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(54) DEVICE FOR REMOTELY COMMANDING A CRANE MOUNTED TO A TRUCK AND FOR MOVING SAID TRUCK, SYSTEM AND METHOD

(57) The present invention refers to a device (1) for remotely commanding a crane mounted to a truck and for moving said truck, comprising:
- a commanding panel (3) comprising a plurality of command members (5) controllable by an operator for commanding motions of the crane (100) and motions of the truck (200);
- a device controlling unit operatively connected to the commanding panel (3), configured to generate crane motions commanding messages and truck motions commanding messages based on commands given by the operator to the command members (5);
- a transmission unit operatively connected to the device controlling unit and configured to transmit to a crane controlling unit said crane motions commanding messages and said truck motions commanding messages.

According to a further aspect, the present invention refers to a system comprising said remote commanding device (1); a crane (100) mounted to a truck (200), and said truck (200), and also to a method of moving a truck (200) by a remote commanding device (1) of a crane.

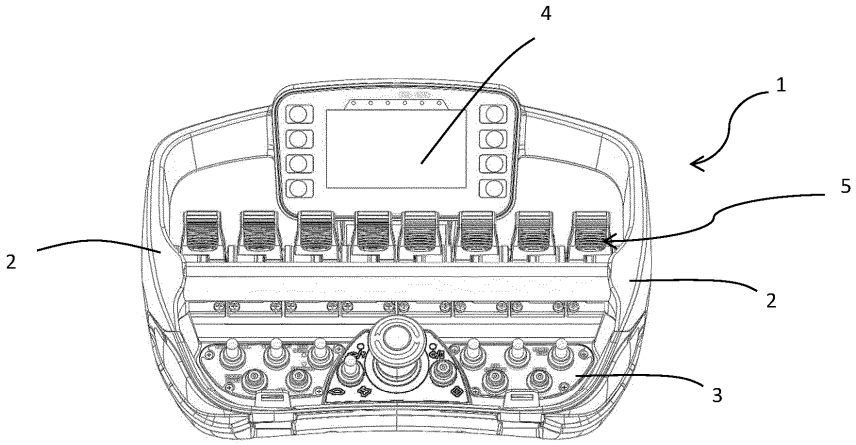

FIG. 2

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Description

Technical field of the invention

[0001] The present invention refers to a device for remotely commanding a crane, particularly a loading crane, mounted to a truck and for moving said truck, and also to a system and a method of commanding a crane mounted to a truck and also of moving said truck to which the crane is mounted. It is to be observed that, according to the present invention, the crane and truck are two distinct elements, wherein the first one is mounted to the second. Consequently, the present invention does not find an application in the field of self-propelled cranes or similar fields, such as for example of the small-sized tracked cranes, wherein the crane and the means moving the crane itself form a single unit, in other words, they comprise a single controlling unit commanding the operation of both.

Prior art

[0002] Modern cranes have a plurality of degrees of freedom, particularly a plurality of motions performed for example by an extendable arm. Usually, such motions are commanded by an operator via a remote commanding device, typically a remote control. Such remote commanding device comprises a plurality of levers actuatable by the operator, each of them is generally responsible for a specific crane motion and direction.

[0003] Some types of cranes are made to be mounted to and consequently moved (in other words displaced from one position to another) by a truck, usually made by a manufacturer different from the manufacturer making the crane itself. During the operations of the crane, which are controlled by a crane remote control, the same remains fixed to the truck, which in turn is stationary, subsequently the truck is moved for transporting the crane to another location where the presence of the crane is required. For example, when Jersey barriers are positioned along a freeway, the crane is gradually moved forward for placing Jersey barriers consecutively to each other.

[0004] Such sequence of operations causes the operator to repeatedly get in and out the truck cab, respectively for moving and stopping the truck and for commanding the crane once the truck is stationary. The operations of getting in and out, besides fatiguing the operator, can be time consuming, can be impossible to be performed in confined spaces and, moreover, can be dangerous in some circumstance (for example when an operator works in a freeway open to the traffic).

