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(54) **Method of operating a fork-lift truck, a fork-lift truck, a computer program product, and a method of modifying a fork-lift truck**

(57) The present disclosure relates to a fork-lift truck with support arms and a mast structure, arranged to provide a constant maximum lifting height independent of the position of the support arms, wherein the fork-lift truck further comprises, a lifting device, carried by the mast structure and movable along the mast structure. The fork-lift truck further comprises an elongated element comprising a magnetic or ferromagnetic material arranged on the lifting device. A sensor arranged on the mast structure is configured to sense a presence/absence of the elongated element. The fork-lift truck is operative to stop an upward movement of the lifting device when the sensor senses the presence of the elongated element in a case where the support arms are in an upright position, to provide the constant maximum lifting height.

The fork-lift truck is further operative to ramp down the speed of the upward movement of the lifting device in a case where the support arms are in a lowered position and stop the movement of the lifting device when the lifting device has moved upwards a predetermined distance wherein the sensor sense the absence of the elongated element, to provide the constant maximum lifting height. The present disclosure further related to a method of operating a fork-lift truck and a method of modifying a fork-lift truck, such that the fork-lift truck is able to provide a constant maximum lifting height independent of the position of the support arms.

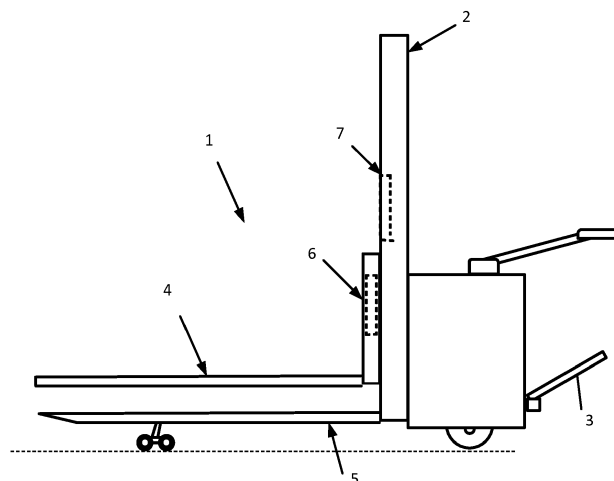


Figure 1

Description

TECHNICAL FIELD

[0001] The present disclosure relates to a method of operating a fork-lift truck to provide a constant maximum lifting height independent of the position of its support arms, a fork-lift truck with support arms and a mast structure arranged to provide a constant maximum lifting height independent of the position of the support arms

[0002] The disclosure also relates to a computer-readable storage medium, having stored thereon a computer program and a method of modifying a fork-lift truck, with support arms and a mast structure, such that the fork-lift truck is able to provide a constant maximum lifting height independent of the position of the support arms.

BACKGROUND

[0003] When operating fork-lift trucks, the fork-lift truck is handled by an operator that either rides with the fork-lift truck or walks along the fork-lift truck. Generally pallets and/or goods are moved by the fork-lift truck by means of a lifting device, in general it is a pair of forks that enters in two slots of a pallet and then the forks are lifted and the pallet is lifted together with the forks. Then the fork-lift truck can travel a distance and the operator maneuvers the fork-lift truck to lower its forks and then place the pallet and leave this position without a load. The fork-lift truck is then driven by the operator without any pallet and/or goods, to a new location. During travel, the operator generally needs to raise/lift the load carrier/forks a small distance, in order to avoid unnecessary wear or damages to the forks by touching the ground.

[0004] In general tiller arm trucks have a platform on which the operator can stand while operating the truck. Some fork-lift trucks are provided with protective side guards that protect the operator. The protective side guards can be in their protective position in which they protect the operator. The protective side guards can also be in their non-protective position in which the protective side guards do not protect the operator.

[0005] On some fork-lift trucks there is a demand that the lifting device is limited to a maximum lifting height when the protective side guards are in their protective position. On fork-lift trucks which has movable support arms this means that the lifting device only can provide the maximum lifting height minus the lifting height of the support arms. This is a problem for operators that want to reach the maximum lifting height without having to raise the support arms.

[0006] There is also another problem with fork-lift trucks that only can lift a maximum lifting height when the protective side guards are in their protective position. When the lifting device is lifted with high speed and the lifting device has to stop at the maximum lifting height, the lifting device will not immediately stop since the hydraulic pump will not immediately stop and due to natural

dynamics of the hydraulic fluid. If there is no load on the lifting device, the lifting device may continue e.g. 8 centimeters or more. If there is load on the lifting device, the lifting device will stop faster. However, this means that the maximum lifting height will vary depending on the load on the lifting device.

