinear racks 18 connected to frame 2. In detail, the indirect-support means 17 comprises a rack 18 fastened to each wall 5 defining niche 4 of frame 2. Preferably, the two racks 18 are parallel to each other and are located at the same height.

[0030] For example, the indirect-support means 17 comprises a respective upper wheel 19, which is preferably smooth, and a respective lower wheel that is toothed. The upper wheel 19 and lower toothed wheel 26 are each connected to upright 7 and are associated with the respective rack 18. In this way, at least part of the upright 7 weight and the load possibly carried by said upright 7 is transmitted to frame 2 through contact of wheels 19 and/or 26 with racks 18. This weight portion is then discharged onto the work plane "P" through said frame wheels. In other words, at least one portion of the upright 7 weight and the weight of the load possibly transported is discharged onto the work plane "P" in an indirect manner.

[0031] The indirect-support means 17 further comprises a crosspiece 20 connecting upright 7 to wheels 19 and/or 26. More specifically, the crosspiece 20 is fastened to the first pair of longitudinal members 9.

[0032] The crosspiece 20 further comprises guide means 21 acting on racks 18 to facilitate sliding of crosspiece 20 relative to frame 2. The guide means 21 comprises a pair of parallel plates 22 between which the respective rack 18 is housed.

[0033] A motor 23 is associated with the indirect-support means 17 to allow rotation of the toothed wheels 26 and/or the upper wheels 19 in racks 18 and thus enable movement of upright 7 relative to frame 2. Preferably the motor is associated with one of the toothed wheels 26.

[0034] When the upright 7 is in motion relative to frame 2, the position of wheels 19 and/or 26 varies along the respective racks 18. Therefore, the indirect-support means 17 is movable relative to frame 2 and can have a plurality of distinct configurations. In this way, the distance between the upright 7 and shoulder 6 of frame 2 can continuously vary.

[0035] Consequently, the support points through which the weight of upright 7 is partly transferred to frame 2 are moved as well. However the support points are maintained constantly contained within the plan of the upright 7 and at the same time also do not go out of the plan development of frame 2.

[0036] The lift truck 1 further comprises stabilisation means 24 acting on the upright 7 when starting of an overturning stress applied to the upright 7 itself occurs.

[0037] In fact, during use, it may happen that the upright 7 and/or the possibly carried load will knock against an obstacle and that therefore a moment promoting overturning of the upright 7 or the whole truck 1 will be generated.

[0038] It is also possible that during movement of truck 1, a moment of inertia is generated, due to sudden accelerations or decelerations, that will tend to overturn the upright 7, above all when the load is very heavy.

[0039] The stabilisation means 24 comprises means 25 for detecting rotation of upright 7 relative to frame 2.

[0040] This detecting means 25 comprises a sensor (not shown in the figures) associated with at least one of the racks 18. In detail, this sensor consists of a roller with a spring (not shown in the figures) brought into contact with rack 18.

[0041] In addition, in an alternative embodiment, the detecting means 25 comprises a sensor (not shown) associated with the direct-support means 14, alternatively or in addition to the sensor associated with rack 18. In detail, the sensor associated with the direct-support means 14 is located in one or more of rollers 16 and checks the ceased contact of rollers 16 with the work plane "P".

[0042] In use, when an overturning moment acts on the upright 7, the detecting means 25 senses an anomalous rotation of the upright 7 relative to frame 2 and immediately generates a signal activating an alarm device not shown. In addition, the detecting means 25 also generates a signal that will stop motor 23 associated with the indirect-support means 17 and the motor associated with frame 2.

[0043] The stabilisation means 24 can further comprise one or more mechanical detents on which at least part of the upright 7 abuts at a predetermined critical rotation angle. By way of example, these mechanical detents can consist of prismatic blocks substantially corresponding with plates 22 of the guide means 21.

[0044] The lift truck 1 further comprises means 27 for

lifting the direct-support means 14 acting when the upright 7 is in the first operating position. In other words, the lifting means 27 acts on the direct-support means 14 when the lift truck 1 is moved on the work plane "P". This lifting means 27 stops contact between the plurality of rollers 16 and the work plane "P" to facilitate movement of truck 1.

[0045] For instance, the lifting means 27 comprises at least one hydraulic ram 28 connected to the crosspiece 20. In this way, ram 28 by its engagement with abutment means not shown, promotes a limited rotation of the upright 7 as far as contact between the direct-support means 14 and work plane "P" stops.

