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(54) Machine for moving material

(57) Machine for moving material, comprising a control cabin (7) mechanically connected to a supporting frame (2) of the machine; a first four-bar linkage (9) provided with a supporting base (10) fixed to the supporting frame (2), with a movable base (11), and with two first arms (12, 13) comprising a control arm (12) provided with a lever (29); a second four-bar linkage (15) provided with a supporting bearing footboard (16) fastened to the control cabin (7), and with two second arms (17, 18) provided to connect the supporting footboard (16) to the movable base (11).

The machine, further comprises a linear actuator (30), which is provided to connect the lever (29) of the control arm (12) of the first four-bar linkage (9) to one of the second arms (17, 18) of the second four-bar linkage (15), and through which the control arm (12) of the first four-bar linkage (9) is adapted to move the second four-bar linkage (15) between a raised position and a ground position, in which the supporting footboard (16) of the control cabin (7) is arranged at ground level.

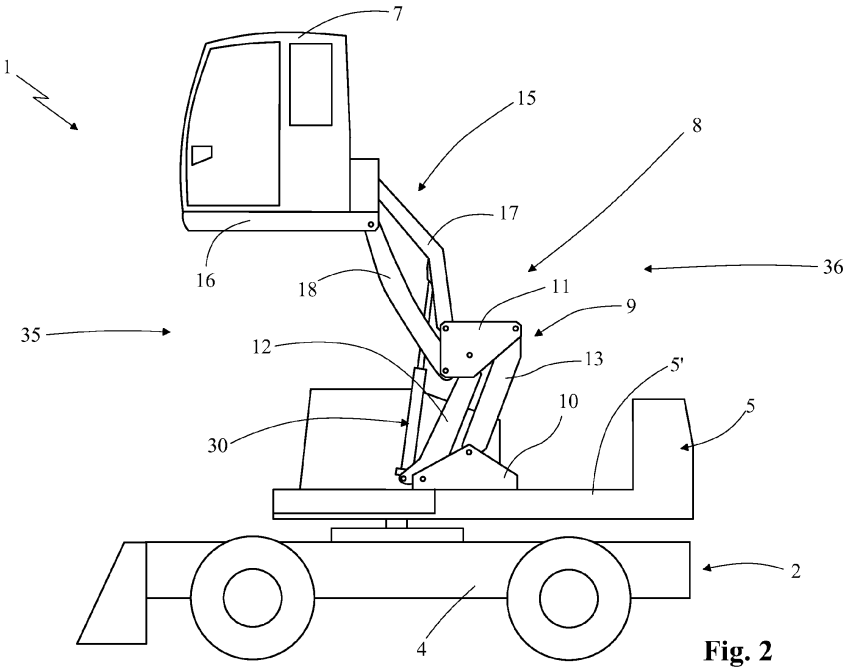

Fig. 2

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Description

Field of application

[0001] The present invention concerns a machine for moving material according to the preamble of the independent claim number 1.

[0002] The machine according to the invention belongs to the industrial field of the manufacturing of heavy machines, in particular self-propelled loaders, used for collecting and moving materials, such as scrap iron, metal, wood and industrial waste.

[0003] In detail, the machine object of the present invention is equipped with a control cabin that is intended to house an operator and is suitable for being raised to a height such as to allow the operator to view the loading and unloading operations carried out by the machine.

State of the art

[0004] As it is known, self-propelled loaders that are used for collecting and moving materials of various types (such as scrap iron, metal, wood and industrial waste, etc.) are widespread on the market. In particular, such self-propelled loaders are used in work sites (such as warehouses, landfills, recycling plants, etc.) to load and unload material from a container, from the body of a lorry, from a press, etc. Self-propelled loaders of the known type conventionally comprise a supporting frame that is provided with wheels or tracks for moving forward on the ground, and a rotary turret that is mounted on the supporting frame in a raised position with respect to the ground (for example around 2 metres high).

[0005] The rotary turret is equipped with a horizontal resting plane on which a considerably long articulated arm is mounted (for example 16 metres), which has, fixed to its free end, a bucket for picking up the material to be moved, and that can be moved so as to collect, through the bucket, the material from the ground and release it inside the container or body of the lorry or for taking the material from the container or from the body of the lorry.

[0006] The self-propelled loaders are equipped, moreover, with a control cabin, which is associated with the resting plane of the rotary turret and contains, inside it, control devices, through which an operator controls the operation of the loader, and in particular the movement of the articulated arm, the rotation of the rotary turret, the forward movement of the loader on the ground, etc.

[0007] More in detail, the control cabin is slidingly mounted on two vertical guides that are fastened to the rotary turret, and can be actuated by means of hydraulic cylinders to move along such vertical guides between a lowered position, in which it rests on the resting plane of the rotary turret, and a position that is raised with respect to such a resting plane so as to allow the operator to better view the loading and unloading operations of the material, in particular inside the container or the body of the lorry to be loaded or unloaded.

[0008] The main drawback of loaders of the type described above is due to the fact that the raising height of the cabin from the resting plane of the rotary turret is limited by the length of the vertical guides that, for construction reasons, are typically not longer than one metre. In such a way, when the cabin is in the raised position, the eye of the operator is brought to a height from the ground that is not greater than four metres. This does not allow the operator to see inside the container or inside the body of lorries in an optimal manner, since the latter have side panels of a height of about four metres.

[0009] A further drawback of the self-propelled loaders of the known type described above consists of the difficulty of entering the cabin by an operator, since the latter, in order to enter the cabin, must necessarily climb onto the rotary turret that, as previously mentioned, is usually arranged at a height of about three metres from the ground.

[0010] In order to partially solve the aforementioned drawbacks, for a long time now self-propelled loaders have been introduced on the market that are equipped with an apparatus for moving the cabin that comprises a four-bar linkage mechanism. More in detail, such a four-bar linkage comprises a supporting base that is fastened on the resting plane of the rotary turret, a supporting bearing footboard that is fastened to the control cabin, and two side arms that are parallel to one another and are provided to connect the supporting base to the supporting footboard of the cabin. The two side arms are hinged, at a first end thereof, to the supporting base and, at the other end, to the supporting footboard.

[0011] The moving apparatus further comprises a hydraulic cylinder which is connected between the supporting base and one of the side arms of the four-bar linkage, and can be actuated, by oleodynamic control means, to rotate the side arms of the four-bar linkage in a way such as to raise and lower the supporting footboard of the control cabin.