Summary of the invention

[0005] Therefore, the object of the present invention consists of providing a device for remotely commanding a crane, particularly a loading crane mounted to a truck, and for moving a truck, a system and method of commanding a crane mounted to a truck and also of moving the truck to which the crane is mounted, in order to at least partially overcome the problems cited with reference to the prior art.

[0006] This and other objects are obtained by a device for remotely commanding a crane and for moving a truck according to claim 1, by a system for commanding a crane mounted to a truck and for moving the truck to which the crane is mounted according to claim 11, and by a method of commanding a crane mounted to a truck and of moving the truck to which the crane is mounted according to claim 20.

[0007] The dependent claims define possible advantageous embodiments of the invention.

Brief description of the figures

[0008] The invention and the advantages thereof will be better understood and appreciated in the following by some exemplifying embodiments thereof, with reference to the attached figures, wherein:

Figure 1 is a lateral view of a system comprising a crane mounted to a truck, and also of a remote command device for commanding the crane and for moving the truck according to an embodiment;
Figure 2 is a front view of a remote commanding device according to an embodiment of the invention;
Figure 3 is a schematic illustration of a possible screenshot available in the remote commanding device according to a possible embodiment of the invention.

Detailed description of the invention

[0009] With reference to the attached Figure 1, a crane, particularly a hydraulic crane, is generally indicated by reference 100 and a truck is indicated by reference 200. The crane 100 is mounted to the truck 200, which enables to move the crane 100 among different positions. The crane 100, in turn, comprises movable parts. For example, according to the crane type, the available motions can include: rotating the column, moving up and down a first arm, moving up and down a second arm, extending and retracting the extensions of the second arm, moving up and down a third arm, extending and retracting the extensions of a third arm, moving up and down a capstan. Obviously, the number and type of motions depend on the type of crane commanded by the device 1. The above cited exemplary crane motions are made possible by respective actuators, usually hydraulic and/or electric, associated to corresponding crane portions. Sensors collect parameters associated to such motions and/or crane portions (e.g. extending and flexing the extensions of an arm, etcetera) and output signals representative of the same. Such signals are supplied to a crane controlling unit, which controls the actuators based on the sensors

signals and based also on instructions given by the operator through the device 1 itself.

[0010] A remote commanding device, commandable by an operator, provided with a controlling unit, enables the crane to perform such motions. Device 1, in order to communicate with the crane controlling unit, comprises a suitable transmission unit which establishes a communication between the device 1 and crane controlling unit 100. Preferably, device 1 is a remote control and therefore the transmission unit is adapted to communicate with the crane controlling unit - which can be in turn provided with a corresponding transmission unit - by radio signals. Obviously, the crane controlling unit can possibly use other types of wireless communications, or also, as an alternative, wired communications.

[0011] It is to be observed that the remote commanding device 1 does not directly communicate with the truck. On the contrary, crane 100 and truck 200 are connected to each other so that their respective controlling units can communicate with each other, in order to transmit information and instructions. Particularly, as it will be more apparent in the following, the crane controlling unit 100 is capable of transmitting instructions received from the remote commanding device 1 to the truck controlling unit. It is to be observed that, according to an embodiment, the crane 100 and truck 200 controlling units can be connected by an interface device 300, which will be specifically described in the following.

[0012] Preferably, the device 1 comprises a battery, still more preferably a rechargeable one, so it can be used also without a power supply. Alternatively, or additionally, the device 1 can be directly connected to an electric power source and supplied by a cable.

[0013] With reference to Figure 2, the remote commanding device 1 can be for example shaped as a steering wheel comprising lateral grips 2 to be gripped by the operator, the remote commanding device 1 comprises a commanding panel 3 having, for example, levers and/or keys and preferably a screen 4 displaying operative information.

