(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 369 688 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.09.2018 Bulletin 2018/36

(51) Int Cl.:
B66C 13/04 *(2006.01)* ***B66C 13/08*** *(2006.01)*
B66C 23/36 *(2006.01)*

(21) Application number: **18159211.4**

(22) Date of filing: **28.02.2018**

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

(30) Priority: **02.03.2017 SE 1750229**

(71) Applicant: **Cargotec Patenter AB**
341-81 Ljungby (SE)

(72) Inventors:
- **Granström, Olov**
  Ljusdal (SE)
- **Bergman, Tomas**
  Hudiksvall (SE)
- **Morales, Daniel**
  Umeå (SE)
- **Rösth, Marcus**
  Hudiksvall (SE)

(74) Representative: **Bjerkéns Patentbyrå KB (Gävle)**
Box 1274
801 37 Gävle (SE)

(54) LOAD HANDLING CRANE

(57) A load handling crane comprising:
- a load handling tool (15) mounted at a boom tip (14) of a crane boom system (11);
- an electronic control device (21) for controlling the hydraulic cylinders (8, 10) of the crane boom system;
- a main manoeuvring device (20) provided with manoeuvring members manoeuvrable by a crane operator in order to control the position of the load handling tool via the electronic control device; and
- an auxiliary manoeuvring device (30) comprising an auxiliary manoeuvring member (31) to be manoeuvrable by a person standing in the vicinity of the load handling tool in order to control the position of the load handling tool via the electronic control device.

The auxiliary manoeuvring device comprises a base part (33) to be attached to the load handling tool (15) or a load (16) or the boom tip (14), the auxiliary manoeuvring member being fixed to the base part.

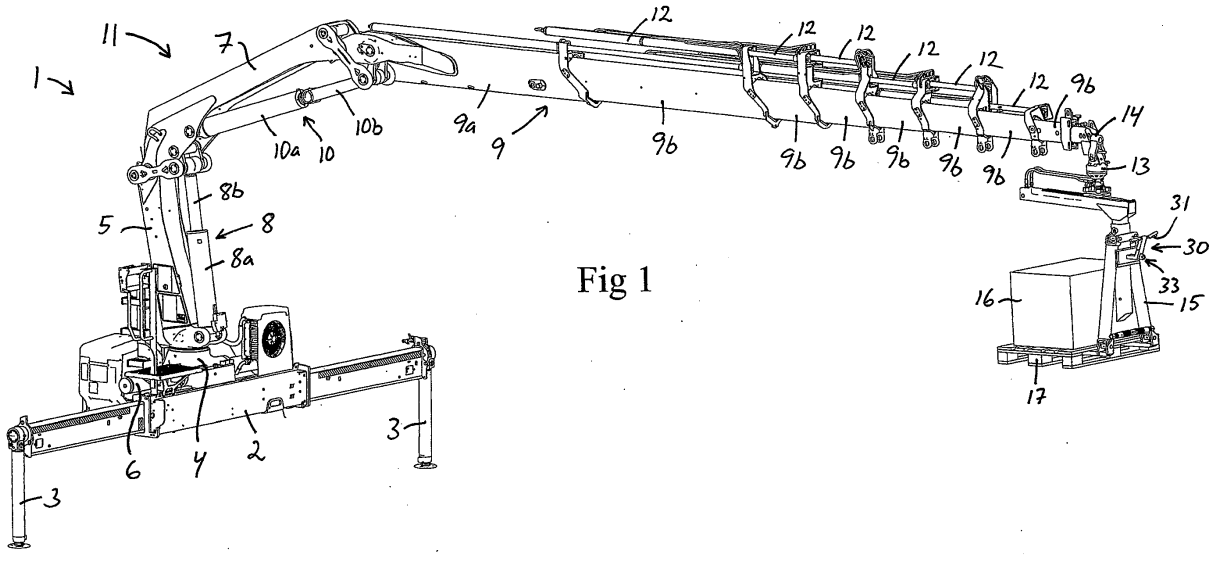


Fig 1

EP 3 369 688 A1

Description

FIELD OF THE INVENTION AND PRIOR ART

[0001] The present invention relates to a hydraulic load handling crane according to the preamble of claim 1.

[0002] A load handling crane in the form of a conventional lorry crane normally comprises a column, which is rotatable about a vertical axis of rotation, and a crane boom system, which is mounted to the column and which is intended to carry a load via a load handling tool suspended at a boom tip of the crane boom system, i.e. at the outer end of the outermost crane boom of the crane boom system. The load handling crane also comprises a manoeuvring device with one or more manoeuvring members configured to be manoeuvrable by a crane operator in order to control the crane boom movements. The individual movements of the crane booms of the crane boom system are regulated by an electronic control device based on control signals from the manoeuvring device. In order to facilitate for the crane operator to control the position of the load handling tool in an accurate manner, the control of the crane boom movements is with advantage based on so-called boom tip control. In the case of boom tip control, a first manoeuvring member may be used for controlling the rotation of the column, a second manoeuvring member may be used for controlling the movement of the boom tip in the vertical direction and a third manoeuvring member may be used for controlling the movement of the boom tip in the horizontal direction. The manoeuvring device could as an alternative be provided with a manoeuvring member in the form of a joystick to be used for controlling the movement of the boom tip in the vertical and horizontal directions.

[0003] The manoeuvring device is normally portable and carried by the crane operator, for instance by means of a waist belt or harness. For different reasons, such as for instance convenience, in order to save time and/or in order to be able to prevent unauthorized people from entering a safety zone around the lorry, the crane operator of a lorry crane normally remains in the vicinity of the lorry when controlling the crane boom movements by means of the portable manoeuvring device. When the crane boom system of the lorry crane has a long reach and a load has to be handled far away from the lorry, it is sometimes difficult or even impossible for the crane operator to visually observe the load handling tool and the load, such as for instance when the load is to be set down on or picked up from a spot on the roof of a high building. In such a situation, the crane operator may be assisted by a person which is standing in the vicinity of said spot and which communicates with the crane operator via a wireless communication system, for instance in the form of a radio system, wherein the assisting person instructs the crane operator verbally how to move the boom tip and the load handling tool. A disadvantage with such a solution is that there is a risk for the crane operator to misunderstand the verbal instructions from the assisting person, which may result in accidents.