[0012] More in detail, the hydraulic cylinder can be actuated by the oleodynamic control means to move between a retracted position, in which the side arms are arranged substantially horizontal so as to arrange the supporting footboard on the resting plane of the rotary turret, and an extended position, in which the side arms are arranged substantially vertical for raising the supporting footboard from the resting plane.

[0013] The moving apparatus with the four-bar linkage briefly described above, despite allowing the cabin, in the raised position, to reach a greater height with respect to the solution with vertical guides, is not capable of solving the drawback concerning the difficulty of an operator entering the cabin, since the cabin, in the lowered position, rests by the four-bar linkage on the resting plane of the rotary turret of the loader and therefore the operator must climb up and down the turret in order to be able to enter or come out from the cabin, respectively.

[0014] In order to solve also this last drawback, self-

propelled loaders have been introduced on the market, equipped with an apparatus for moving the cabin that is provided with two four-bar linkages that are mounted in series with one another and can be actuated separately with respect to one another so as to be able to make the control cabin reach the ground.

[0015] More in detail, this last moving apparatus of the known type comprises a first four-bar linkage that is provided with a supporting base that is fixed to the rotary turret of the loader and is connected to a movable base through first parallel arms, and a second four-bar linkage that is provided with a supporting footboard of the cabin connected to the movable base of the first four-bar linkage through second parallel arms.

[0016] Moreover, the moving apparatus comprises a first hydraulic cylinder that is connected between the supporting base and one of the first arms of the first four-bar linkage, and a second hydraulic cylinder that is connected between the second movable base and one of the second arms of the second four-bar linkage. Each hydraulic cylinder can be actuated by the oleodynamic control means of the self-propelled loader for moving the correspondent four-bar linkage without interfering with the movement of the other four-bar linkage.

[0017] In particular, by simultaneously actuating the two hydraulic cylinders, it is possible to move the two four-bar linkages so as to bring the control cabin to the ground so as to allow the operator to enter or come out from the cabin itself without needing to climb up onto the rotary turret.

[0018] More in detail, the first four-bar linkage is moved by the first hydraulic cylinder so as to arrange the first arms substantially horizontal with respect to the movable base arranged beyond the bulk of the supporting frame of the loader, and the second four-bar linkage is actuated by the second hydraulic cylinder so as to rotate the second arms downwards so as to lower the supporting footboard, on which the control cabin is fixed, to the ground.

[0019] The main drawback of this last loader of the known type, which is provided with a moving apparatus with two four-bar linkages, is due to the complex sequence of movements of the four-bar linkages needed in order to bring the control cabin to the ground. For such a purpose, indeed, it is necessary to actuate both the hydraulic cylinders, and possibly manually coordinate their operation, preventing the control cabin from hitting the supporting frame of the self-propelled loader during the movement of the two four-bar linkages.

[0020] This requires a complex actuation system of the hydraulic cylinders or rather it requires the operator to pay great attention when moving the control cabin.

Presentation of the invention

[0021] The main purpose of the present invention is therefore that of avoiding the drawbacks present in known solutions, by providing a machine for moving material that is simple and easy to use.

[0022] Another purpose of the present invention is that of providing a machine for moving material that is constructively simple and cost-effective to make. Another purpose of the present invention is that of providing a machine for moving material that is completely reliable in its operation.

Brief description of the drawings

[0023] The technical characteristics of the invention, according to the aforementioned purposes, can be clearly seen in the content of the claims below and the advantages thereof shall become clearer from the following detailed description, given with reference to the attached drawings, which represent an embodiment that is purely given as an example and not for limiting purposes, in which:

- figure 1 shows a side view of the machine for moving material object of the present invention, in which the control cabin is arranged in a transportation position adjacent to the supporting frame of the machine itself;
- figure 2 shows a side view of the machine for moving material object of the present invention, in which the control cabin is arranged in a working position raised above the supporting frame of the machine itself;
- figure 3 shows a side view of the machine for moving material object of the present invention, in which the control cabin is arranged in a ground access position for allowing an operator to enter it and come out from it;
- figure 4 shows a plan view from above of the machine for moving material illustrated in figure 3;
- figure 5 illustrates a detail of the machine for moving material object of the present invention relative to the moving apparatus of the control cabin.

Detailed description of a preferred embodiment

[0024] With reference to the attached drawings the machine for moving material object of the present invention has been wholly indicated with reference numeral 1.

[0025] In accordance with the particular embodiment illustrated in the attached figures, the machine 1, object of the invention, concerns a self-propelled loader, which is intended to be advantageously used for collecting and moving materials of various types (such as scrap iron, metal, wood and industrial waste, etc.), with the purpose, for example, of collecting material from the ground in a work site and loading it into the body of a lorry or into a container.

[0026] The machine 1, object of the present invention, comprises a supporting frame 2 which is intended to be rested on the ground, and is preferably provided with at least four wheels 3 for moving forward on the ground itself or, on the other hand, with at least a pair of tracks.

[0027] In accordance with a different embodiment that

is not illustrated, the supporting frame of the machine is anchored to the ground by means of a base made from cement or steel.

[0028] In particular, the supporting frame 2 comprises a base framework 4 that rests on the ground by means of the wheels 3, and an upper turret 5 which is mounted on the base framework 4 in a raised position with respect to the ground, and it can be advantageously pivotably actuated around a vertical rotation shaft 6 thereof that can be rotatably constrained to the base framework 4. The upper turret 5 is equipped with a resting plane 5' that is substantially horizontal, on which an articulated arm (not illustrated) is preferably mounted bearing, fixed to its free end, a bucket (not illustrated) for picking up and releasing the material to be moved.

[0029] The machine 1 further comprises a control cabin 7 (intended to receive an operator) that is mechanically connected to the supporting frame 2, and a moving apparatus 8 that is provided to connect the supporting frame 2 to the control cabin 7 and is able to be actuated to move the latter between different positions with respect to the supporting frame 2 itself.

[0030] In accordance with the embodiment illustrated in the attached figures, the moving apparatus 8 is mounted on the upper turret 5 of the supporting frame 2, and can be actuated, as described more in detail in the rest of the description, to move the control cabin 7 between at least three different positions, of which: a transportation position (illustrated in the example of figure 1), in which the control cabin 7 is arranged adjacent to the resting plane 5' of the upper turret 5, for example when the machine 1 is moving from one work site to another; a working position (illustrated in the example of figure 2), in which the control cabin 7 is raised above the resting plane 5' of the upper turret 5 so as to allow the operator present in the cabin 7 to view the work site during the material loading and unloading operations; and a control cabin 7 access position (illustrated in the example of figure 3), in which the cabin is substantially arranged at ground level so as to allow the operator to enter and exit.