[0014] The commanding panel 3 can for example comprise keys for turning on the device itself, alarm keys, keys for emitting acoustic signals, keys for recalling predefined functions, etcetera. Moreover, the commanding panel 3 can comprise a plurality of manual commanding members 5, each of them can command a particular one of the above cited crane 100 motions and the direction thereof and, as will be explained in the following, it can be also used for commanding truck 200 motions. The manual commanding members 5 can for example comprise levers which can be forwardly actuatable (for a first motion direction) or backwardly actuatable (for a second motion direction opposite to the first one).

[0015] The screen 4 can be of a touch type, in order to enable the operator to input instructions by touching the screen 4 itself. The screen can be particularly provided with virtual keys, selectable by a digital action on the touchscreen. Alternatively, the screen 4 is of a non-touch type. According to a further variant, the screen 4 can show icons which are associated to physical commands.

[0016] The remote commanding device 1, particularly its controlling unit, is configured to command the crane motions and truck 200 motions by outputting, through its transmission unit, commanding messages to the crane controlling unit. When the commanding messages refer to crane motions, the crane controlling unit commands the crane actuators in order to perform the required motions. On the contrary, if the commanding messages refer to truck 200 motions, the crane controlling unit 100 transmits them to the truck 200 controlling unit, preferably through the interface device 300.

[0017] The commanding messages can be input by the operator by acting on the manual commanding members and/or virtual keys of the touchscreen. According to an embodiment, the remote commanding device 1 is configured to operate in a crane commanding mode or in a truck commanding mode. For this purpose, the commanding panel 3 of the device 1 can comprise a physical or virtual selection element for enabling an operator to transition from a mode to another. According to this embodiment, the same physical or virtual commanding members can be used for supplying commands both to the crane and truck, according to a selected operative mode. According to an alternative embodiment, some physical or virtual commanding members, are dedicated to command the crane, while other physical or virtual commanding members are dedicated to command the truck.

[0018] The truck 200 motions commandable by the remote commanding device 1 can include one or more of: acceleration, braking, leftward steering, rightward steering.

[0019] For example, acceleration and braking can be commanded by a first lever of the device 1 (for example: movable along a first direction for accelerating and along a second direction for decelerating), and leftward and rightward steering can be commanded by a second lever (for example: movable along a first direction for leftward steering and along a second direction for rightward steering.

[0020] According to an embodiment, the remote commanding device 1 is also configured to command the strength of the above cited truck motions. For example, modulating the lever stroke makes possible to modulate the acceleration/braking or steering angle of the truck 200. In this case, the truck motion commanding messages also include the motion strength.

[0021] According to an embodiment, the remote commanding device 1 is configured to output to the truck 200, again by said modes, further commands different from the above-cited ones. Such further commands can be output by suitable manual or virtual commands of device 1. For example, such further commands can include one or more of: turning on/off the truck engine, turning on/off the truck headlights, engaging the truck emergency

brake, selecting a truck gear.

[0022] The remote commanding device 1, particularly its controlling unit, is configured to receive, by its transmission unit, data from the crane controlling unit, regarding the crane itself or regarding the truck. In this latter instance, the truck data are output by the truck 200 to crane 100, preferably by the interface device 300, and from crane 100 to the remote commanding device 1.

[0023] It is to be observed that rules can be provided in order to modify or prevent some motions of the truck, also after the truck controlling unit receives commanding messages from the remote commanding device by the crane controlling unit. Preferably, these safety rules are stored in the crane controlling unit.

[0024] For example, according to a possible embodiment, the crane controlling unit is configured to inhibit the command to move the truck when the controlling unit of this latter is informed of the truck stabilizing elements abutting the ground.

[0025] According to a possible embodiment, the crane controlling unit is configured so that after terminating a truck motion command, in particular an acceleration one, the truck gradually decelerates, for example according to a deceleration ramp.