[0046] In an alternative embodiment (not shown in the figures), frame 2 has two niches 4 in which two distinct uprights 7 are housed, which uprights 7 can operate jointly or separately. In this way, the lift truck 1 can simultaneously reach several distinct positions.

[0047] The present invention achieves the intended aims and has important advantages.

[0048] First of all, since the lift truck 1 comprises said indirect-support means 17 of the upright 7 contained in the plan of the upright 7 itself, truck 1 has a limited requirement for balance weights. In this manner, the overall weight of the lift truck 1 is reduced as compared with trucks of the known art.

[0049] In addition, due to the indirect-support means 17, the presence of the known art trolleys to be drawn out when the upright 7 is in said second operating position, becomes useless. As a result, the weight of the lift truck 1 is further reduced.

[0050] Yet, the absence of said trolleys enables the bulkiness of truck 1 to be limited. In this manner, also in connection with the increased light weight of the lift truck 1, the latter can be handled more easily and quickly, as far as both movement of the whole truck 1 and of the upright 7 alone is concerned.

[0051] Advantageously, due to the presence of the indirect-support means 17 and to the consequent reduction in weight, there is an important decrease in the production cost of the lift truck 1.

Claims

1. A lift truck, comprising:

- at least one frame (2) movable on a work plane (P);
- at least one upright (7) slidably associated with the movable frame (2);

the upright (7) being movable between a first operating position, corresponding to a movement step of the lift truck (1) and a second operating position corresponding to a step of loading and/or unloading the goods; the upright (7) comprising direct-support means (14) resting on the work plane (P) and contained in the plan of the upright (7);

- grip means (12) associated with the upright (7) to grasp a load;

characterised in that it further comprises indirect-support means (17) contained in the plan of the upright (7), said indirect-support means (17) connecting the upright (7) to the frame (2).

2. A truck as claimed in claim 1, wherein the indirect-support means (17) is movable relative to the frame (2), the indirect-support means (17) being able to take a plurality of distinct configurations, each of said configurations defining a predetermined spacing between the upright (7) and the frame (2).

3. A truck as claimed in anyone of the preceding claims, wherein the indirect-support means (17) comprises at least one preferably rectilinear rack (18) connected to the frame (2), at least one upper wheel (19) connected to the upright (7) and resting on the rack (18) and at least one lower toothed wheel (26) associated with the rack (18).

4. A truck as claimed in claim 3, wherein the indirect-support means (17) comprises two preferably rectilinear racks (18) connected to the frame (2) and preferably parallel to each other, two upper wheels (19) connected to the upright (7) and resting on a respective rack (18) and two lower toothed wheels (26) associated with a respective rack (18).

5. A truck as claimed in anyone of the preceding claims, wherein the upright (7) further comprises a crosspiece (20) to connect each wheel (19, 26) with the upright (7) itself.

6. A truck as claimed in anyone of the preceding claims, wherein the direct-support means (14) comprises rolling means (15) applied to the upright (7) and brought into contact with the work plane (P).

7. A truck as claimed in anyone of the preceding claims, further comprising stabilisation means (24) acting on the upright (7) when starting of an overturning stress applied to the upright (7) itself occurs.

8. A truck as claimed in claim 7, wherein the stabilisation means (24) comprises means (25) for detecting rotation of the upright (7) relative to the frame (2).

9. A truck as claimed in claim 8, wherein the means (25) for detecting rotation of the upright (7) relative to the frame (2) comprises a sensor (26) associated with one of said racks (18).

10. A truck as claimed in claim 7, 8 or 9, wherein the stabilisation means (24) further comprises at least

one mechanical detent on which at least part of the upright (7) abuts at a predetermined critical angle of rotation.

11. A truck as claimed in claims 7 and 9, wherein the detecting means (25) comprises a sensor associated with the rolling means (15) to check contact of the rolling means (15) with the work plane (P).

12. A truck as claimed in anyone of the preceding claims, further comprising means (27) for lifting the direct-support means (14) to stop contact between the direct-support means (14) and the work plane (P) during movement of frame (2) preferably at the first operating position of the upright (7).

13. A truck as claimed in anyone of the preceding claims, wherein the grip means (12) comprises a fork (13) slidably associated with the upright (7); the fork (13) preferably comprising flat or tubular prongs.

14. A lift truck, comprising:

- at least one frame (2) movable on a work plane (P);
- at least one upright (7) slidably associated with the movable frame (2);
the upright (7) being movable between a first operating position, corresponding to a movement step of the lift truck (1) and a second operating position corresponding to a step of loading and/or unloading the goods; the upright (7) comprising direct-support means (14) resting on the work plane (P) and contained in the plan of the upright (7);
- grip means (12) associated with the upright (7) to grasp a load;

characterised in that it further comprises stabilisation means (24) acting on the upright (7) to generate a moment contrary to an overturning moment applied to the upright (7) itself.