[0031] The moving apparatus 8 of the control cabin 7 comprises a first four-bar linkage 9 that is provided with a supporting base 10, that is fixed to the supporting frame 2 of the machine 1, a movable base 11, and two first arms 12, 13 provided to connect the movable base 11 to the supporting base 10 and that are hinged to the latter through corresponding first pins 14.

[0032] Moreover, the moving apparatus 8 comprises a second four-bar linkage 15 that is provided with three movable elements 16, 17, 18, including a supporting bearing footboard 16 that is fixed to the control cabin 7, and two second arms 17, 18 that are provided to connect the supporting footboard 16 to the movable base 11 and are hinged to the latter through corresponding second pins 19.

[0033] In particular, the two first arms 12, 13 of the first four-bar linkage 9 are each equipped with a first end 20 that is hinged to the supporting base 10 through the aforementioned first pin 14 that is arranged substantially horizontal, and with a second end 21, which is opposite the first end 20 and is hinged to the movable base 11 by means of a third pin 22 that is parallel to the first pin 14, so as to allow the first four-bar linkage 9 to move on a substantially vertical moving plane.

[0034] The second arms 17, 18 of the second four-bar linkage 15 are each equipped with a third end 23 that is hinged to the movable base 11 through the aforementioned second pin 19 that is substantially arranged horizontal, and with a fourth end 24 that is hinged to the supporting footboard 16 of the control cabin 7 through a fourth pin 25 that is parallel to the second pin 19, so as to allow the second four-bar linkage 15 to move parallel with respect to the vertical movement plane of the first four-bar linkage 9.

[0035] The second arms 17, 18 of the second four-bar linkage 15 are connected to the supporting footboard 16 so as to support the latter substantially horizontal position, irrespective of the position the second four-bar linkage 15 takes up.

[0036] The moving apparatus 8 comprises, moreover, a first actuator 26 that is mechanically connected to the first four-bar linkage 9 and can be actuated to make the first arms 12, 13 rotate around the corresponding first pins 14 for connecting to the supporting base 10, so as to move the movable base 11, on which the second four-bar linkage 15 is mounted, with respect to the supporting frame 2 of the machine 1 to move the control cabin 7, as described in detail in the rest of the description.

[0037] In accordance with the embodiment illustrated in the attached figures, the first actuator 26, of the linear type, is provided to connect the supporting base 10 to one of the first arms 12, 13 of the first four-bar linkage 9. In particular, the first actuator 26 is preferably obtained with a first hydraulic cylinder 26' that is provided with a first end part 27 that is hinged to the supporting base 10 and with a second end part 28 that is hinged to the first arm 13 of the first four-bar linkage 9. The first actuator 26 is operatively connected to known types of control means (not illustrated), comprising, in particular, an oleodynamic pump and adapted to control the extension or retraction actuation of the first actuator 26 to move the first four-bar linkage 9.

[0038] According to the idea forming the basis of the present invention, the two first arms 12, 13 of the first four-bar linkage 9 comprise a control arm 12 that is provided with a lever 29, and the moving apparatus 8 comprises a second actuator 30, of the linear type, which is provided to connect the aforementioned lever 29 of the control arm 12 of the first four-bar linkage 9 to one of the movable elements 16, 17, 18 of the second four-bar linkage 15.

[0039] Through such a second actuator 30, the control arm 12 of the first four-bar linkage 9, pivotably actuated by the first actuator 26, makes the second arms 17, 18 of the second four-bar linkage 15 rotate around corresponding second pins 19 for connecting to the movable

base 11, to move the second four-bar linkage 15 between a raised position, in which the supporting footboard 16 is arranged at a higher height than that of the movable base 11 so as to arrange the control cabin 7 in the working position, and a ground position, in which the supporting footboard 16 is arranged at a lower height than the height of the supporting base 10 so as to arrange the control cabin 7 in the access position.

[0040] In such a way, the second actuator 30 acts as an element for transmitting movement between the first and the second four-bar linkage 9 and 15, so that the rotation of the first arms 12, 13 of the first four-bar linkage 9, actuated by the first actuator 26, determines the rotation of the second arms 17, 18 of the second four-bar linkage 15, to move the supporting footboard 16 between the raised position and the ground position without it being necessary to vary the length of the second actuator 30, as described more in detail in the rest of the description. Advantageously, the second four-bar linkage 15 of the moving apparatus can be moved between the raised position and the ground position with the second actuator 30 kept extended at a predetermined length, making it possible to move the control cabin 7 between the working position and the access position without making the second actuator 30 itself extend or retract.

[0041] In accordance with the embodiment illustrated in the attached figures, the second actuator 30 is preferably obtained with a second hydraulic cylinder 30' and is provided with a first end part 31 that is hinged to the lever 29 of the control arm 12 of the first four-bar linkage 9 through a first hinge 32, and with a second end part 33 that is hinged to the aforementioned one of the movable elements 16, 17, 18 of the second four-bar linkage 15 through a second hinge 34.

[0042] Preferably, the second actuator 30 is operatively connected to the aforementioned control means, which are suitable for controlling it to extend and retract so as to move the second four-bar linkage 15, as described more in detail in the rest of the description.

[0043] Advantageously, the second actuator 30 is connected, with its second end part 33, to a driven arm 17 of the second arms 17, 18 of the second four-bar linkage 15.

[0044] In particular, the second end part 33 of the second actuator 30 is connected to the driven arm 17 with the second hinge 34 that is arranged between the third and the fourth end 23, 24 of the driven arm 17 and is preferably arranged closest to the third end 23 of the latter hinged to the movable base 11.

[0045] Advantageously, the driven arm 17 of the second four-bar linkage 15 is arranged above the other second arm 18 (lower) of the second four-bar linkage 15 itself.

[0046] In particular, the other second arm 18 (lower) of the second four-bar linkage 15 is provided with a through opening (not illustrated) that is crossed by the second actuator 30, so as to allow the connection of the latter to the driven arm 17 and to allow the second actuator 30 to move during the movement of the four-bar linkages 9, 15 without hitting against such a second lower arm 18.

[0047] In accordance with a different embodiment that is not illustrated, the driven arm (connected to the second end part of the second actuator) is arranged lower with respect to the other second arm of the second four-bar linkage.

[0048] In accordance with a further different embodiment, that is not illustrated, the second end part of the second actuator is connected to the supporting footboard of the second four-bar linkage.

[0049] With reference to the embodiment illustrated in the attached figures, the moving apparatus 8 extends according to the movement plane of the four-bar linkages 9, 15 between a front side 35 and a rear side 36 thereof, the rear side facing the opposite direction with respect to the front one 35.