OBJECT OF THE INVENTION

[0004] The object of the present invention is to provide a new and favourable manner of assisting a crane operator of a hydraulic load handling crane in a situation when the place where a load is to be picked up or set down is not within sight of the crane operator.

SUMMARY OF THE INVENTION

[0005] According to the present invention, said object is achieved by means of a load handling crane having the features defined in claim 1.

[0006] The load handling crane according to the invention comprises:

- a crane base;
- a column which is rotatably mounted to the crane base so as to be rotatable in relation to the crane base about an essentially vertical axis of rotation;
- an actuator for rotating the column;
- a crane boom system comprising two or more liftable and lowerable crane booms which are articulately connected to each other and hydraulic cylinders for lifting and lowering the crane booms, wherein a first crane boom of the crane boom system is articulately connected to the column and a second crane boom of the crane boom system is articulately connected to the first crane boom;
- a load handling tool mounted to the crane boom system at a boom tip of the crane boom system;
- an electronic control device for controlling said actuator and said hydraulic cylinders so as to control the rotation of the column and the movement of the crane booms and thereby control the position of the load handling tool;
- a main manoeuvring device with one or more main manoeuvring members configured to be manoeuvrable by a crane operator in order to control the position of the load handling tool, wherein the main manoeuvring device is configured to transmit control signals to the electronic control device related to the manoeuvring of said manoeuvring members; and
- an auxiliary manoeuvring device with at least one auxiliary manoeuvring member configured to be manoeuvrable by a person standing in the vicinity of the load handling tool in order to control the position of the load handling tool, wherein the auxiliary manoeuvring device is configured to transmit control signals to the electronic control device related to the manoeuvring of the auxiliary manoeuvring member.

[0007] The auxiliary manoeuvring device comprises a base part which is configured to be attached to the load handling tool or to a load carried by the load handling tool or to the boom tip of the crane boom system, wherein

the auxiliary manoeuvring member is fixed to the base part.

[0008] Thus, a person standing in the vicinity of the load handling tool at a place out of sight of the ordinary crane operator may take over the manoeuvring of the crane by means of the auxiliary manoeuvring device. By having the auxiliary manoeuvring device attached to the load handling tool or to a load carried by the load handling tool or to the boom tip of the crane boom system, the auxiliary manoeuvring device will always be available to a person standing in the vicinity of the load handling tool. Owing to the fact that the auxiliary manoeuvring device is attached to the load handling tool or to a load carried by the load handling tool or to the boom tip of the crane boom system, it will also be possible to design the auxiliary manoeuvring device in such a manner that the boom tip of the crane boom system is made to move in the direction in which the person pulls or pushes the auxiliary manoeuvring member of the auxiliary manoeuvring device, whereby the crane can be manoeuvred in a simple and intuitive manner by means of the auxiliary manoeuvring device.

[0009] Further advantageous features of the load handling crane according to the present invention will appear from the description following below and the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The invention will in the following be more closely described by means of embodiment examples, with reference to the appended drawings. In the drawings:

Fig 1 is a schematic perspective view of a load handling crane according to an embodiment of the present invention,

Fig 2 is a schematic perspective view of a main manoeuvring device with a number of main manoeuvring members for controlling different crane functions,

Fig 3 is a schematic perspective view of a load handling tool and an auxiliary manoeuvring device included in the load handling crane of Fig 1,

Fig 4 is a schematic perspective view of the auxiliary manoeuvring device,

Fig 5 is a schematic lateral view of the auxiliary manoeuvring device and a part of the load handling tool, as seen with the auxiliary manoeuvring device removed from the load handling tool,

Fig 6 is a schematic perspective view of the auxiliary manoeuvring device, as seen when attached to a load,

Fig 7 is a schematic lateral view of the auxiliary manoeuvring device and the load handling tool, as seen with a flexible and elongated pulling element secured to a bracket included in the auxiliary manoeuvring device,

Fig 8 is a schematic illustration of an auxiliary manoeuvring device according to an alternative variant attached to a load handling tool, and

Fig 9 is an outline diagram of parts included in a load handling crane according to the invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0011] In this description, the expression "liftable and lowerable crane boom" refers to a crane boom which can be pivoted in a vertical plane so as to thereby perform liftings and lowerings of a load carried by the crane. The expression "hydraulic cylinder for lifting and lowering the crane boom" here refers to the hydraulic cylinder which is associated with the liftable and lowerable crane boom and which carries out the pivoting thereof in a vertical plane.

[0012] Fig 1 shows a hydraulic load handling crane 1 according to an embodiment of the present invention. The crane 1 comprises a frame 2, which for instance can be connected to the chassis of a lorry. The frame 2 is provided with adjustable support legs 3 for supporting the crane 1.

[0013] The crane 1 further comprises:

- a crane base 4, which is fixed to the frame 2;
- a column 5, which is rotatably mounted to the crane base 4 so as to be rotatable in relation to the crane base about an essentially vertical axis of rotation by means of an actuator 6, for instance in the form of a hydraulic cylinder;
- a liftable and lowerable first crane boom 7, here denominated inner boom, which is articulately connected to the column 5 in such a manner that it is pivotable in relation to the column about an essentially horizontal axis of rotation;
- a first hydraulic cylinder 8 for lifting and lowering the inner boom 7 in relation to the column 5;
- a liftable and lowerable second crane boom 9, here denominated outer boom, which is articulately connected to the inner boom 7 in such a manner that it is pivotable in relation to the inner boom 7 about an essentially horizontal axis of rotation; and
- a second hydraulic cylinder 10 for lifting and lowering the outer boom 9 in relation to the inner boom 7.

[0014] In the illustrated example, the first hydraulic cylinder 8 comprises a cylinder part 8a which is articulately connected to the column 5, and a piston which is received in the cylinder part 8a and displaceable in relation to it,

wherein the piston is fixed to a piston rod 8b which is articulately connected to the inner boom 7. The second hydraulic cylinder 10 comprises a cylinder part 10a which is articulately connected to the inner boom 9, and a piston which is received in the cylinder part 10a and displaceable in relation to it, wherein the piston is fixed a piston rod 10b which is articulately connected to the outer boom 9.

