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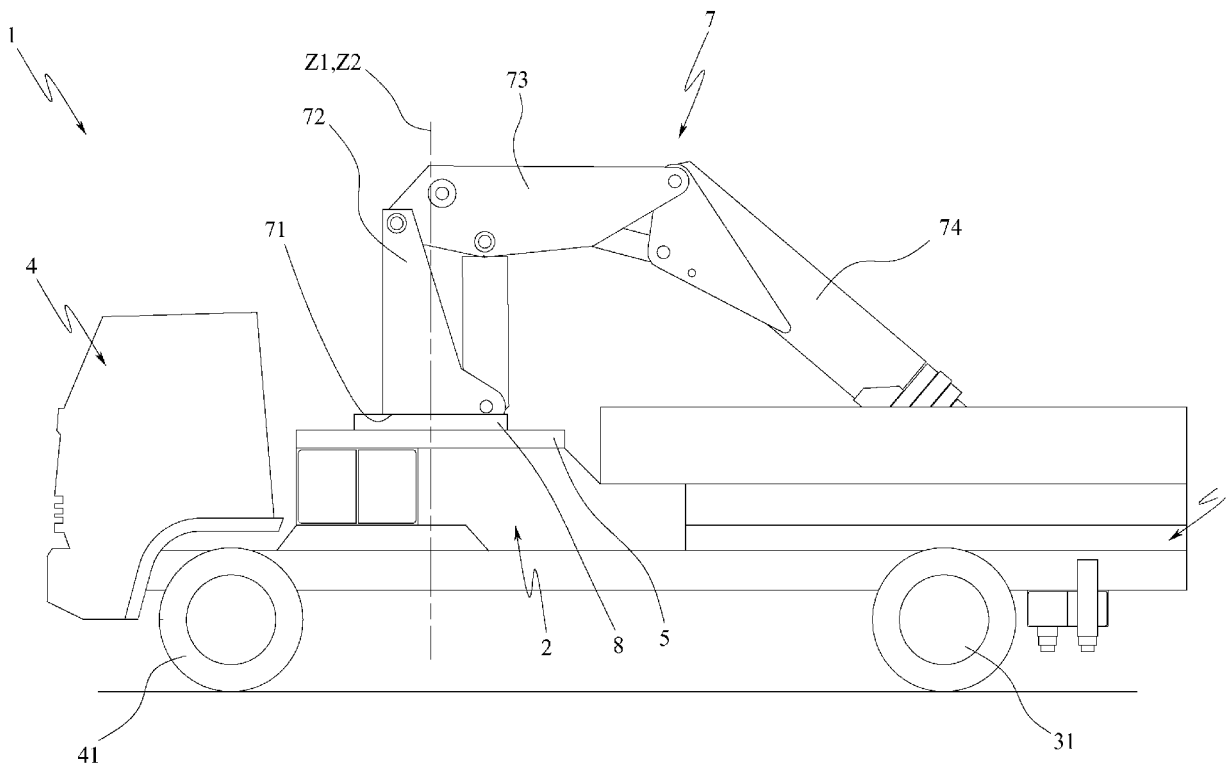
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(54) **LIFTING SYSTEM**

(57) A lifting system (1), comprising: a main frame (2), a platform (5) pivotally associated with the main frame (2) according to a first rotation axis (Z1), a first crane (6) fixed to the platform (5) in eccentric position with respect to the first rotation axis (Z1), and a second crane (7) piv-

otally associated with the platform (5) beside of the first crane (6) and with respect to a second rotation axis (Z2), which is parallel and eccentric with respect to the first rotation axis (Z1).



**FIG.1**

**Description**TECHNICAL FIELD

**[0001]** The present invention relates to a lifting system, for example for roadside emergency means or other.

PRIOR ART

**[0002]** As is known, to lift heavy and elongated objects, there is a need to grasp such objects close to the axial ends in order to avoid undesired movements of the object during the lifting.