[0050] In particular, the moving apparatus 8 supports the supporting footboard 16 of the control cabin 7 arranged on the aforementioned front side 35, which preferably faces the orientation direction of the articulated arm of the machine 1 to make the control cabin 7 face the work site, or rather it is intended to face the forward movement direction of the machine 1 when it is moving forward on the ground with the control cabin 7 arranged in the transportation position.

[0051] With reference to the example in figure 1, in which the control cabin 7 is arranged in the transportation position, the first four-bar linkage 9 is arranged in a folded position, in which the movable base 11 is arranged substantially above the supporting base 10, and the second four-bar linkage 15 is arranged in a lowered position in which the supporting footboard 16 of the control cabin 7 is arranged at a lower height than the height of the movable base 11 so as to arrange the cabin 7 substantially at the same height as the resting plane 5' of the upper turret 5 of the supporting frame 2 of the machine 1.

[0052] Advantageously, with the first four-bar linkage 9 arranged in the aforementioned folded position, the second actuator 30 can be actuated by the control means to move between a retracted position, in which the second four-bar linkage 15 is in the lowered position to arrange the control cabin 7 in the transportation position, and an extended position, in which the second four-bar linkage 15 is in the raised position with the supporting footboard 16 arranged at a higher height than that of the movable base 11 so as to arrange the control cabin 7 raised in the working position (illustrated in the example of figure 2).

[0053] Operatively, in order to raise the control cabin 7 from the transportation position to the working position, the second actuator 30 is actuated by control means to move from the retracted position to the extended position to bring the second four-bar linkage 15 from the lowered position to the raised position, so as to raise the control cabin 7 to a height such as to allow the operator to have a suitable view of the loading and unloading operations

in the working site.

[0054] In order to bring the control cabin 7 from the working position to the access position (illustrated in the example of figures 3 and 4), the first actuator 26 sets in rotation the first arms 12, 13 of the first four-bar linkage 9, the control arm 12 of which, through the second actuator 30, in turn actuates the second four-bar linkage 15 to move between the raised position and the ground position.

[0055] More in detail, with reference to the examples illustrated in figures 2 and 3, with the second actuator 30 arranged in the extended position or rather with a predefined length, the first actuator 26 can be actuated by the control means to move the first four-bar linkage 9 between the aforementioned folded position (illustrated in the example of figure 2) and an unfolded position (illustrated in the example of figure 3), in which the movable base 11 is arranged laterally with respect to the supporting base 10 on the front side 35 of the moving apparatus 8 and is preferably positioned at a lower height than when the second four-bar linkage 15 is in the raised position.

[0056] Consequently, the second actuator 30, in its extended position, can be moved by the lever 29 of the control arm 12 of the first four-bar linkage 9 (pivotably actuated by the first actuator 26) to move the second four-bar linkage 15 between the raised position and the ground position, in which the supporting footboard 16 of the control cabin 7 is arranged at a lower height than the height of the movable base 11 of the first four-bar linkage 9 in the unfolded position, so as to lower the control cabin 7 near to the ground.

[0057] Preferably, with the second four-bar linkage 15 arranged in the lowered position, the supporting footboard 16 projects forward beyond the supporting frame 2 of the machine 1 so as to allow the control cabin 7 to be lowered to the ground without interfering with the supporting frame 2 itself.

[0058] Operatively, in order to bring the control cabin 7 from the working position to the access position, the first actuator 26 actuates the first arms 12, 13 of the first four-bar linkage 9 to rotate around the corresponding first pins 14 in a first rotation direction R1 to move the first four-bar linkage 9 from the folded position to the unfolded position, moving the movable base 11 (and therefore also the second four-bar linkage 15 with the control cabin 7) forwards on the front side 35 of the moving apparatus 8. In particular, with the first four-bar linkage 9 in the unfolded position, the first arms 12, 13 are substantially arranged horizontal and support the movable base 11 arranged substantially at the same height as the supporting base 10 fixed to the supporting frame 2 of the machine 1. Consequently, the rotation of the first arms 12, 13 in the first rotation direction R1 determines, through the second actuator 30 in the extended position, a rotation of the second arms 17, 18 of the second four-bar linkage 15 in a second rotation direction R2 around the corresponding second pins 19 to lower the supporting footboard 16 to the ground.

[0059] More in detail, following the rotation of the first arms 12, 13 in the first rotation direction R1, the lever 29 of the control arm 12 moves the first end part 31 of the second actuator 30 (hinged to the lever 29 itself) backwards towards the rear side 36 of the moving apparatus 8, so that the second actuator 30 brings the second arms 17, 18 to rotate towards such a rear side 36 with their fourth end 24 (connected to the supporting footboard 16) that carries out a movement having at least a vertical component facing downwards, so as to bring the control cabin 7 to the ground, in particular without needing to vary the length of the second actuator 30.

[0060] In particular, the rotation of the control arm 12 in the first rotation direction R1 determines a movement of the lever 29 (and therefore of the first end part 31 of the second actuator 30) having at least a horizontal component that is oriented towards the rear side 36 of the moving apparatus 8. In such a way, the position of the first end part 31 of the second actuator 30 is more retracted when the second four-bar linkage 15 is in the ground position with respect to when it is in the raised position, so as to rotate the second arms 17, 18 in the second rotation direction R2 lowering the supporting footboard 16 below the supporting frame 2 of the machine 1.

[0061] Advantageously, the lever 29 of the control arm 12 of the first four-bar linkage 9 develops projecting from the first end 20 of the control arm 12 itself hinged to the supporting base 10 of the first four-bar linkage 9.

[0062] In particular, the lever 29 develops from the first end 20 of the control arm 12 away from the second end 21 of the latter hinged to the movable base 11, and preferably (with the first four-bar linkage 9 arranged in the folded position) it projects downwards below the first pin 14 of the control arm 12 connected to the supporting base 10.

[0063] Advantageously, the lever 29 of the control arm 12 at least partially develops forward on the front side 35 of the moving apparatus 8, with the first four-bar linkage 9 that is arranged in its folded position, being arranged in particular before the first pin 14 of the control arm 12.

[0064] Preferably, moreover, the lever 29 of the control arm 12, with the first four-bar linkage 9 arranged in the unfolded position, is arranged behind the first pin 14, so that the rotation of the control arm 12 in the first rotation direction R1 determines the movement of the second actuator 30 towards the rear side 36 of the moving apparatus 8 leading to the lowering of the second four-bar linkage 15.