[0015] In the illustrated embodiment, the crane boom system 11 of the crane 1 is formed by the inner boom 7 and the outer boom 9 and the associated hydraulic cylinders 8, 10. However, the crane boom system 11 of the crane 1 may as an alternative include more than two liftable and lowerable crane booms articulately connected to each other. One or more of the crane booms of the crane boom system 11 may be telescopically extensible, for instance by means of one or more hydraulic cylinders, in order to enable an adjustment of the extension length thereof.

[0016] In the illustrated embodiment, the outer boom 9 is telescopically extensible and comprises a base section 9a and several telescopic crane boom sections 9b which are mutually slidable in relation to each other in the longitudinal direction of the outer boom 9 for adjustment of the extension length thereof. The telescopic crane boom sections 9b are displaceable in relation to the base section 9a and in relation to each other by means of hydraulic cylinders 12 carried by the outer boom 9.

[0017] In the illustrated embodiment, a rotator 13 is articulately fastened to a boom tip 14 at the outer end of the outer boom 9, which rotator in its turn carries a load handling tool 15. In the illustrated example, the load handling tool 15 is a crane fork, which for instance may be used for lifting a load 16 resting on a loading pallet 17. However, the crane 1 of the present invention may also be provided with another type of load handling tool, such as for instance a lifting hook or a hydraulic gripping tool in the form of a so-called grapple.

[0018] The crane 1 comprises a main manoeuvring device 20, for instance in the form of a portable manoeuvring device of the type illustrated in Fig 2, with one or more main manoeuvring members S1-S6 configured to be manoeuvrable by a crane operator in order to control the movement of the boom tip 14 of the crane boom system 11 and thereby the movement of the load handling tool 15. Control signals are transmitted via cable or a wireless connection from the manoeuvring device 20 to an electronic control device 21 (very schematically illustrated in Fig 9), which in its turn controls the hydraulic cylinders 6, 8, 10, 12 and the other actuators of the crane 1 in a conventional manner in dependence on the control signals from the manoeuvring device 20 related to the manoeuvring of the main manoeuvring members S1-S6. The electronic control device 21 comprises a microprocessor or the similar for processing the control signals from the main manoeuvring device 20.

[0019] The electronic control device 21 is with advantage configured to control the crane boom movements on the basis of a calculation model for boom tip control. The calculation model may for instance be stored as an algorithm in a memory of the electronic control device 21. In the case of boom tip control, a first manoeuvring member S1 may be used for controlling the rotation of the column 5 in relation to the crane base 4, a second manoeuvring member S2 may be used for controlling the movement of the boom tip 14 in a vertical direction in order to control the height of the boom tip 14 and a third manoeuvring member S3 may be used for controlling the movement of the boom tip 14 in a horizontal direction in order to control the lifting radius. The main manoeuvring device 20 could as an alternative be provided with a main manoeuvring member in the form of a joystick to be used for controlling the movement of the boom tip 14 in the vertical and horizontal directions.

[0020] The crane 1 comprises an auxiliary manoeuvring device 30 with at least one auxiliary manoeuvring member 31, 31' configured to be manoeuvrable by a person standing in the vicinity of the load handling tool 15 in order to allow that person to control the movement of the boom tip 14 of the crane boom system 11 and thereby the position of the load handling tool 15. The auxiliary manoeuvring device 30 is configured to transmit control signals to the electronic control device 21 related to the manoeuvring of the auxiliary manoeuvring member 31, 31', wherein the electronic control device 21 in its turn controls the hydraulic cylinders 6, 8, 10, 12 and the other actuators of the crane 1 in dependence on the control signals from the auxiliary manoeuvring device 30 related to the manoeuvring of the auxiliary manoeuvring member 31, 31'. The auxiliary manoeuvring device 30 comprises a communication unit 32 (very schematically illustrated in Fig 9) for wireless transmission of control signals to the electronic control device 21.

[0021] The auxiliary manoeuvring device 30 comprises a base part 33 which is configured to be attached to the load handling tool 15 (as illustrated in Fig 3) or to a load 16 carried by the load handling tool (as illustrated in Fig 6) or to the boom tip 14 of the crane boom system 11. The auxiliary manoeuvring member 31, 31' is fixed to the base part 33. The base part 33 is preferably configured for releasable attachment to the load handling tool 15 or to a load 16 carried by the load handling tool or to the boom tip 14. As an alternative, the base part 33 may be permanently fixed to the load handling tool 15.

[0022] In the embodiment illustrated in Figs 3-7, one or more permanent magnets 34 (see Fig 4) are fixed to the base part 33, wherein the magnets 34 are configured to be magnetically attracted to a metallic element at the boom tip 14 or on the load handling tool 15 or on a load 16 carried by the load handling tool in order to keep the base part 33 attached to this metallic element. In the illustrated example, the magnets 34 are fixed to a mounting plate 38 included in the base part 33.

[0023] As illustrated in Fig 5, the load handling tool 15 may be provided with a holder 18 designed for receiving the above-mentioned mounting plate 38. A snap lock or

the similar may be provided on the holder 18 and/or on the mounting plate 38 in order to lock the mounting plate reliably to the holder 18.

[0024] The auxiliary manoeuvring member 31, 31' preferably has the form of a handle or handlebar to be gripped by one or both hands of a person standing in the vicinity of the load handling tool 15, wherein the auxiliary manoeuvring device 30 comprises a force sensing unit 35 (very schematically illustrated in Fig 9) for sensing the direction and magnitude of the force exerted onto the base part 33 via the auxiliary manoeuvring member 31, 31' by a person gripping the auxiliary manoeuvring member. The auxiliary manoeuvring device 30 further comprises an electronic processing unit 36 (very schematically illustrated in Fig 9) which is connected to the force sensing unit 35 in order to receive measuring signals from the force sensing unit as to the direction and magnitude of the force exerted onto the base part 33 via the auxiliary manoeuvring member 31, 31' by a person gripping the auxiliary manoeuvring member 31, 31', wherein the electronic processing unit 36 is configured to convert these measuring signals into control signals for transmission to the electronic control device 21 of the crane 1.

[0025] The force sensing unit 35 may comprise strain gauges 37 for sensing the direction and magnitude of the force exerted onto the base part 33 via the auxiliary manoeuvring member 31, 31' by a person gripping the auxiliary manoeuvring member. However, the force sensing unit 35 may as an alternative comprise any other suitable type of sensors for sensing the direction and magnitude of the force exerted onto the base part 33 via the auxiliary manoeuvring member 31, 31' by a person gripping the auxiliary manoeuvring member.