**[0003]** However, it is not always possible to act in such manner, for example if a roadside emergency vehicle has to lift an overturned vehicle, since it is provided with a single crane and/or hoist, it may tow/lift the overturned vehicle by grasping it in one point alone.

**[0004]** Moreover, in given situations, the space occupied by an emergency vehicle may be an impeachment for the positioning of a second emergency vehicle which would allow lifting the overturned vehicle in an optimal manner.

**[0005]** Similar situations may occur also in other areas, for example at worksites when beams, large pipes and the like are to be lifted.

**[0006]** It is an object of the present invention to make available a lifting system capable of overcoming the mentioned drawbacks of the known technique, within the scope of a simple, rational and affordable solution.

**[0007]** Such objects are achieved by the features of the invention indicated in the independent claim. The dependent claims outline preferred and/or particularly advantageous aspects of the invention.

DESCRIPTION OF THE INVENTION

**[0008]** The invention particularly makes available a lifting system, comprising: a main frame, a platform pivotally associated with the main frame according to a first rotation axis, a first crane fixed to the platform in eccentric position with respect to the first rotation axis, and a second crane pivotally associated with the platform beside of the first crane and with respect to a second rotation axis, which is parallel and eccentric with respect to the first rotation axis.

**[0009]** Thereby, a relatively compact lifting system is made available provided with two cranes due to which a heavy and elongated object may be lifted by correctly grasping it by the ends.

**[0010]** One aspect of the invention provides for the lifting system to comprise an orientating unit for the first crane, adapted to put the platform into rotation with respect to the first rotation axis, and a second orientating unit for the second crane, adapted to put the second crane into rotation with respect to the second rotation axis, in which the orientating unit for the first crane is independent from the orientating unit for the second

crane.

**[0011]** Due to such solution, the system is particularly flexible and adaptable to any condition of use.

**[0012]** A further aspect of the invention provides for the first crane and the second crane to be associated with the platform in positions which are diametrically opposed with respect to the first rotation axis.

**[0013]** Thereby, the distribution of the weights is optimized over the platform, and therefore over the support bearings of the platform, thus allowing a more homogeneous wear of the rotating components.

**[0014]** Preferably, the first crane and the second crane may comprise respectively a first telescopic arm and a second telescopic arm.

**[0015]** Thereby, the cranes have a relatively large radius of action while remaining highly compact.

**[0016]** According to another aspect of the invention, the lifting system may comprise a cart supported by wheels to which the main frame is fixed.

**[0017]** Due to such solution, the lifting system may be easily transported to bring it where it is required.

**[0018]** According to a further aspect of the invention, the first rotation axis may be eccentric with respect to a vertical centreline plane of the cart containing the longitudinal axis of the cart itself.

**[0019]** Thereby, by rotating the platform, both cranes may be positioned on one side of the cart, thus allowing both to align them to the longitudinal axis of the cart and to take advantage of the maximum radius of action available to both cranes.

**[0020]** Another aspect of the invention provides for the lifting system to comprise a motor provided with wheels and associated with the main frame, in which the platform is interposed in a plan view between the motor and the cart.

BRIEF DESCRIPTION OF THE DRAWINGS

**[0021]** Further features and advantages of the invention will be more apparent after reading the following description provided by way of a non-limiting example, with the aid of the accompanying drawings.

Figure 1 is a side view of a lifting system according to the invention.

Figure 2 is a plan view of the lifting system in figure 1. Figure 3 is a plan view of the system in figure 1, in an operating configuration.

Figure 4 is a plan view of the lifting system in figure 2, in a further operation configuration.

IMPROVED METHOD FOR IMPLEMENTING THE INVENTION

**[0022]** With particular reference to the drawings, indicated overall with numeral 1 is a lifting system comprising a main frame 2 and a cart 3, which is supported by at least one pair of wheels 31 and is fixed to the main frame

2.