[0026] According to a possible embodiment, the crane controlling unit is configured so that, after terminating the truck moving command and/or after a braking instruction, the truck is held braked until a new truck acceleration instruction is provided.

[0027] Advantageously, the remote commanding device 1 is configured to provide at least some of the data received from the crane and/or truck, to the operator by a suitable indication on the commanding panel 3.

[0028] For example, Figure 3 shows a possible representation of the information available to the operator through the screen 4 of the remote commanding device 1. Specifically, the strength of the acceleration 6, the engaged gear 7, the steering direction and strength 8, the braking strength 9, a sign indicating the emergency brake is engaged 10, can be shown. Moreover, truck operative parameters available in the truck cab can be provided, such as for example: a transversal out-of-shape indication 11 and a vertical out-of-shape indication 12. Further, the enabled truck maneuvers can be indicated, particularly: acceleration 13, braking 14, leftward steering 15, rightward steering 16. For example, such maneuvers can be inhibited under some truck operative conditions, for example when the stabilizing elements abut the ground, as previously said.

[0029] Further indications can include the presence/absence of a connection between the truck and crane 17 (e.g. by the interface device 300), the permission 18 to command the truck 200 motions by the remote commanding device 1, possible alarms 19.

[0030] The virtual keys displayed on the screen 4 can comprise, for example: a key for turning on/off the truck engine 20, a key for engaging the truck emergency brake 21, one or more keys for engaging a gear of the truck 22.

[0031] Moreover, virtual keys 23 can be included for modifying a screenshot/modifying a menu.

[0032] The user interface device 300 preferably comprises a Can Bus first line to be connected to the truck 200 and a Can Bus second line to be connected to the crane 100. It is configured to decode into a language compatible with the crane controlling unit the data from the truck controlling unit, and viceversa. Consequently, the same crane can be associated to different types of trucks, by simply modifying the configuration of the user interface device or replacing it with a suitable one.

[0033] According to a possible embodiment, the interface device 300 is configured to filter information from the truck controlling unit, consequently supplying only some predetermined information to the crane controlling unit, and viceversa.

[0034] According to an embodiment, the interface device 300 is configured to automatically determine the type of truck (for example: the manufacturer and model) and consequently decode the data between the crane and truck compatibly which each other.

[0035] According to a further aspect of the present invention, a method of moving a truck 200 to which is mounted a crane 100 commandable by a remote commanding device 1 according to the invention, comprises:

- actuating the one or more commanding members 5 of the commanding panel 3 of a crane remote commanding device 1;
- generating in the device controlling unit of the remote commanding device 1 the truck motions commanding messages based on said actuations of the one or more commanding members 5;
- transmitting, by the transmission unit of the remote commanding device 1 to the crane controlling unit, said truck motions commanding messages;
- transmitting, by said crane controlling unit to the truck controlling unit, said truck motions commanding messages;
- moving said truck based on the truck motions commanding messages transmitted by the crane controlling unit.

[0036] According to an embodiment, said method further comprises selecting by the remote commanding device 1, a truck commanding mode before actuating said one or more commanding members 5 of the commanding panel of the remote commanding device 1.

[0037] According to an embodiment, said method further comprises modulating the action on said commanding members 5 for modulating the strength of said truck motions.

[0038] According to an embodiment, said method further comprises:

- generating, based on further actions on said one or more commanding members 5, further truck commanding messages in addition to the truck motions

commanding messages;

- transmitting said further truck commanding messages by the transmission unit of the remote commanding device 1 to the crane controlling unit and from the crane controlling unit to the truck controlling unit,
- said further commanding messages comprise one or more of: turning on/off the truck engine, turning on/off the truck headlights, engaging the truck emergency brake, selecting a truck gear.

[0039] According to an embodiment, said method further comprises:

- providing by the truck controlling unit to the crane controlling unit data relative to the truck;
- providing said data relative to the truck by the crane controlling unit to the transmission unit of the remote commanding device;
- processing said data relative to the truck in the device controlling unit;
- displaying said data relative to the truck on a screen 4 of the remote commanding device 1.