[0026] The communication unit 32 of the auxiliary manoeuvring device 30 may comprise a radio transceiver for communicating with the electronic control device 21. It is of course also possible to use any other suitable technique for wireless communication between the auxiliary manoeuvring device 30 and the electronic control device 21. The communication unit 32 and the electronic control device 21 are suitably adapted for bi-directional communication so that the communication unit 32 of the auxiliary manoeuvring device 30 can transmit control signals to the electronic control device 21 as well as receive control instructions from the electronic control device 21. The operation of the communication unit 32 is controlled by the electronic processing unit 36.

[0027] In the illustrated embodiments, the base part 33 comprises a mounting plate 38 and a bracket 39, the bracket having an inner end 39a facing the mounting plate 38 and an outer end 39b. The mounting plate 38 is configured for attachment to the load handling tool 15 or to a load 16 carried by the load handling tool or to the boom tip 14 of the crane boom system 11, wherein the bracket 39 is fixed to the mounting plate 38 at its inner end 39a and projects outwards from the mounting plate 38. The auxiliary manoeuvring member 31, 31' is fixed to the bracket 39 and the force sensing unit 35 is arranged in the bracket 39. The other electronic components of the auxiliary manoeuvring device 30, such as for instance the above-mentioned communication unit 32 and electronic processing unit 36, may be arranged in the bracket 39 or in the mounting plate 38.

[0028] In the embodiment illustrated in Figs 3-6, the auxiliary manoeuvring member 31 is mounted to the bracket 39 at the outer end 39b thereof. In this case, the auxiliary manoeuvring member 31 is rigidly fixed to the bracket 39. As an alternative, the auxiliary manoeuvring member 31' may be fixed to the bracket 39 via a flexible and elongated pulling element 40 in the form of a rope, a wire, a cable, a band or the similar, as illustrated in Figs 7 and 8. In the latter case, a person gripping the auxiliary manoeuvring member 31' exerts a pulling force on the bracket 39 via the pulling element 40.

[0029] In the embodiment illustrated in Fig 8, the pulling element 40 is permanently fixed to the bracket 39. In the embodiment illustrated in Fig 7, the pulling element 40 is removably fixed to the bracket 39 via an attachment eye 41 on the bracket. Thus, the auxiliary manoeuvring device 30 illustrated in Figs 3-7 may, at the choice of the person standing in the vicinity of the load handling tool 15, be operated by means of the auxiliary manoeuvring member 31 rigidly fixed to the bracket 39 or by means of the auxiliary manoeuvring member 31' removably fixed to the bracket 39 via the pulling member 40.

[0030] Particularly in the case when the auxiliary manoeuvring member 31' is fixed to the bracket 39 via a flexible and elongated pulling member 40, the auxiliary manoeuvring member 31' is with advantage provided with a reverse direction switch 42, for instance in the form of a push button, which is manually moveable between a first position representing a normal movement direction and a second position representing a reverse movement direction. A pulling force on the bracket 39 exceeding a given threshold magnitude is converted into control signals for moving the load handling tool 15 in a given first direction when the reverse direction switch 42 is in the first position and into control signals for moving the load handling tool 15 in the reverse direction when the reverse direction switch 42 is in the second position. As an example, a pulling force on the bracket 39 from the pulling member 40 may be converted into control signals for moving the load handling tool 15 in the pulling direction when the reverse direction switch 42 is in the first position and into control signals for moving the load handling tool 15 in a direction opposite to the pulling direction when the reverse direction switch 42 is in the second position. When the auxiliary manoeuvring member 31 is rigidly fixed to the bracket 39, it will be possible to exert a pulling force or pushing force on the bracket 39 in any direction by means of the auxiliary manoeuvring member 31. Thus, in the latter case, a reverse direction switch 42 of the above-mentioned type may be omitted.

[0031] The auxiliary manoeuvring member 31, 31' is with advantage provided with a dead-man's grip 43 which has to be pressed down by the person gripping the aux-

iliary manoeuvring member 31, 31' in order to allow the crane 1 to be manoeuvred under the control of the auxiliary manoeuvring device 30.

[0032] The reverse direction switch 42 and the switch associated with the dead-man's grip 43 on the auxiliary manoeuvring member 31' illustrated in Figs 7 and 8 are connected to the electronic processing unit 36 via a wireless connection or via wires extending along the pulling element 40.

[0033] The auxiliary manoeuvring device 30 further comprises an orientation sensing unit 44 (very schematically illustrated in Fig 9) for sensing the orientation of the base part 33 in relation to the crane boom system 11. The orientation sensing unit 44 may for instance comprise a gyro sensor 45 for sensing the orientation of the base part 33 in relation to the crane boom system 11. However, the orientation sensing unit 44 may as an alternative comprise any other suitable type of sensors, such as for instance tilt sensors, for sensing the orientation of the base part 33 in relation to the crane boom system 11. The electronic processing unit 36 is connected to the orientation sensing unit 44 in order to receive measuring signals from the orientation sensing unit as to the orientation of the base part 33 in relation to the crane boom system 11. The electronic processing unit 36 is configured to take the orientation of the base part 33 in relation to the crane boom system 11 into account when converting the measuring signals from the force sensing unit 35 into control signals for moving the boom tip 14 and the load handling tool 15.

[0034] The auxiliary manoeuvring device 30 also comprises a power supply unit (not shown), for instance in the form of a battery, which is responsible for the supply of electric current to the electric and electronic components of the auxiliary manoeuvring device 30.

[0035] When the ordinary crane operator, by means of the main manoeuvring device 20, has moved the load handling tool 15 to a position where it is out of sight of the crane operator, the crane operator may hand over the further manoeuvring of the crane 1 from the main manoeuvring device 20 to the auxiliary manoeuvring device 30. The main manoeuvring device 20 preferably comprises switching means by means of which the crane operator may select whether the main manoeuvring device 20 or the auxiliary manoeuvring device 30 is to have control of the manoeuvring of the crane 1. The switching means may for instance have the form of a manoeuvring member 46 (see Fig 2), for instance in the form of a push button, on the main manoeuvring device 20 or a menu-guided interface with a function which can be selected by the crane operator in order to hand over the manoeuvring of the crane 1 from the main manoeuvring device 20 to the auxiliary manoeuvring device 30.