**[0023]** Preferably, the system 1 comprises a motor 4 associated with the main frame 2, for example fixed to the main frame 2, and provided with wheels 41 for pulling the motor itself.

**[0024]** However, it is not excluded, in another embodiment of the invention, for the motor 4 to be associated with the main frame 2, i.e. with the cart 3, by means of a joint and/or an articulated element.

**[0025]** The system 1 comprises a platform 5 pivotally associated with the main frame 2 according to a first rotation axis Z1, for example interposed in a plan view between the motor 4 and the cart 3.

**[0026]** The platform 5 may for example be pivotally associated with the load-bearing frame 2 by means of an articulate coupling defining the first rotation axis Z1.

**[0027]** The first rotation axis Z1 is substantially perpendicular to the lying plane of the platform 5, i.e. in the embodiment shown in the drawings, i.e. it is substantially perpendicular to a plane containing a longitudinal axis of the cart 3 and a rotation axis of the pair of wheels 31 of the cart 3.

**[0028]** The system 1 may comprise levelling means adapted to stabilise and/or tilt the main frame 2 with respect to the ground on which the system is resting.

**[0029]** Due thereto, it may be possible to tilt the frame so that when the system is in use, the first rotation axis Z1 is substantially vertical.

**[0030]** Moreover, the first rotation axis Z1 is eccentric with respect to a vertical centreline plane of the cart 3 containing the longitudinal axis of the cart itself. For example, the first rotation axis Z1 is positioned between said vertical centreline plane of the cart 3 and a longitudinal side of the cart itself.

**[0031]** The platform 5 has a volume in transverse direction, i.e. perpendicular to the longitudinal axis of the cart 3, which is smaller than the volume in transverse direction of the cart 3.

**[0032]** For example, the volume in transverse direction of the platform 5 is substantially equal to 0.7 and 0.9 times the volume in transverse direction of the cart 3, preferably 0.8 times the volume in transverse direction of the cart 3.

**[0033]** Preferably, the platform 5 is disc-shaped and the rotation axis Z1 passes through the centre of such disc.

**[0034]** The system 1 comprises a first crane 6 fixed to the platform 5 in eccentric position with respect to the first rotation axis Z1, i.e. the first crane 6 comprises a base 61 fixed at the top to the platform 5 in eccentric position with respect to the first rotation axis Z1.

**[0035]** Basically, the first crane 6 is fixed to the platform 5 without rotational degrees of freedom with respect to an axis parallel to the first rotation axis Z1.

**[0036]** Namely, the base 61 is fixed at the top to the platform 5 without rotational degrees of freedom with respect to the platform 5, i.e. it is fixed to the platform 5 without any degrees of freedom with respect to the plat-

form 5.

**[0037]** The first crane 6 comprises a column 62 fixed to the base 61 and having a longitudinal axis which is substantially parallel to the first rotation axis Z1.

5 **[0038]** Namely, the first crane 6 comprises a column 62 fixed to the base 61 without rotational degrees of freedom with respect to the base 61 and having a longitudinal axis which is substantially parallel to the first rotation axis Z1.

10 **[0039]** Preferably, the column 62 is fixed to the base 61 without any degrees of freedom with respect to the base 61.

**[0040]** The first crane 6 comprises also an arm 63 hinged to an end of the column 62 distal from the base 61 according to a first hinge axis lying on a plane substantially perpendicular to the longitudinal axis of the column.

15 **[0041]** Moreover, the first crane 6 comprises a telescopic arm 64 hinged to an end of the arm 63 distal from the column 62 according to a second hinge plane substantially parallel to the first hinge axis.

**[0042]** At the end of the telescopic arm 64 opposite to the arm 63, there is a hook or eyelet or a through hole for the connection of any gripping or hooking element.

20 **[0043]** The first crane 6 comprises a first actuation apparatus configured to rotate the arm 63 with respect to the column 62 according to the first hinge axis.