[0065] In accordance with the embodiment illustrated in figure 5, the lever 29, preferably made in a single body with the control arm 12, develops like an elbow from the first end 20 of the latter, with a first portion 29' thereof that is substantially aligned with the axial development of the control arm 12 and with a second portion 29" developing perpendicular with respect to the first 29'.

[0066] Of course, the lever of the control arm can be obtained with a portion of the latter that is arranged outside the rectilinear segment joining the two ends of the

control arm even if such a portion does not project or extend from the control arm itself, without for this reason departing from the scope of protection of the present patent document. In particular, the lever can be obtained with an arched portion of the control arm, or rather at a widened side section of the control arm itself.

[0067] Advantageously, in accordance with the embodiment illustrated in the attached figures, the control arm 12 of the two first arms 12, 13 of the first four-bar linkage 9, with the latter arranged in the folded position, is arranged before the other first arm 13 on the front side 35 of the moving apparatus 8.

[0068] In accordance with a different embodiment not illustrated, the control arm of the two first arms of the first four-bar linkage is arranged, with the latter arranged in the folded position, behind the other first arm on the rear side of the moving apparatus.

[0069] Operatively, in order to bring the control cabin 7 back from the access position to the working position, the first actuator 26 is actuated by the control means to make the first arms 12, 13 of the first four-bar linkage 9 rotate in a third rotation direction that is opposite to the first rotation direction R1, so as to bring the first four-bar linkage 9 from the unfolded position to the folded position. Consequently, the control arm 12, through the second actuator 30, in turn makes the second arms 17, 18 of the second four-bar linkage 15 rotate in a fourth rotation direction that is opposite to that of the second rotation direction R2, so as to move the second four-bar linkage 15 from the ground position to the raised position.

[0070] Moreover, in order to bring the control cabin 7 from the working position to the transportation position, with the first four-bar linkage 9 kept stopped in the folded position, the second actuator 30 is actuated by the control means to move from the extended position to the retracted position so as to lower the second four-bar linkage 15 from the raised position to the lowered position.

[0071] Therefore the invention thus described achieves the set purposes.

Claims

1. Machine (1) for moving material, which comprises:

- a supporting frame (2) intended to be rested on the ground;
- a control cabin (7) mechanically connected to said supporting frame (2);
- a moving apparatus (8), provided to connect said control cabin (7) to said supporting frame (2), and able to be actuated to move said control cabin (7) between different positions with respect to said supporting frame (2);

said moving apparatus (8) comprising:

- a first four-bar linkage (9) provided with a supporting base (10) fastened to said supporting frame (2), with a movable base (11), and with at least two first arms (12, 13) provided to connect said movable base (11) to said supporting base (10) and hinged to this latter through corresponding first pins (14);
- a second four-bar linkage (15) provided with at least three movable elements (16, 17, 18) including a supporting bearing footboard (16) fastened to said control cabin (7), and at least two second arms (17, 18) provided to connect said supporting footboard (16) to said movable base (11) and hinged to this latter through corresponding second pins (19);
- at least a first actuator (26) mechanically connected to said first four-bar linkage (9) and able to be actuated to make said first arms (12, 13) rotate around said corresponding first pins (14);

said machine (1) being **characterised in that**:

- at least a first control arm (12) of said first arms (12, 13) of said first four-bar linkage (9) is provided with at least a lever (29);
- said moving apparatus (8) further comprises at least a second, linear, actuator (30), which is provided to connect the lever (29) of the control arm (12) of said first four-bar linkage (9) to one of said movable elements (16, 17, 18) of said second four-bar linkage (15), and through which the control arm (12) of said first four-bar linkage (9), pivotably actuated by said first actuator (26), makes the second arms (17, 18) of said second four-bar linkage (15) rotate around said corresponding second pins (19), to move said second four-bar linkage (15) between a raised position, wherein said supporting footboard (16) is arranged at a higher height than said movable base (11), and a ground position, wherein said supporting footboard (16) is arranged at a lower height than said supporting base (10).

2. Machine (1) for moving material according to claim 1, **characterised in that** said second four-bar linkage (15) can be moved between said raised position and said ground position with said second actuator (30) extended at a predetermined length.

3. Machine (1) for moving material according to claim 2, **characterised in that** said first four-bar linkage (9) can be moved by said first actuator (26) between a folded position, in which said movable base (11) is arranged substantially above said supporting base (10), and an unfolded position, in which said movable base (11) is arranged laterally with respect to said supporting base (10),
with said first four-bar linkage (9) in said folded position, said second actuator (30) being able to be

actuated to move between a retracted position, wherein said second four-bar linkage (15) is in a lowered position with said supporting footboard (16) arranged at a lower height than the height of said movable base (11), and an extended position, in which said second four-bar linkage (15) is in said raised position with said supporting footboard (16) arranged at a higher height than the height of said movable base (11), and in said extended position said second actuator (30) can be moved by the lever (29) of the control arm (12) of said first four-bar linkage (9) pivotably actuated by said first actuator (26), to move said second four-bar linkage (15) between said raised position and said ground position, in which said supporting footboard (16) is arranged at a lower height than the height of the movable base (11) of said first four-bar linkage (9) in said unfolded position.

4. Machine (1) for moving material according to any one of the previous claims, **characterised in that** the lever (29) of said control arm (12) develops projecting from a first end (20) of said control arm (12) hinged to the supporting base (10) of said first four-bar linkage (9).

5. Machine (1) for moving material according to claim 4, **characterised in that** said lever (29) develops from the first end (20) of said control arm (12) away from a second end (21) of said control arm (12) hinged to said movable base (11).

6. Machine (1) for moving material according to any one of the previous claims, **characterised in that** said first four-bar linkage (9) is able to be moved by said first actuator (26) between a folded position, in which said movable base (11) is arranged substantially above said supporting base (10), and an unfolded position, in which said movable base (11) is arranged laterally with respect to said supporting base (10) on a front side (35) of said moving apparatus (8);
the lever (29) of said control arm (12) developing at least partially forward from the front side (35) of said moving apparatus (8) with said first four-bar linkage (9) in said folded position.

7. Machine (1) for moving material according to claim 6, **characterised in that** said control arm (12) is arranged before the other first arm (13) of said first arms (12, 13) on the front side (35) of said moving apparatus (8), with said first four-bar linkage (9) in said folded position.

8. Machine (1) for moving material according to any one of the previous claims, **characterised in that** said second actuator (30) is connected to a driven arm (17) of said second arms (17, 18) of said second four-bar linkage (15).

9. Machine (1) for moving material according to claim 8, **characterised in that** said driven arm (17) is arranged above the other second arm (18) of said second arms (17, 18) of said second four-bar linkage (15).