Fig 1

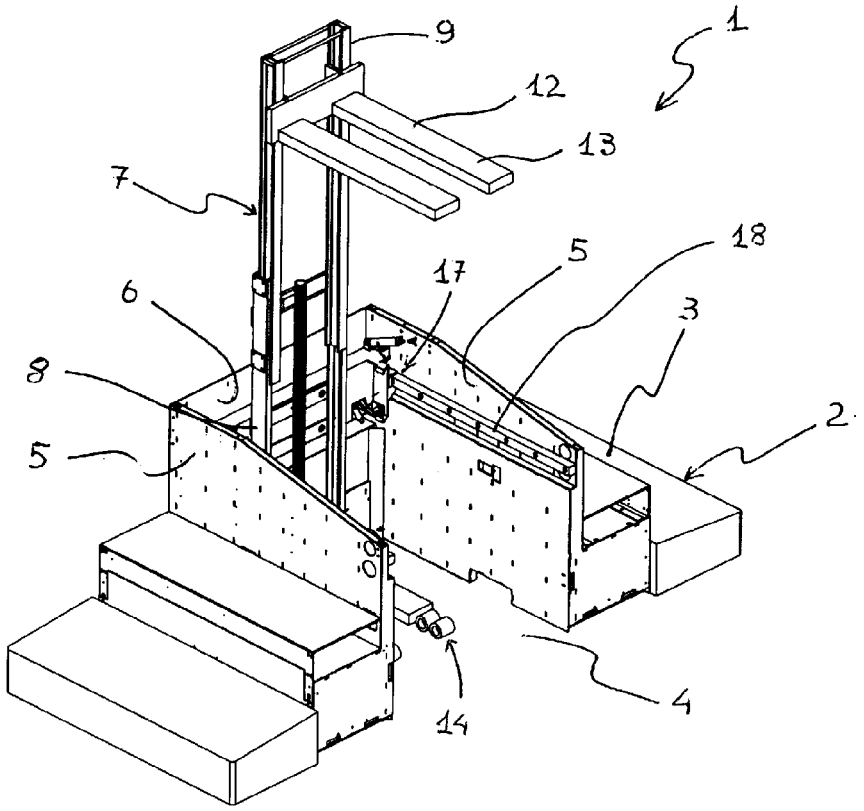

Fig 2

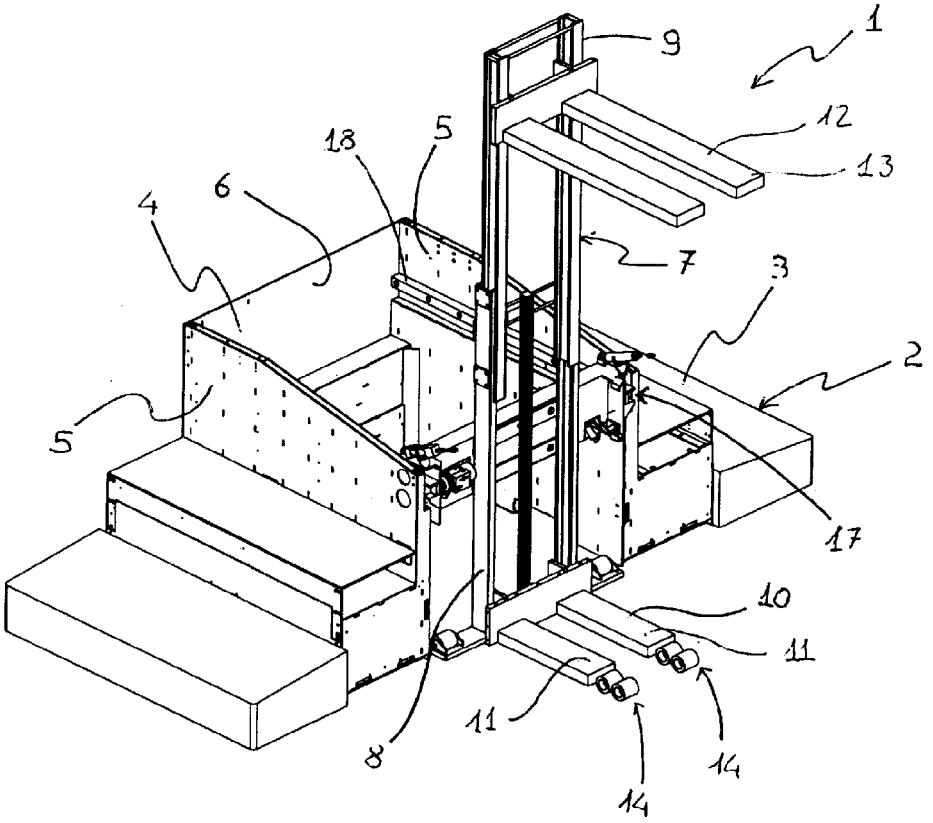

Fig. 3