**[0044]** The first crane 6 comprises also a second actuation apparatus configured to rotate the telescopic arm 64 with respect to the arm 63 according to the second hinge axis, and a third actuation apparatus for extending and retracting the telescopic arm 64.

25 **[0045]** The system 1 is provided with an orientating unit 65 for the first crane 6, which is configured to put the platform 5 into rotation, i.e. the first crane 6 with respect to the rotation axis Z1.

**[0046]** For example, the orientating unit 65 is configured to rotate the platform 5 by 360° with respect to the first rotation axis Z1 and to allow the locking of said platform 5 in any angular position.

30 **[0047]** Preferably, the orientating unit 65 is mechanically coupled to the articulate coupling of the platform 5.

**[0048]** The system 1 comprises a second crane 7 pivotally associated with the platform 5 with respect to a second rotation axis Z2, which is parallel and eccentric with respect to the first rotation axis Z1.

35 **[0049]** Preferably, the second crane 7 is fixed to an upper platform 8, which is pivotally associated with the platform 5 by means of an articulate coupling defining the second rotation axis Z2.

**[0050]** The second rotation axis Z2 is positioned diametrically opposed to the first crane 6 with respect to the first rotation axis Z1.

40 **[0051]** The platform 8 is for example, disc-shaped and the second rotation axis Z2 passes through the centre of such disc.

45 **[0052]** The second crane 7 is substantially identical to the first crane 6.

**[0053]** However, it is not excluded for the second crane 7 to be different from the first crane 6.

**[0054]** The second crane 7 comprises a base 71 fixed at the top to the upper platform 8.

**[0055]** Namely, the base 71 is fixed at the top to the upper platform 8 without rotational degrees of freedom with respect to the upper platform 8, i.e. it is fixed to the upper platform 8 without any degrees of freedom with respect to the upper platform 8. The second crane 7 comprises a column 72 fixed to the base 71 and having a longitudinal axis which is substantially parallel to the first rotation axis Z1 or to the second rotation axis Z2.

**[0056]** Namely, the second crane 7 comprises a column 72 fixed to the base 71 without rotational degrees of freedom with respect to the base 71 and having a longitudinal axis which is substantially parallel to the first rotation axis Z1 or to the second rotation axis Z2.

**[0057]** Preferably, the column 72 is fixed to the base 71 without any degrees of freedom with respect to the base 71.

**[0058]** The second crane 7 comprises also an arm 73 hinged to an end of the column 72 distal from the base 71 according to a first hinge axis lying on a plane substantially perpendicular to the longitudinal axis of the column 72.

**[0059]** Moreover, the second crane 7 comprises a telescopic arm 74 hinged to an end of the arm 73 distal from the column 72 according to a second hinge plane substantially parallel to the first hinge axis.

**[0060]** At the end of the telescopic arm 74 opposite to the arm 73, there is a hook or eyelet or a through hole for the connection of any gripping or hooking element.

**[0061]** The second crane 7 comprises a first actuation apparatus configured to rotate the arm 73 with respect to the column 72 according to the first hinge axis.

**[0062]** The second crane 7 comprises also a second actuation apparatus configured to rotate the telescopic arm 74 with respect to the arm 73 according to the second hinge axis, and a third actuation apparatus for extending and retracting the telescopic arm 74.

**[0063]** The second crane 7 is adapted to rotate with respect to the second rotation axis Z2 between a first position, in which the arm 73 of the second crane 7 is parallel to and placed side-by-side the arm 63 of the first crane 6, and a second position, in which a longitudinal axis of the arm 73 forms an obtuse angle with a longitudinal axis of the arm 63.

**[0064]** For example, the obtuse angle formed by the longitudinal axis of the arm 63 of the first crane 6 with the longitudinal axis of the arm 73 of the second crane 7 is comprised between 160° and 140°, preferably 150°.

**[0065]** The system 1 is provided with an orientating unit 75 for the second crane 7, which is configured to put the upper platform 8 into rotation, i.e. the base 71 of the second crane 7, between the first position and the second position, and to allow the locking of said base 71 in the first position, in the second position and in any intermediate position between the first position and the second

position.