10. Machine (1) for moving material according to claim 9, **characterised in that** said other second arm (18) is provided with a through opening passed through by said second actuator (30).

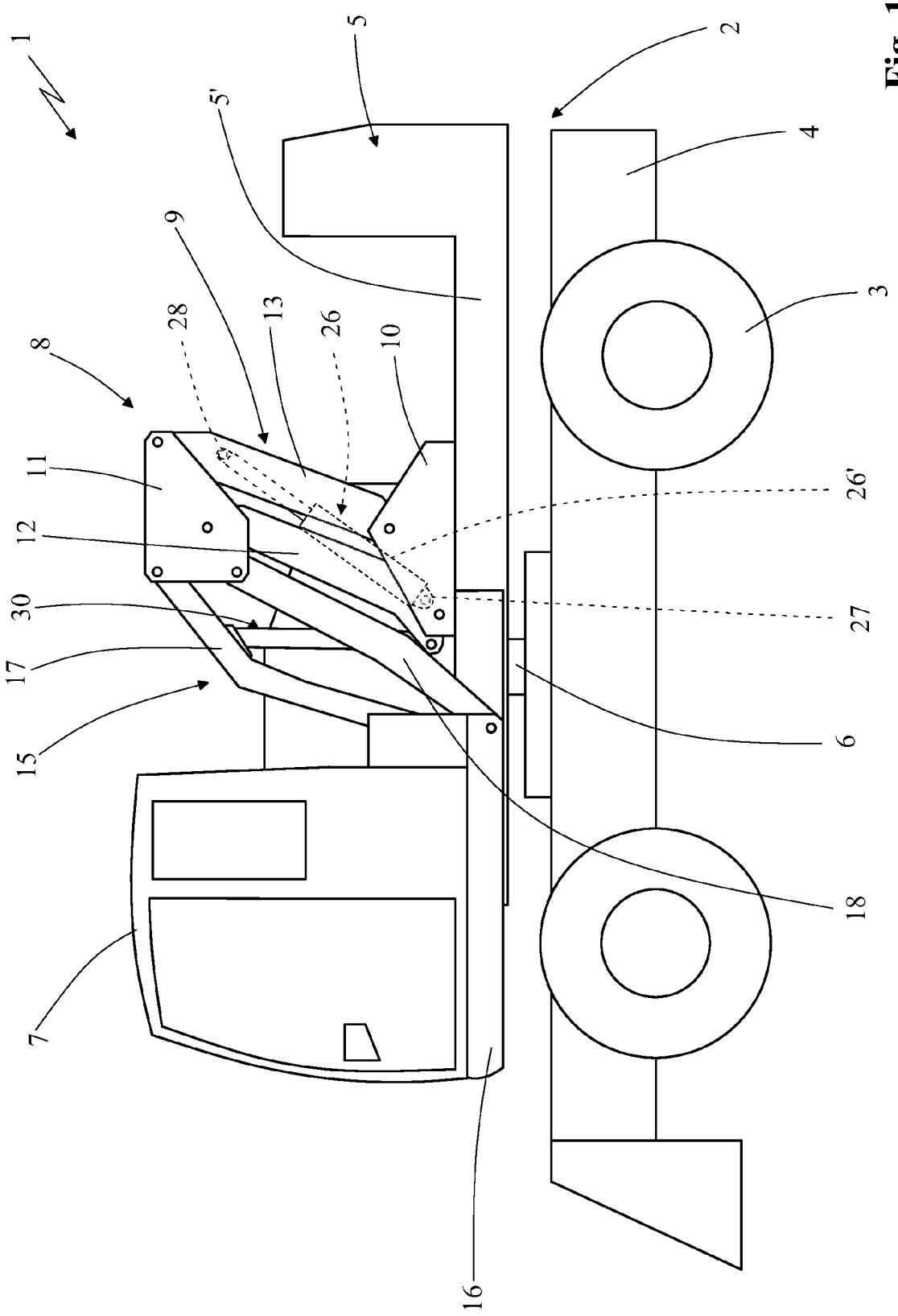

Fig. 1