[0040] According to an embodiment, said method further comprises preventing truck motions in the presence of truck predefined operative conditions.

[0041] According to an embodiment, said method further comprises commanding the truck to gradually decelerate after terminating a truck acceleration command on the commanding panel 3 of the remote commanding device 1.

[0042] According to an embodiment, said method further comprises: commanding the truck to be held braked until a new truck acceleration command is provided after terminating a truck acceleration command and/or upon a braking command on the commanding panel 3 of the remote commanding device 1.

[0043] A person skilled in the art in order to meet contingent specific needs, could introduce many additions, modifications, or substitutions of elements with other operatively equivalent ones, to the described embodiments without falling out of the scope of the attached claims.

Claims

1. Device (1) for remotely commanding a crane mounted to a truck and for moving said truck, comprising:

   - a commanding panel (3) comprising a plurality of command members (5) controllable by an operator for commanding motions of the crane (100) and motions of the truck (200);
   - a device controlling unit operatively connected to the commanding panel (3), configured to generate crane motions commanding messages and truck motions commanding messages based on commands given by the operator to the command members (5);
   - a transmission unit operatively connected to the device controlling unit and configured to transmit to a crane controlling unit said crane motions commanding messages and said truck motions commanding messages.

2. Remote commanding device (1) according to claim 1, wherein said device controlling unit is configured so that the remote commanding device (1) alternatively operates in a crane commanding mode or in a truck commanding mode, said commanding panel (3) comprising a selection element for enabling the operator to switch from one command mode to the other.

3. Remote commanding device (1) according to claim 2, wherein at least some of said commanding members (5) are controllable for commanding the crane motions (100) or truck motions (200) according to the selected command mode.

4. Remote commanding device (1) according to any of the preceding claims, wherein said truck (200) commandable motions comprise one or more of: acceleration, braking, leftward steering, rightward steering.

5. Remote commanding device (1) according to any of the preceding claims, wherein said device controlling unit is configured to command the strength of said truck motions based on the entity of an action by an operator on said commanding members (5).

6. Remote commanding device (1) according to any of the preceding claims, wherein said device controlling unit is further configured to generate further truck commanding messages in addition to the truck motions commanding messages and to transmit them to the transmission unit so that the latter transmits them to the crane controlling unit, said further commanding messages comprising one or more of: turning on/off the truck engine, turning on/off the truck headlights, engaging the truck emergency brake, selecting a truck gear.

7. Remote commanding device (1) according to any of the preceding claims, further comprising a screen (4) adapted to show operative information relative to the crane and truck.

8. Remote commanding device (1) according to the preceding claim, wherein said screen (4) is of the touch-screen type and comprises virtual keys manually actuatable by acting on the screen itself, wherein at least some of said commanding members and/or said selecting element of the remote commanding device are implemented by said virtual

keys.

9. Remote commanding device (1) according to any of the preceding claims, wherein said device controlling unit is configured to receive, by the transmission unit, data from the crane controlling unit relative to the crane itself and/or data relative to the truck, provided by the truck controlling unit to the crane controlling unit.

10. Remote commanding device (1) according to any of the preceding claims, wherein said transmission unit is configured to establish a communication between the device (1) and the crane controlling unit through radio signals.

11. System comprising:

- a remote commanding device (1) according to any of the preceding claims;
- a crane (100) comprising a crane controlling unit, mounted to said truck (200);
- a truck (200) comprising a truck controlling unit,

wherein said crane controlling unit is configured to actuate crane motions based on said crane motions commanding messages, and to transmit to the truck controlling unit said truck motions commanding messages,
wherein said truck controlling unit is configured to move said truck based on the truck motions commanding messages transmitted by the crane controlling unit.