[0036] The auxiliary manoeuvring device 30 is preferably provided with signalling means, for instance in the form of a lamp 47, which is configured to emit a given signal when the crane operator has actuated the above-mentioned switching means in a desire to hand over the manoeuvring of the crane 1 from the main manoeuvring device 20 to the auxiliary manoeuvring device 30. In a similar manner, the main manoeuvring device 20 is preferably provided with signalling means, for instance in the form of a lamp 48, which is configured to emit a given signal when a person standing in the vicinity of the load handling tool 15 has subsequently activated the auxiliary manoeuvring device 30 by pressing down the dead-man's grip 43 or by pressing a dedicated push button on the auxiliary manoeuvring device 30. The control of the manoeuvring of the crane 1 may for instance be returned to the main manoeuvring device 20 and the ordinary crane operator when the dead-man's grip 43 has been released for a given period of time, which may be signalled to the crane operator by means of a given signal emitted by the above-mentioned signalling means on the main manoeuvring device 20.

[0037] The invention is of course not in any way limited to the embodiments described above. On the contrary, several possibilities to modifications thereof should be apparent to a person skilled in the art without thereby deviating from the basic idea of the invention as defined in the appended claims.

Claims

1. A load handling crane comprising:

- a crane base (4);
- a column (5) which is rotatably mounted to the crane base (4) so as to be rotatable in relation to the crane base about an essentially vertical axis of rotation;
- an actuator (6) for rotating the column (5);
- a crane boom system (11) comprising two or more liftable and lowerable crane booms (7, 9) which are articulately connected to each other and hydraulic cylinders (8, 10) for lifting and lowering the crane booms (7, 9), wherein a first crane boom (7) of the crane boom system is articulately connected to the column (5) and a second crane boom (9) of the crane boom system is articulately connected to the first crane boom (7);
- a load handling tool (15) mounted to the crane boom system (11) at a boom tip (14) of the crane boom system;
- an electronic control device (21) for controlling said actuator (6) and said hydraulic cylinders (8, 10) so as to control the rotation of the column (5) and the movement of the crane booms (7, 9) and thereby control the position of the load handling tool (15); and
- a main manoeuvring device (20) with one or more main manoeuvring members (S1, S2, S3) configured to be manoeuvrable by a crane operator in order to control the position of the load

handling tool (15), wherein the main manoeuvring device (20) is configured to transmit control signals to the electronic control device (21) related to the manoeuvring of said manoeuvring members (S1, S2, S3),

characterized in:

- **that** the crane (1) comprises an auxiliary manoeuvring device (30) with at least one auxiliary manoeuvring member (31, 31') configured to be manoeuvrable by a person standing in the vicinity of the load handling tool (15) in order to control the position of the load handling tool, wherein the auxiliary manoeuvring device (30) is configured to transmit control signals to the electronic control device (21) related to the manoeuvring of the auxiliary manoeuvring member (31, 31'); and
- **that** the auxiliary manoeuvring device (30) comprises a base part (33) which is configured to be attached to the load handling tool (15) or to a load (16) carried by the load handling tool or to the boom tip (14) of the crane boom system (11), wherein the auxiliary manoeuvring member (31, 31') is fixed to the base part (33).

2. A load handling crane according to claim 1, **characterized in that** the auxiliary manoeuvring device (30) comprises a communication unit (32) for wireless transmission of control signals to the electronic control device (21).

3. A load handling crane according to claim 1 or 2, **characterized in that** the base part (33) is configured for releasable attachment to the load handling tool (15) or to a load (16) carried by the load handling tool or to the boom tip (14) of the crane boom system (11).

4. A load handling crane according to claim 3, **characterized in that** one or more permanent magnets (34) are fixed to the base part (33), wherein the permanent magnets (34) are configured to be magnetically attracted to a metallic element at the boom tip (14) of the crane boom system (11) or on the load handling tool (15) or on a load (16) carried by the load handling tool in order to keep the base part (33) attached to this metallic element.

5. A load handling crane according to any of claims 1-4, **characterized in:**

- **that** the auxiliary manoeuvring member (31, 31') has the form of a handle or handlebar; and
- **that** the auxiliary manoeuvring device (30) comprises:

  • a force sensing unit (35) for sensing the direction and magnitude of the force exerted onto the base part (33) via the auxiliary manoeuvring member (31, 31') by a person gripping the auxiliary manoeuvring member; and
  • an electronic processing unit (36) which is connected to the force sensing unit (35) in order to receive measuring signals from the force sensing unit as to the direction and magnitude of the force exerted onto the base part (33) via the auxiliary manoeuvring member (31, 31') by a person gripping the auxiliary manoeuvring member, wherein the electronic processing unit (36) is configured to convert these measuring signals into control signals for transmission to the electronic control device (21).

6. A load handling crane according to claim 5, **characterized in:**

- **that** the base part (33) comprises a mounting plate (38) and a bracket (39), the bracket having an inner end (39a) facing the mounting plate (38) and an outer end (39b), wherein the mounting plate (38) is configured for attachment to the load handling tool (15) or to a load (16) carried by the load handling tool or to the boom tip (14) of the crane boom system (11) and wherein the bracket (39) is fixed to the mounting plate (38) at its inner end (39a) and projects from the mounting plate (38);
- **that** the auxiliary manoeuvring member (31, 31') is fixed to the bracket (39); and
- **that** the force sensing unit (35) is arranged in the bracket (39).

7. A load handling crane according to claim 6, **characterized in that** the auxiliary manoeuvring member (31) is mounted to the bracket (39) at the outer end (39b) thereof.

8. A load handling crane according to claim 6, **characterized in that** the auxiliary manoeuvring member (31') is fixed to the bracket (39) via a flexible and elongated pulling element (40) in the form of a rope, a wire, a cable, a band or the similar.

9. A load handling crane according to claim 8, **characterized in that** the auxiliary manoeuvring member (31') is provided with a reverse direction switch (42) which is manually moveable between a first position representing a normal movement direction and a second position representing a reverse movement direction, wherein a pulling force on the bracket (39) exceeding a given threshold magnitude is converted into control signals for moving the load handling tool (15) in a given first direction when the reverse direc-

tion switch (42) is in the first position and into control signals for moving the load handling tool (15) in the reverse direction when the reverse direction switch (42) is in the second position.