**[0066]** The orientating unit 75 for the second crane 7 is independent from the orientating unit 65 for the first crane 6.

5 **[0067]** Preferably, the orientating unit 75 is mechanically coupled to the articulate coupling of the upper platform 8.

**[0068]** It is not excluded, in an alternative embodiment not shown in the drawings, for the system 1 to comprise a plurality of cranes, for example each one pivotally associated with the platform 5 independently from the other cranes, or each fixed or pivotally associated with a platform which is pivotally associated with the platform of another crane.

10 **[0069]** The following is the operation of the lifting system 1 described.

**[0070]** When the lifting system 1 is transported, or it moves, to reach the object to be lifted, the orientating unit 65 for the first crane 6 and the orientating unit 75 for the second crane 7 rotate the respective cranes 6, 7 with respect to the respective rotation axes Z1, Z2 so that the telescopic arms 64, 74, are placed side-by-side and parallel to the longitudinal axis of the cart 3.

**[0071]** Once it has reached the object to be lifted, after stabilizing the cart 3 by means of the levelling means, the orientating unit 65 rotates the platform 5 so that the telescopic arm 64 of the first crane 6 may reach an axial end of the object to be lifted and the orientating unit 75 rotates the second crane 7 so that the telescopic arm 75 may reach the other axial end of the object to be lifted.

**[0072]** It is recommended to place the cart 3 side-by-side the object to be lifted by arranging it so that the object is beside the longitudinal side of the cart 3 closest to the first rotation axis Z1.

20 **[0073]** Then, the object to be lifted is secured to the telescopic arms 64, 74 to then proceed to lift the object.

**[0074]** The invention thus conceived is susceptible to several modifications and variations, all falling within the scope of the invention concept.

30 **[0075]** Moreover, all the details can be replaced by other technically equivalent elements.

**[0076]** Practically, any materials and also any contingent shapes and sizes may be used, depending on the needs, without departing from the scope of protection of the following claims.

## Claims

50 1. A lifting system (1), comprising:

- a main frame (2),
- a platform (5) pivotally associated with the main frame (2) according to a first rotation axis (Z1),
- a first crane (6) fixed to the platform (5) in eccentric position with respect to the first rotation axis (Z1), and
- a second crane (7) pivotally associated with

the platform (5) beside the first crane (6) and with respect to a second rotation axis (Z2), which is parallel and eccentric with respect to the first rotation axis (Z1).