[0007] There is therefore a need for an improved fork-lift truck, which fork-lift truck solves or at least mitigates at least one of the above mentioned problems.

SUMMARY

[0008] It is an object of the present disclosure to provide embodiments solving the problem providing a fork-lift truck that can reach a maximum lifting height when the support arms are in a lowered position. Another object of the present disclosure is to provide a fork-lift truck where the maximum lifting height will not vary depending on the load on the lifting device.

[0009] The disclosure presents a fork-lift truck with support arms and a mast structure, arranged to provide a constant maximum lifting height independent of the position of the support arms, wherein the fork-lift truck further comprises, a lifting device, carried by the mast structure and movable along the mast structure. The fork-lift truck further comprises an elongated element comprising a magnetic or ferromagnetic material arranged on the lifting device. A sensor arranged on the mast structure is configured to sense a presence/absence of the elongated element; wherein the fork-lift truck is operative to stop an upward movement of the lifting device when the sensor sense the presence of the elongated element in a case where the support arms are in an upright position, to provide the constant maximum lifting height, or ramp down the speed of the upward movement of the lifting device in a case where the support arms are in a lowered position and stop the movement of the lifting device when the lifting device has moved upwards a predetermined distance wherein the sensor sense the absence of the elongated element, to provide the constant maximum lifting height.

[0010] The present disclosure also relates to embodiments of a method of operating a fork-lift truck to provide a constant maximum lifting height independent of the position of the support arms, wherein the fork-lift truck comprises a lifting device, carried by a mast structure and movable along the mast structure. The method comprising the steps of: sensing the presence/absence of an elongated element comprising a magnetic or ferromagnetic material arranged on the lifting device. Stopping an upward movement of the lifting device when sensing the presence of the elongated element in a case where the support arms are in an upright position, or ramping down the speed of the upward movement of the lifting device in a case where the support arms are in a lowered position and stopping the movement of the lifting device when the lifting device has moved upwards a predetermined distance wherein the sensor sense the absence of the elongated element.

gated element.

[0011] The present disclosure also relates to embodiments of a method of modifying a fork-lift truck, with support arms and a mast structure, such that the fork-lift truck is able to provide a constant maximum lifting height independent of the position of the support arms, wherein the method comprising the steps of: providing a lifting device carried by the mast structure and movable along the mast structure with an elongated element comprising a magnetic or ferromagnetic material. Providing the mast structure with a sensor configured to sense a presence/absence of the elongated element, and providing a computer-readable storage medium in the fork-lift truck with a computer program which, when run in a processor of the fork-lift truck causes the fork-lift truck to perform the disclosed method.

[0012] An advantage with embodiments of the present disclosure is that a maximum lifting height can be provided even if the support arms are in lowered position.

[0013] Another advantage with embodiments of the present disclosure is that a fork-lift truck is provided where the maximum lifting height will not vary depending on the load on the lifting device.

[0014] The present disclosure also presents a computer program, comprising computer readable code which, when run in a fork-lift truck causes the fork-lift truck to perform the disclosed method.

[0015] The method of operating the fork-lift truck, and the computer program each display advantages corresponding to the advantages already described in relation to the method performed in the fork-lift truck.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Further objects, features, and advantages of the present disclosure will appear from the following detailed description, wherein some aspects of the disclosure will be described in more detail with reference to the accompanying drawings, in which:

Figure 1 schematically illustrates a fork-lift truck according to an exemplary embodiment of the present disclosure.

Figure 2 schematically illustrates a fork-lift truck according to an exemplary embodiment of the present disclosure.

Figure 3 is a flow chart illustrating the proposed methods performed in the fork-lift truck.

Figure 4 schematically illustrates a fork-lift truck according to an exemplary embodiment of the present disclosure.

DETAILED DESCRIPTION

[0017] Aspects of the present disclosure will be de-

scribed more fully hereinafter with reference to the accompanying drawings. The methods and fork-lift truck disclosed herein can, however, be realized in many different forms and should not be construed as being limited to the aspects set forth herein. Like numbers in the drawings refer to like elements throughout.

[0018] The general object or idea of embodiments of the present disclosure is to address at least one or some of the disadvantages described above as well as below. The various steps described below in connection with the figures should be primarily understood in a logical sense.

[0019] Figure 1 schematically illustrates a fork-lift truck 1 according to an embodiment of the present disclosure, arranged to provide a constant maximum lifting height independent of the position of support arms 5. The fork-lift truck has a mast structure 2 and is thus able to fetch and leave a cargo on a shelf. A lifting device 4 is carried by the mast structure 2 and is movable along the mast structure 2. According to exemplary embodiments of the present disclosure the fork-lift truck 1 comprises a tiller arm 8.