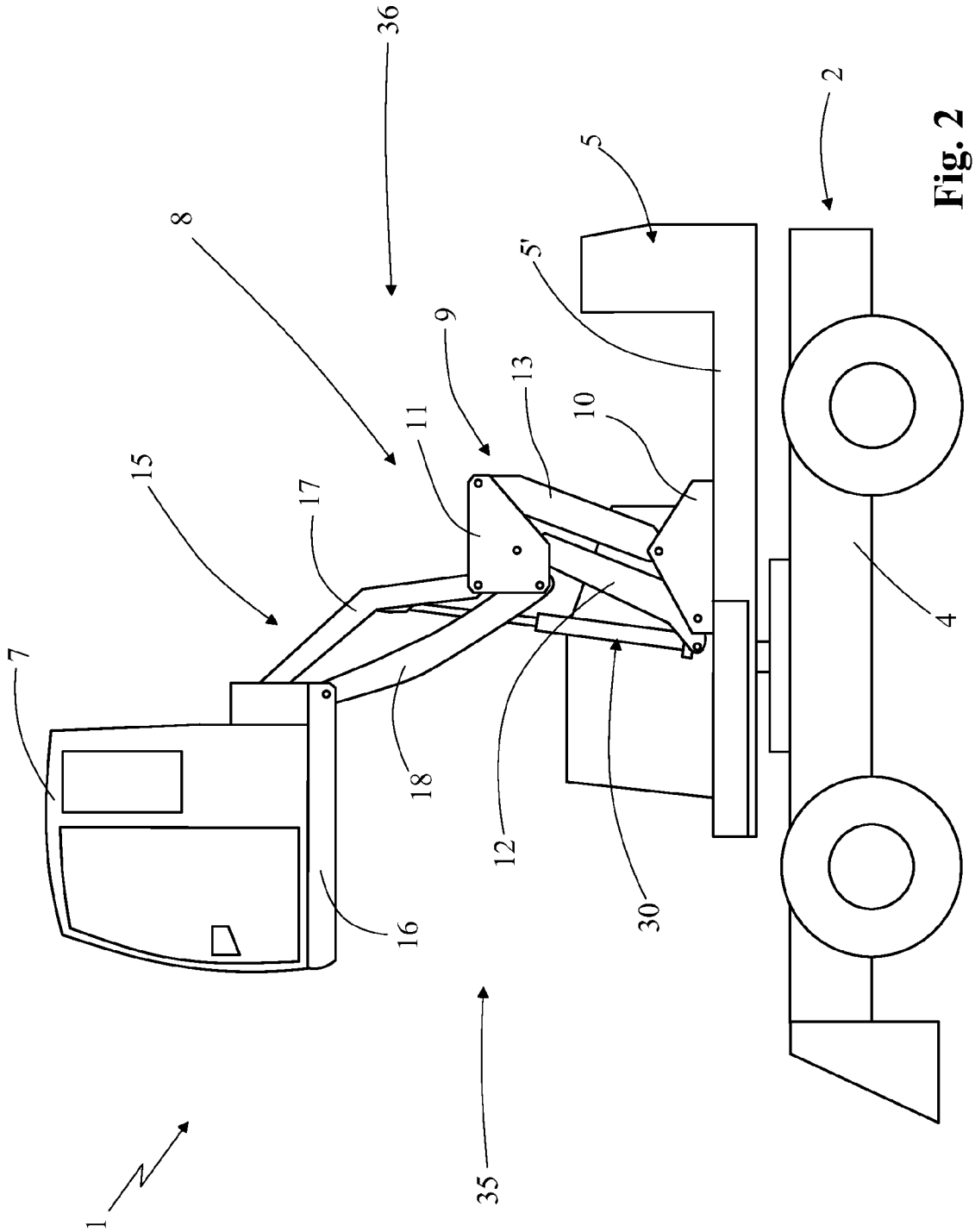

Fig. 2

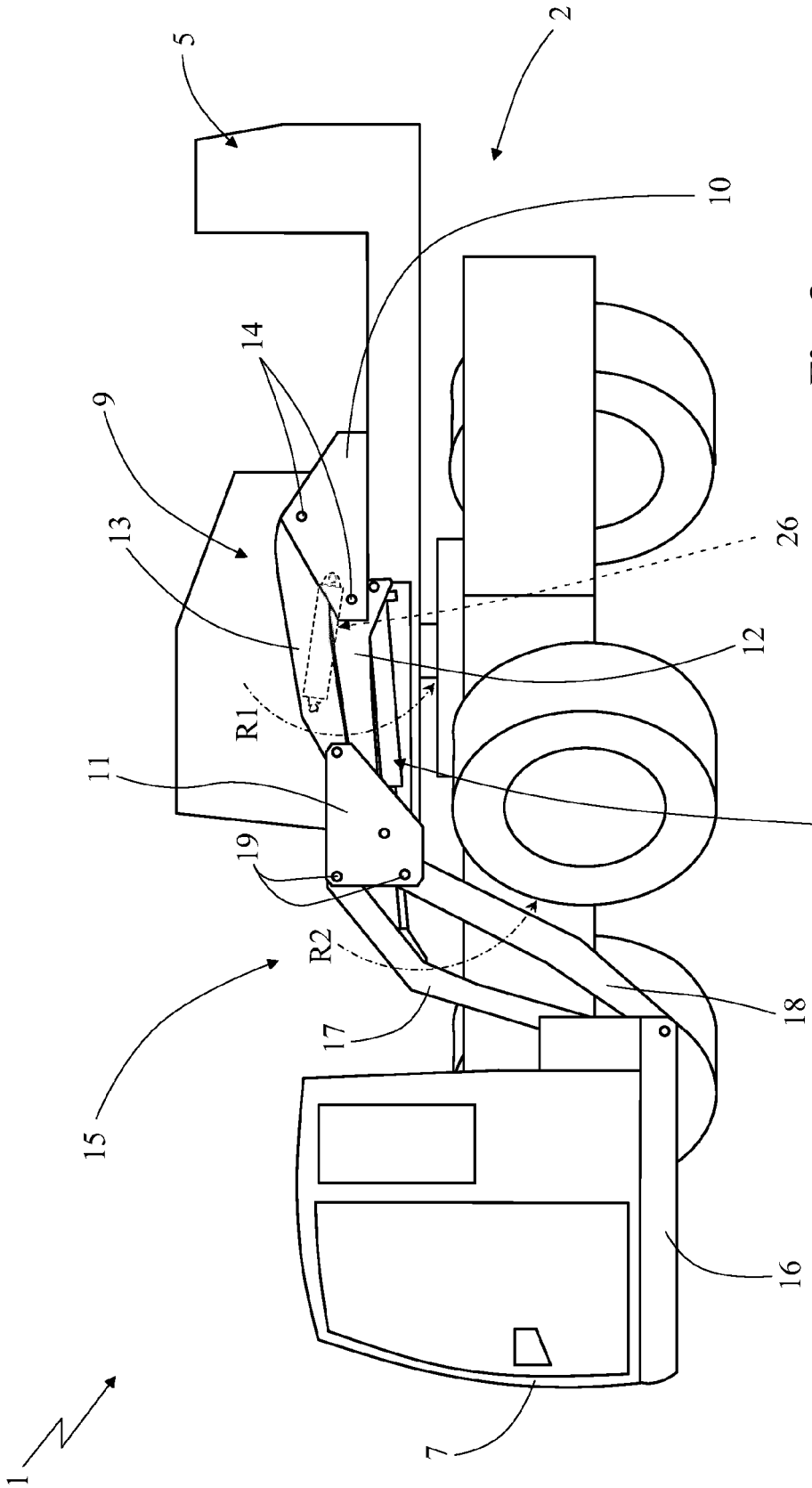

Fig. 3

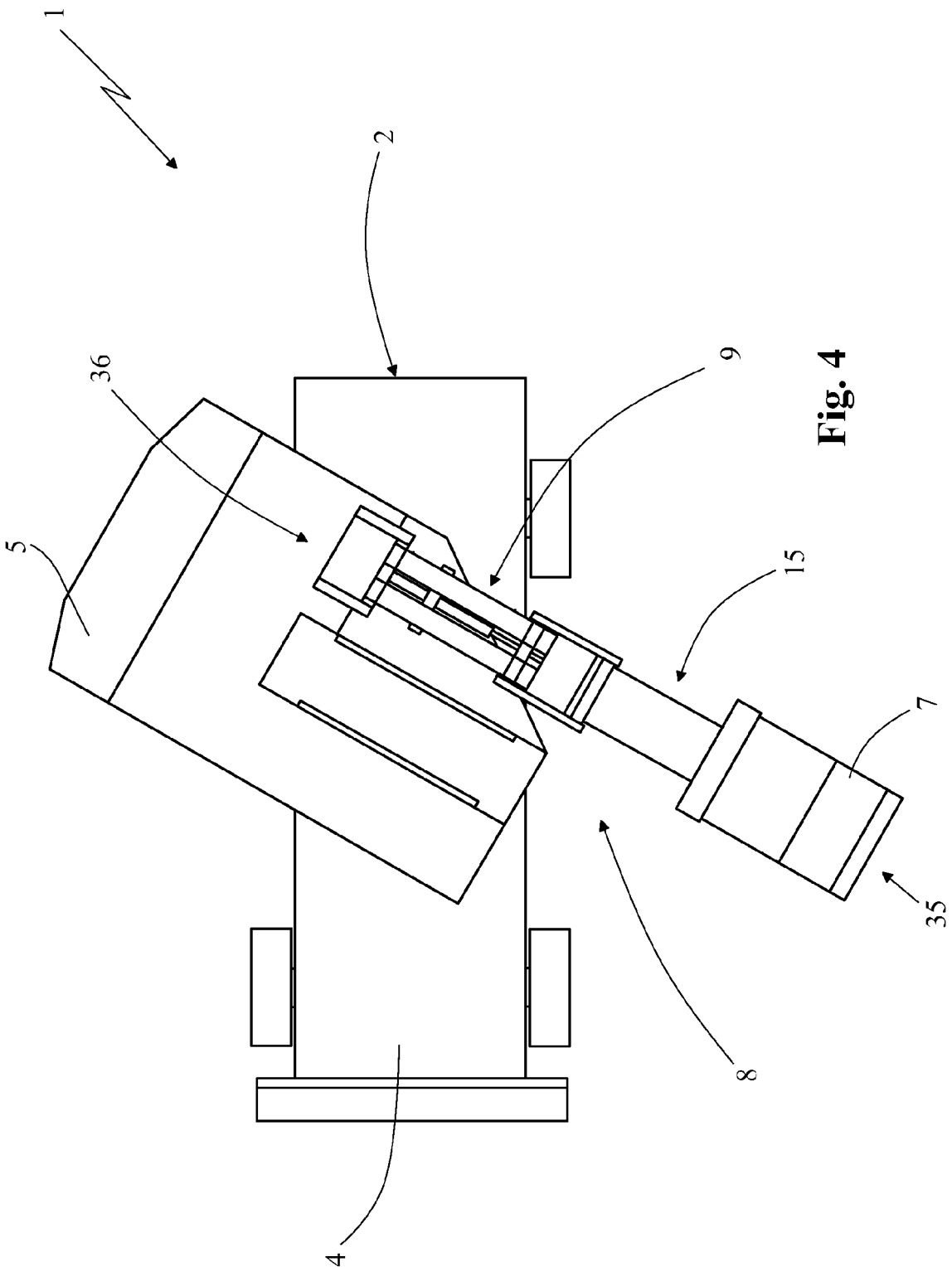

Fig. 4

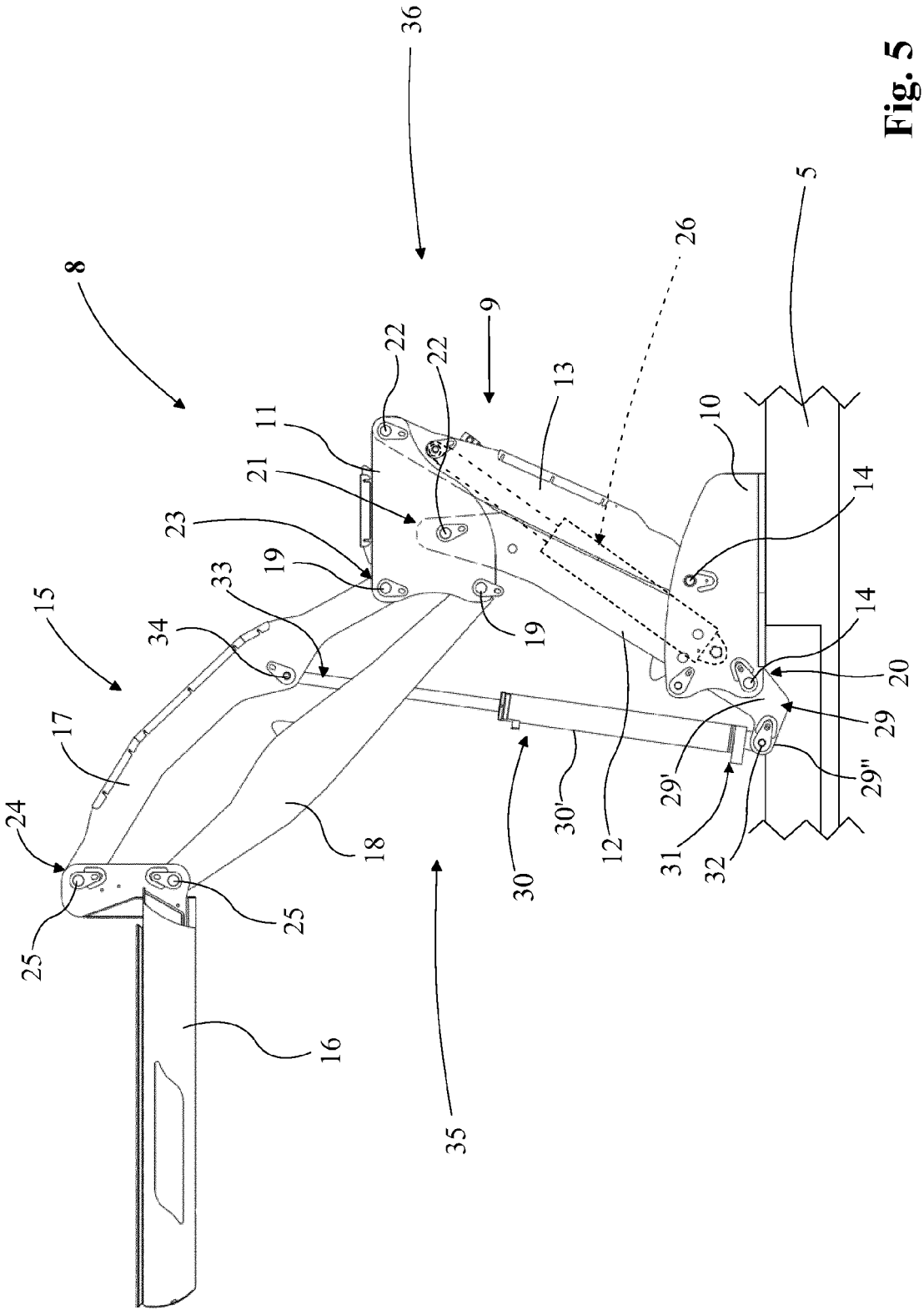
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Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 13 16 8811

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B66C
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 September 2013	Verheul, Omiros

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