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2. The system (1) according to claim 1, comprising an orientating unit (65) for the first crane (6), adapted to put the platform (5) into rotation with respect to the first rotation axis (Z1), and an orientating unit (75) for the second crane (7), adapted to put the second crane (7) into rotation with respect to the second rotation axis (Z2), wherein the orientating unit (65) for the first crane (6) is independent from the orientating unit (75) for the second crane (7).  
10
3. The system (1) according to claim 1, wherein the first crane (6) and the second crane (7) are associated with the platform (5) in diametrically opposed positions with respect to the first rotation axis (Z1).  
15
4. The system (1) according to claim 1, wherein the first crane (6) and the second crane (7) comprise respectively a first telescopic arm (64) and a second telescopic arm (74).  
20
5. The system (1) according to claim 1, comprising a cart (3) supported by wheels (31) to which the main frame (2) is fixed.  
25
6. The system (1) according to claim 5, wherein the first rotation axis (Z1) is eccentric with respect to a vertical centreline plane of the cart (3) containing a longitudinal axis of the cart itself.  
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7. The system (1) according to claim 5, comprising a motor (4) provided with wheels (41) and associated with the main frame, wherein the platform (5) is interposed in a plan view between the motor (4) and the cart (3).  
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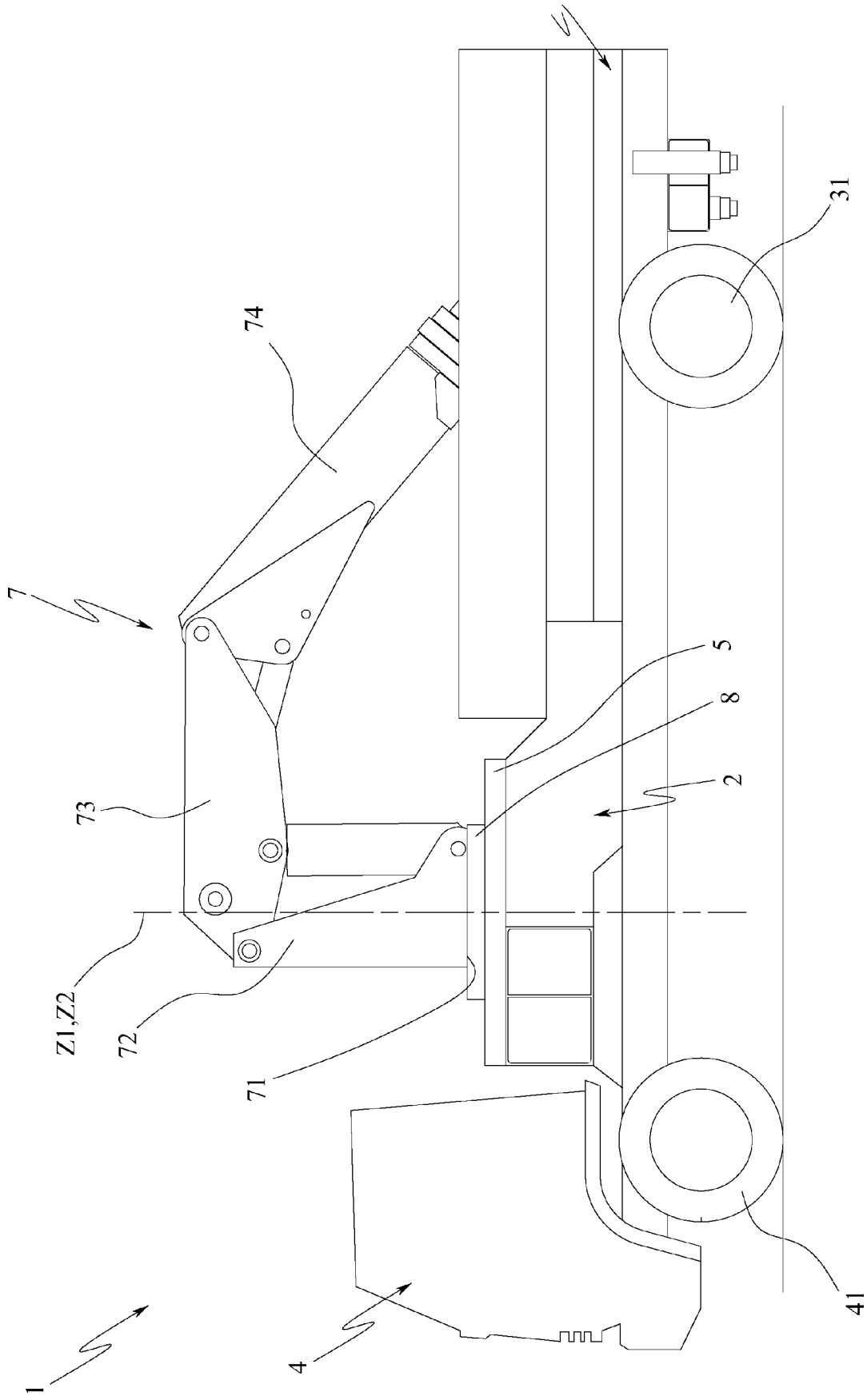