12. System according to the preceding claim, wherein said crane controlling unit is configured to transmit to the transmission unit of the remote commanding device (1) data relative to the crane and/or data relative to the truck, provided by the truck controlling unit.

13. System according to the preceding claim, wherein said crane controlling unit is configured to prevent truck motion commands if the truck controlling unit transmits to the crane controlling unit predefined operative data relative to the truck.

14. System according to any of claims from 11 to 13, wherein said crane controlling unit is configured so that, after an operator terminates a truck acceleration command by the commanding panel of the remote commanding device (1), the truck is commanded to gradually decelerate.

15. System according to any of claims from 11 to 14, wherein the crane controlling unit is configured so that, after the operator terminates the truck acceleration command and/or after the provision of a braking instruction from the operator, by the commanding panel of the crane commanding device (1), the truck is commanded to be held braked until a new truck acceleration instruction is provided.

16. System according to any of claims from 11 to 15, further comprising an interface device (300) operatively connecting the crane and truck controlling units (100, 200).

17. System according to the preceding claim, wherein said interface device (300) is configured to decode into a language compatible with the crane controlling unit the data from the truck controlling unit, and viceversa.

18. System according to the preceding claim, wherein the interface device (300) is configured to automatically determine the truck type and decode into a language compatible with the crane controlling unit the data from the truck controlling unit, and viceversa.

19. System according to any of claims from 16 to 18, wherein the interface device (300) is configured to filter the data from the truck controlling unit and directed to the crane controlling unit.

20. Method of moving a truck (200) to which a crane (100) commandable by a remote commanding device (1) is mounted, said method comprising:

- actuating one or more commanding members (5) of a commanding panel (3) of said crane remote commanding device (1);
- generating in a device controlling unit of the remote commanding device (1) truck motions commanding messages based on said actuations of the one or more commanding members (5);
- transmitting, by a transmission unit of the remote commanding device (1), to a crane controlling unit said truck motions commanding messages;
- transmitting by said crane controlling unit to a truck controlling unit said truck motions commanding messages;
- moving said truck based on the truck motions commanding messages transmitted by the crane controlling unit.