10. A load handling crane according to any of claims 5-9, **characterized in that** the force sensing unit (35) comprises strain gauges (37) for sensing the direction and magnitude of the force exerted onto the base part (33) via the auxiliary manoeuvring member (31, 31') by a person gripping the auxiliary manoeuvring member.

11. A load handling crane according to any of claims 1-10, **characterized in that** the auxiliary manoeuvring member (31, 31') is provided with a dead-man's grip (43).

12. A load handling crane according to any of claims 1-11, **characterized in that** the auxiliary manoeuvring device (30) comprises an orientation sensing unit (44) for sensing the orientation of the base part (33) in relation to the crane boom system (11).

13. A load handling crane according to claim 12, **characterized in that** the orientation sensing unit (44) comprises a gyro sensor (45) for sensing the orientation of the base part (33) in relation to the crane boom system (11).

14. A load handling crane according to any of claims 1-13, **characterized in that** the load handling tool (15) is a crane fork or a grapple.

15. A load handling crane according to any of claims 1-14, **characterized in that** the second crane boom (9) is telescopically extensible so as to enable an adjustment of the extension length thereof.

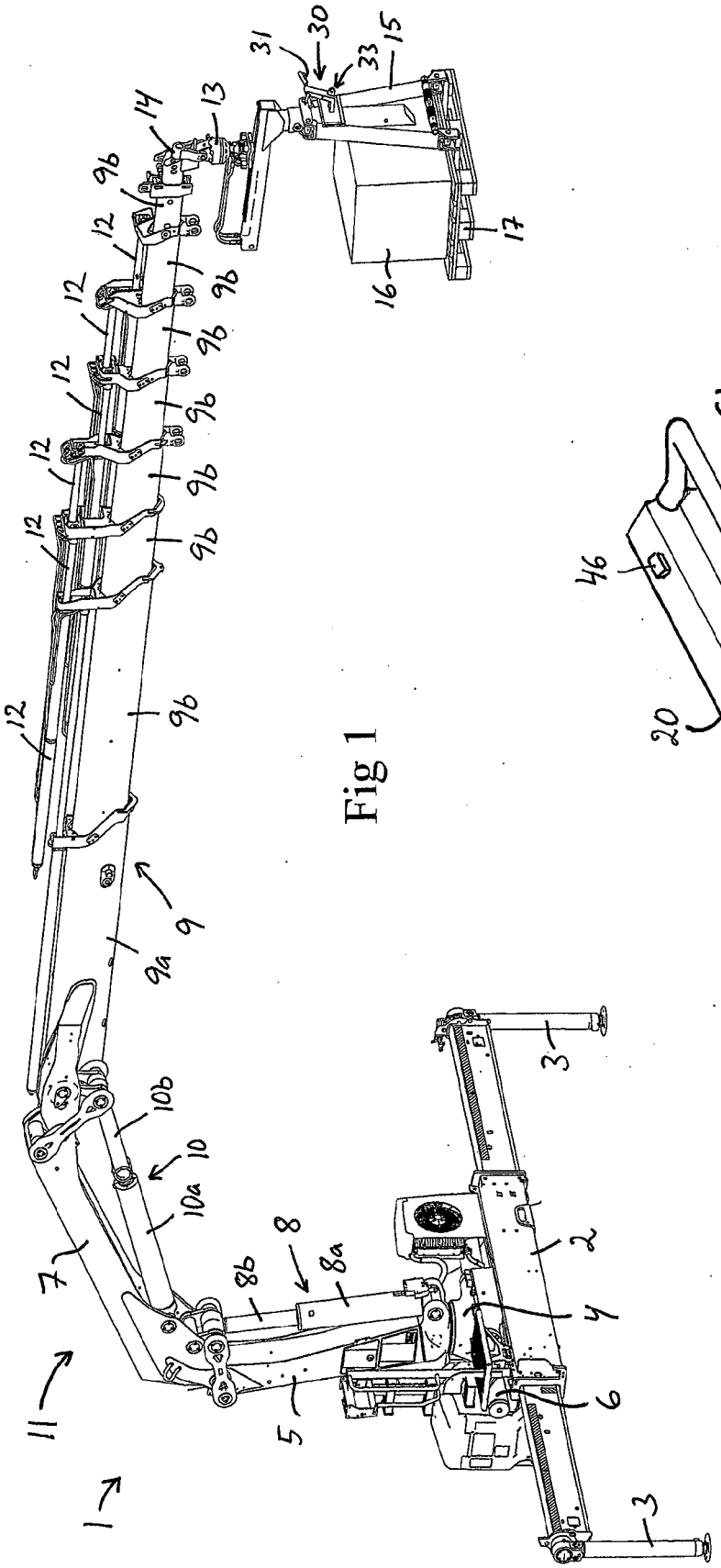

31
30
33
15
14
13
96
12
17
16
10b
10
10a
8
8b
8a
7
2
4
6
5
3
11
1
9
9a

Fig 1

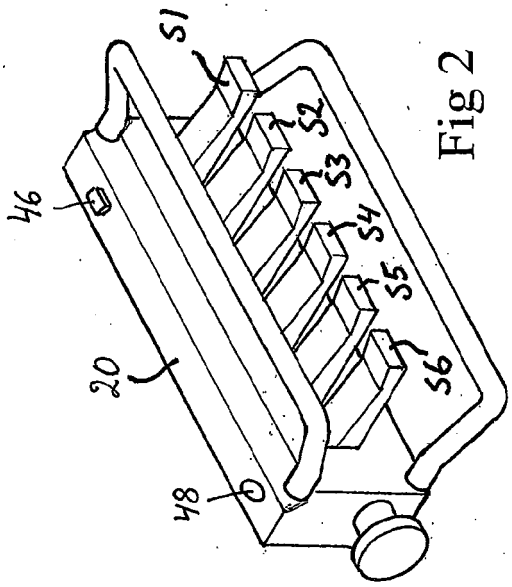

51
52
53
54
55
56
46
20
48

Fig 2

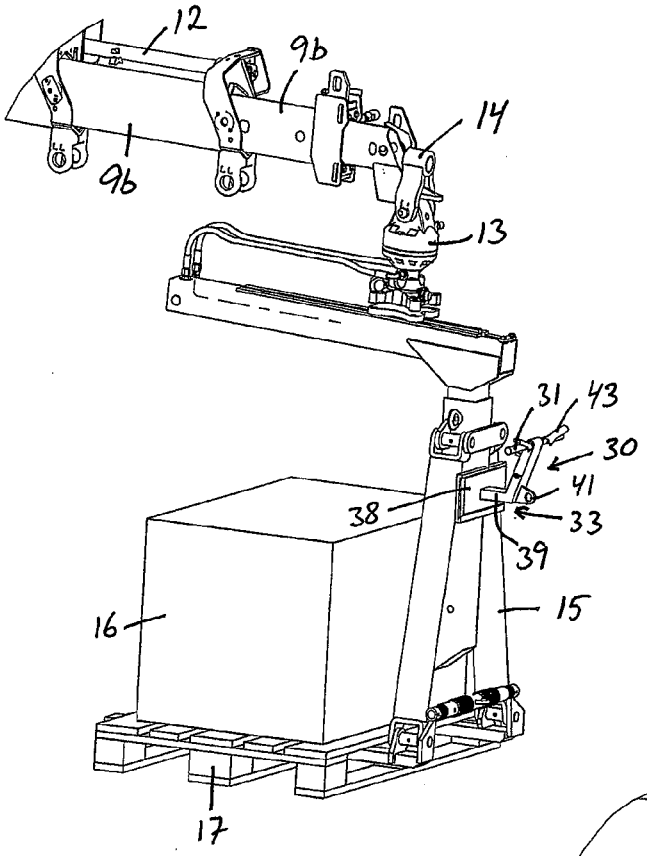
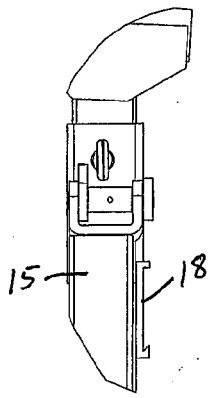