FIG.1

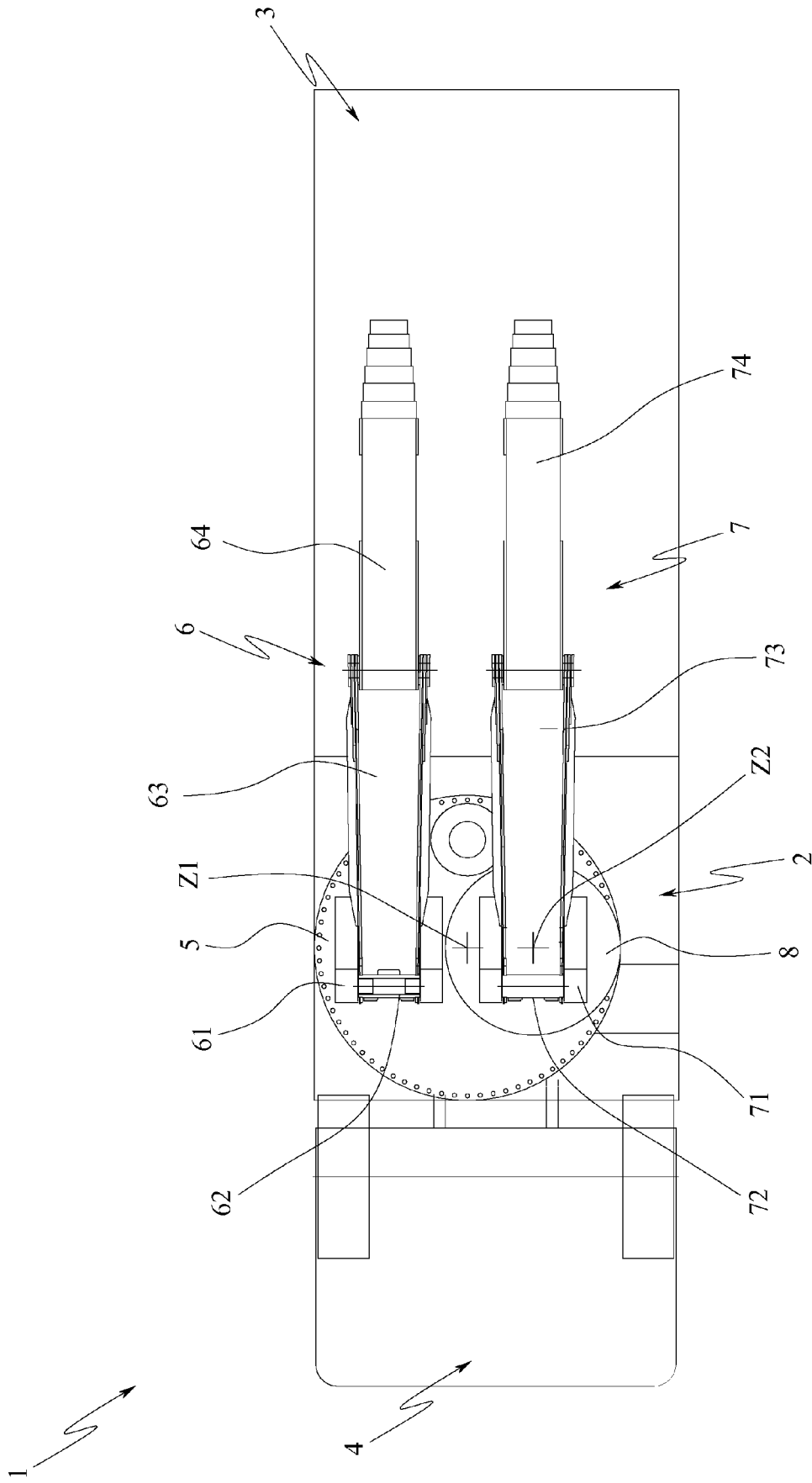
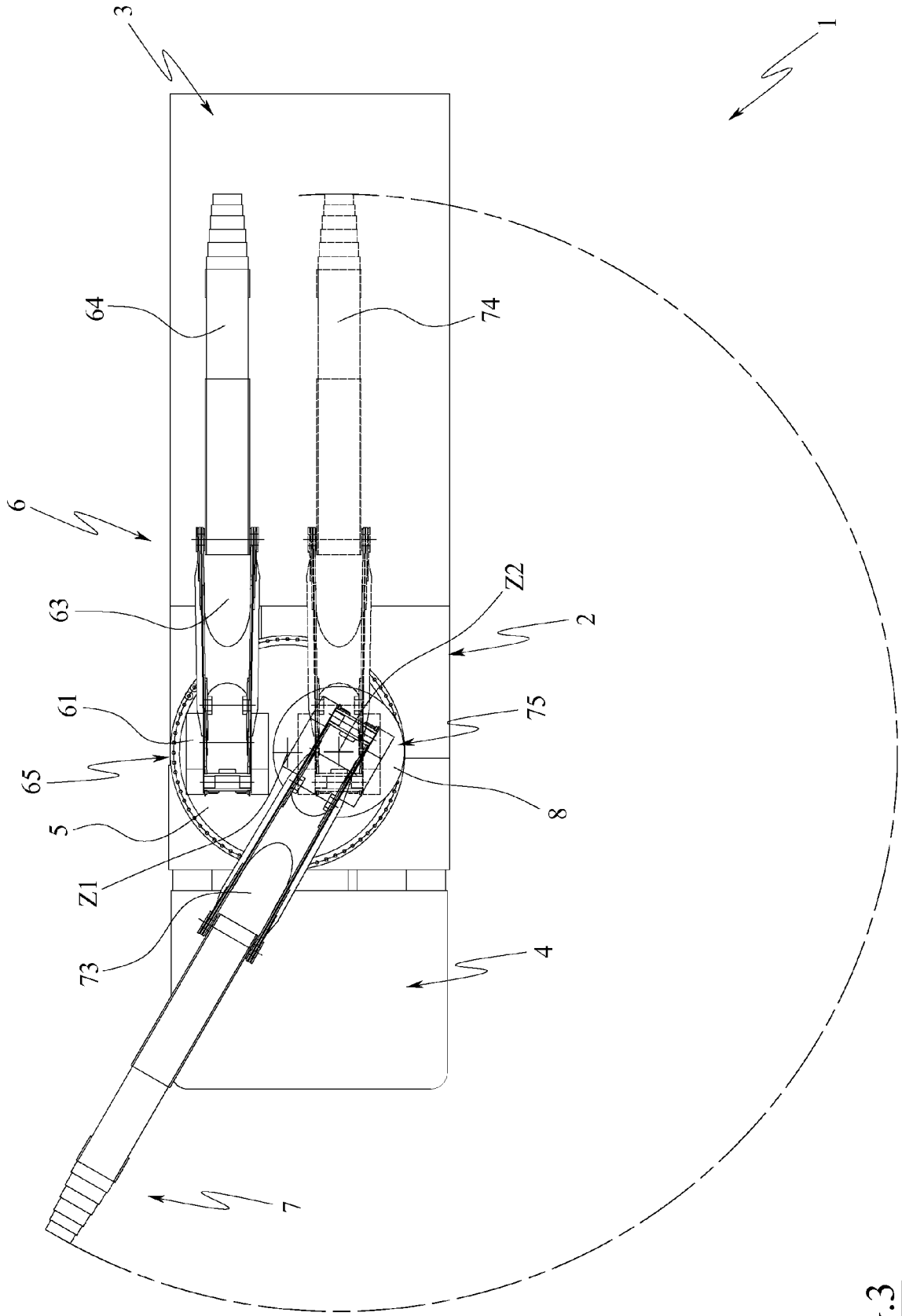


FIG.2



**FIG. 3**





EUROPEAN SEARCH REPORT

Application Number  
EP 18 16 9783

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| DOCUMENTS CONSIDERED TO BE RELEVANT   |   |   |   |
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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