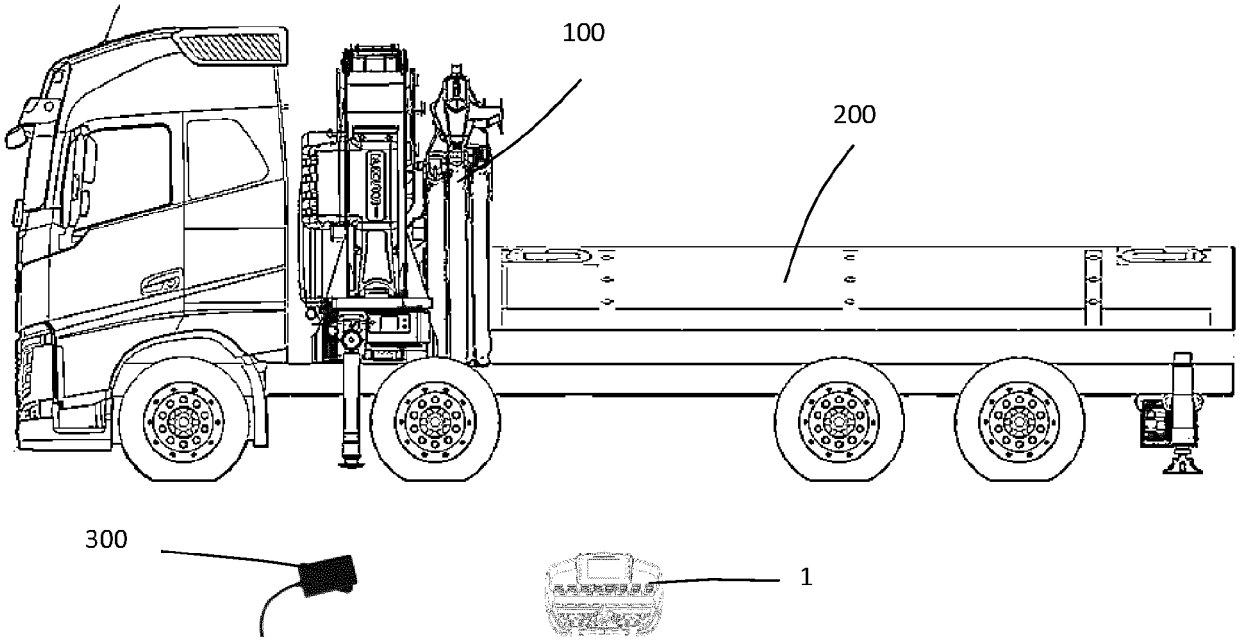

FIG. 1

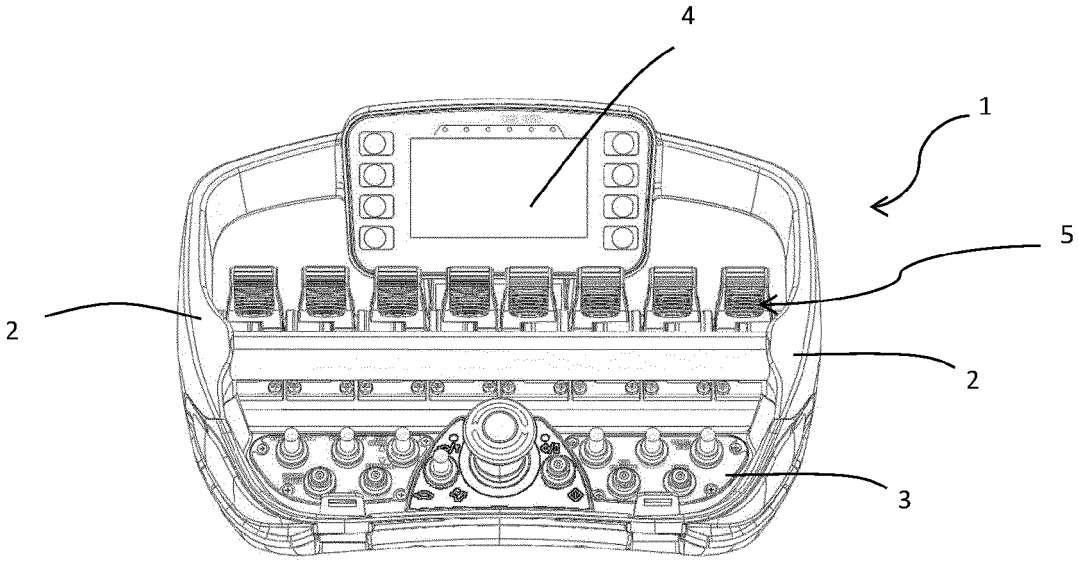

FIG. 2

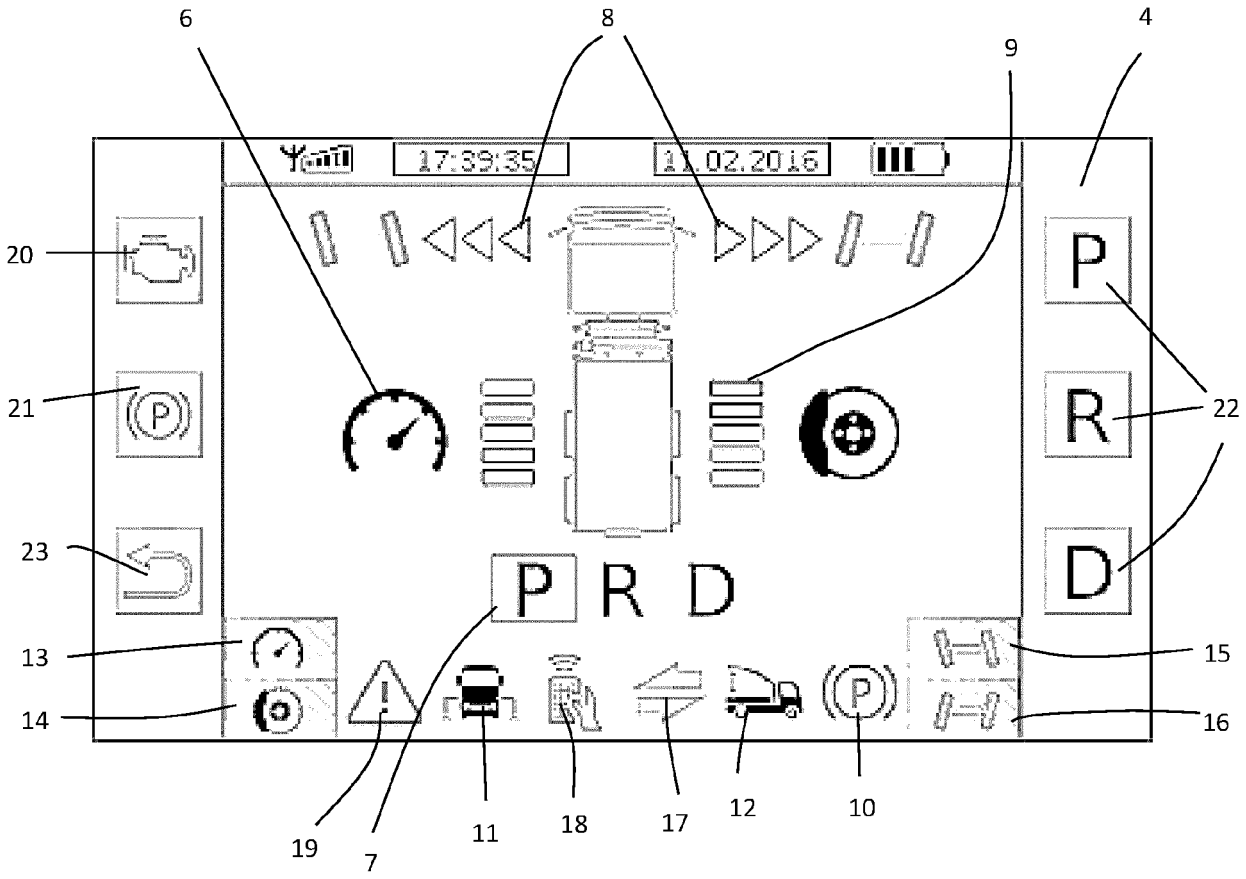
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FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 20 19 2507

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	Fassi: "FX-Link", , 30 September 2018 (2018-09-30), pages 1-4, XP055716899, Retrieved from the Internet: URL:https://www.fassi.com/fassi-loader-crane/fx-link.html [retrieved on 2020-07-21] * the whole document *	1-20	INV. B66C13/40 B66C23/68
Y	Volvo: "Fact Sheet External steering interface EXSTER", , 18 June 2018 (2018-06-18), XP055716891, Retrieved from the Internet: URL:https://stpi.it.volvo.com/STPIFiles/Volvo/FactSheet/EXSTER_Eng_01_309626349.pdf [retrieved on 2020-07-21] * the whole document *	1-20	
A	JP 2004 250118 A (KOMATSU MFG CO LTD) 9 September 2004 (2004-09-09) * abstract * * paragraph [0012] - paragraph [0014] * * figures *	1,11,20	TECHNICAL FIELDS SEARCHED (IPC) B66C
A	JP 2004 331324 A (KOMATSU MFG CO LTD) 25 November 2004 (2004-11-25) * abstract * * paragraph [0014] - paragraph [0043] * * figures *	1,11,20	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 February 2021	Sheppard, Bruce

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2004250118 A	09-09-2004	NONE	
JP 2004331324 A	25-11-2004	NONE	

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