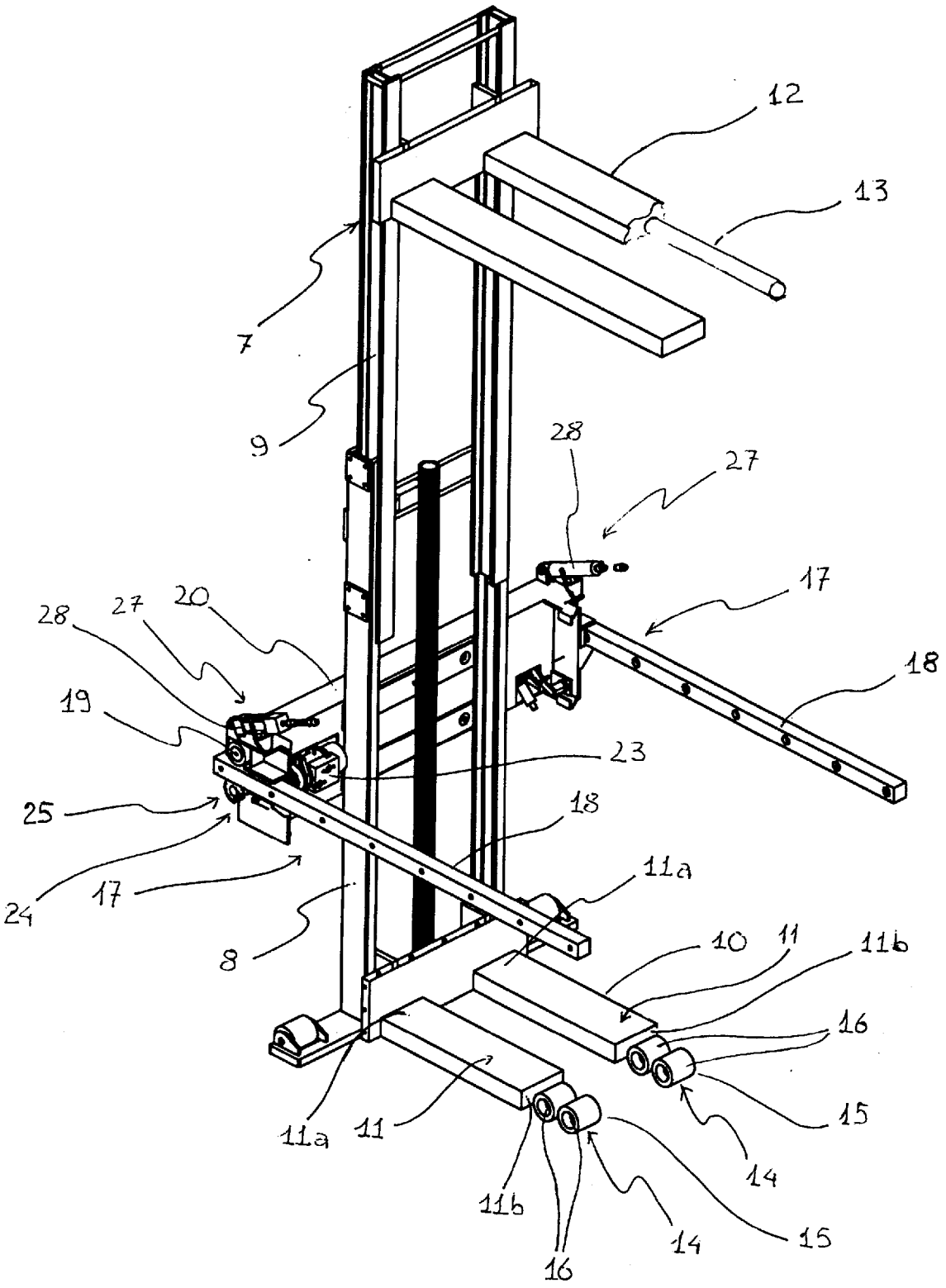
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Fig. 4