Fig 3



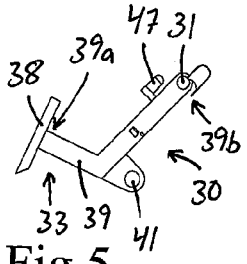


Fig 5

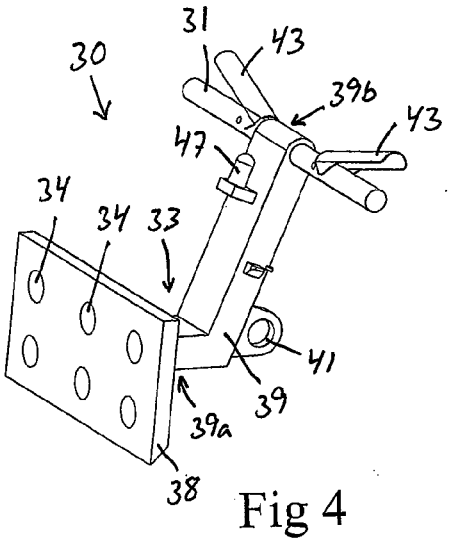


Fig 4

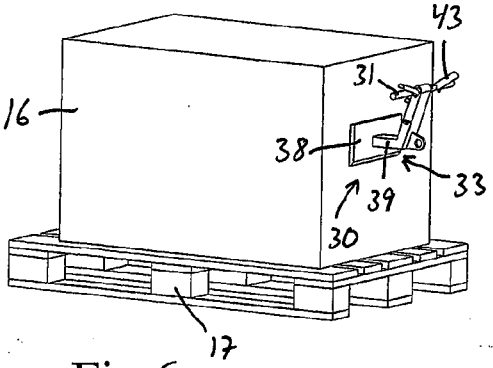


Fig 6

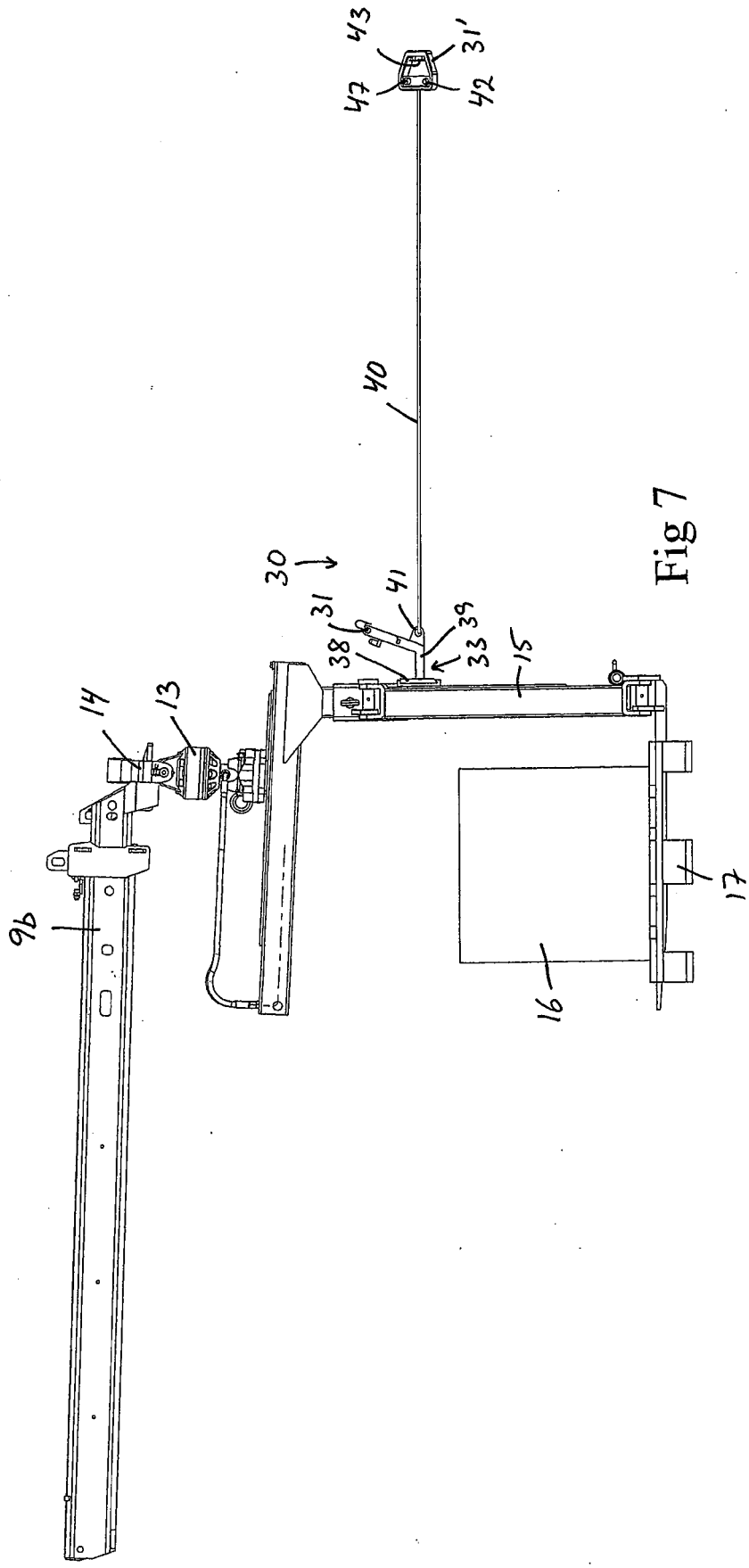
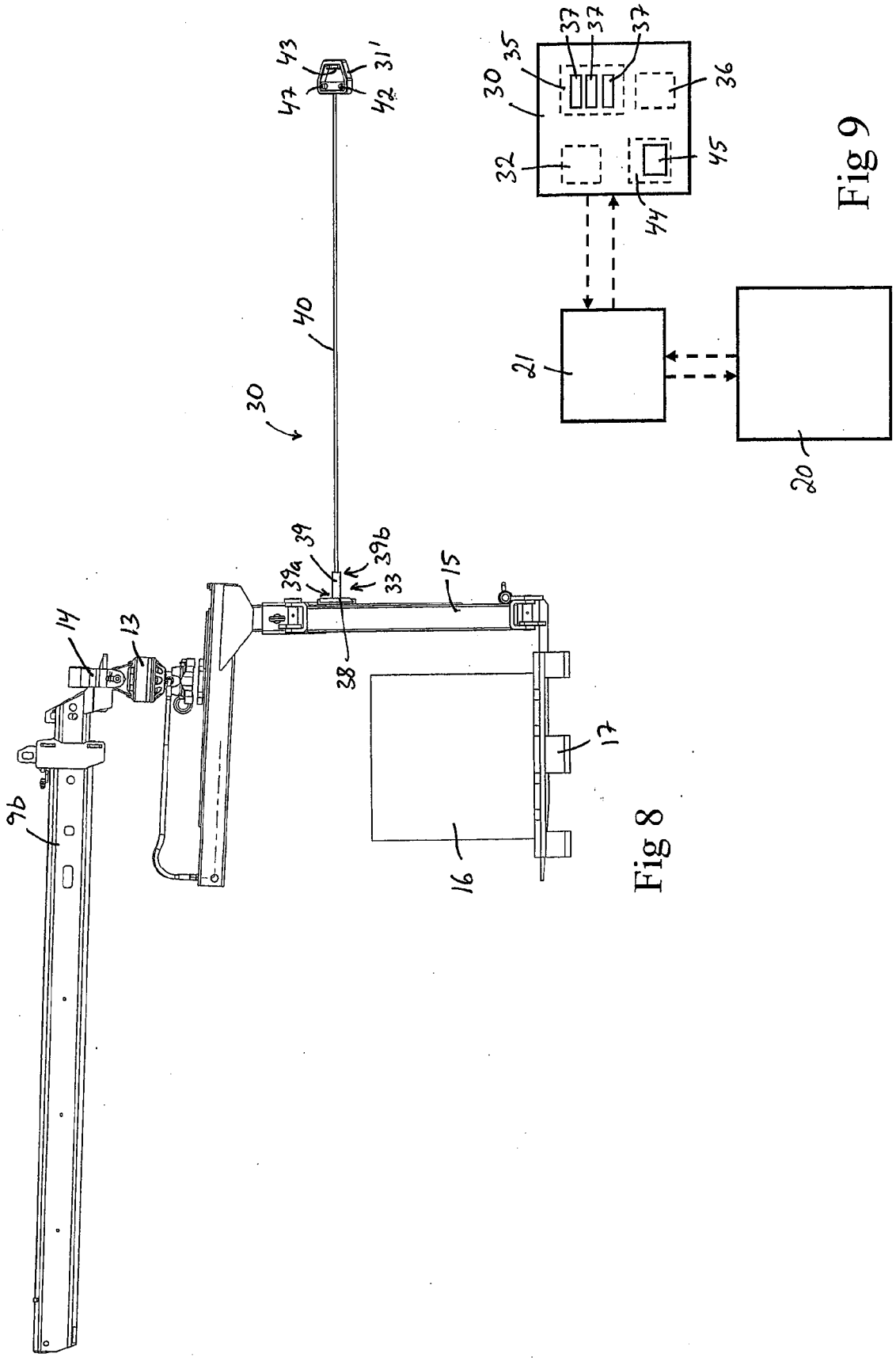


Fig 7


43
47
31'
42
40
30
39
39a
39b
33
38
15
14
13
96
17
16
Fig 8
30
35
37
37
37
36
32
45
44
21
20
Fig 9

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 18 15 9211

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	KR 2014 0122699 A (KANGLIM CO LTD [KR]) 20 October 2014 (2014-10-20) * the whole document * -----	1-15	INV. B66C13/04 B66C13/08 B66C23/36
A	GB 1 019 648 A (DEWHURST & PARTNER LTD; GEORGE ERIC MINNS) 9 February 1966 (1966-02-09) * the whole document * -----	1	
A	EP 2 789 786 A1 (IVECO MAGIRUS [DE]) 15 October 2014 (2014-10-15) * abstract; figure 1 * -----	1	
A	US 3 774 217 A (BONNER R ET AL) 20 November 1973 (1973-11-20) * abstract; figures 1-3 * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

B66C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	19 June 2018	Verheul, Omiros

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 15 9211

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-06-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 20140122699 A	20-10-2014	NONE	
GB 1019648 A	09-02-1966	NONE	
EP 2789786 A1	15-10-2014	CA 2847793 A1	10-10-2014
		CN 104098053 A	15-10-2014
		EP 2789786 A1	15-10-2014
		ES 2569259 T3	09-05-2016
		JP 2014204979 A	30-10-2014
		RU 2014114032 A	20-10-2015
		US 2014305738 A1	16-10-2014
US 3774217 A	20-11-1973	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82