[0020] The fork-lift truck 1 is controlled by an operator. The operator travels with the fork-lift truck, for example by means of a pivotable platform 3. The fork-lift truck 1 is preferably an electrically powered fork-lift truck 1 that has an electrical drive motor (not shown) and an electrical pump motor (not shown) for pumping hydraulic fluid.

[0021] The lifting device 4 is preferably as seen in the Figures 1, a pair of forks. The lifting device 4 can comprise more than two forks and fewer than two forks if desired. The fork-lift truck 1 further comprises support arms 5. The support arms 5 can be in an upright position or in a lowered position. In figure 1 the support arms 5 are in an upright position. When the support arms 5 are in a lowered position, as shown in figure 2, it is possible to lower the lifting device 4 to the ground. In order to be able to lift a pallet, the support arms 5 have to be in the lowered position, or close to the ground, so it is possible to move the lifting device 4 close to the ground. The lifting device 4 has to be close to ground in order to make it possible to position the lifting device 4 in the slots of the pallet.

[0022] The position of the support arms 5 is in an exemplary embodiment of the present disclosure sensed by a support arm position sensor (not shown). The support arm position sensor gives information to the processor 110, shown in figure 4, if the support arms 5 are in an upright position, in a lowered position or in a position in between.

[0023] The lifting device 4 according to an exemplary embodiment of the present disclosure comprises an elongated element 6. The elongated element 6 according to one exemplary embodiment of the present disclosure comprises a magnetic or ferromagnetic material. The elongated element 6 can be positioned on many different positions on the lifting device 4. The elongated element 6 is preferably positioned close to the mast structure 2, so that the elongated element 6 can be sensed by a sensor

7 on the mast structure 2, as will be described next. The sensor 7 is as described above positioned on the mast structure 2 and configured to sense a presence/absence of the elongated element 6.

[0024] According to embodiments of the present disclosure the fork-lift truck 1 is operative to stop an upward movement of the lifting device 4 when the sensor 7 sense the presence of the elongated element 6 in a case where the support arms 5 are in an upright position. This enables the fork-lift truck 1 to always provide a constant maximum lifting height. When the support arms 5 are in an upright position the lifting device 4 and the mast structure 2 are in their respective highest position. The fork-lift truck is therefore, in this case operative to stop an upward movement of the lifting device 4 when the sensor 7 senses the presence of the elongated measuring 6 element. The position of the elongated element 6 on the lifting device 4 and the position of the sensor 7 on the mast structure 2 can according to embodiments of the present disclosure be changed. Depending on the position of the elongated element 6 on the lifting device 4 and the sensor 7 on the mast structure 2 different constant maximum lifting heights can be provided.

[0025] According to one exemplary embodiment of the present disclosure the constant maximum lifting height is a maximum lifting height according to the International Standard for safety requirements of Industrial trucks, i.e. EN ISO 3691-1:2012. This constant maximum lifting height can be a maximum lifting height of 1800 mm from the floor.

[0026] Now turn to figure 2. In figure 2 the support arms 5 of the fork-lift truck 1 is in a lowered position. As mentioned above, in this position it is possible to lower the lifting device 4 to a position close to the ground which makes it possible to position the lifting device 4 under e.g. a pallet. When the support arms 5 are in a lowered position the fork-lift truck 1 is operative to ramp down the speed of the upward movement of the lifting device 4, when the sensor 7 sense the presence of the elongated element 6. In this case the fork-lift truck 1 is also operative to stop the movement of the lifting device 4 when the lifting device 4 has moved upwards a predetermined distance wherein the sensor 7 sense the absence of the elongated element 6. Thus is the constant maximum lifting height also provided in this case.

[0027] Now will embodiments of the present disclosure be described in which the mast structure 2 comprises several mast elements. These embodiments are not shown in the figures.

[0028] In one exemplary embodiment of the present disclosure the mast structure 2 comprises a first mast element, which carries the lifting device 4 and a second mast element, by which the first mast element is carried and along which the first mast element is movable.

[0029] In yet another exemplary embodiment of the present disclosure the mast structure 2 further comprises a third mast element, by which the second mast element is carried and along which the second mast element is

movable.

[0030] In a further exemplary embodiment of the present disclosure the mast structure 2 further comprises a fourth mast element, by which the third mast element is carried and along which the third mast element is movable.

[0031] The fork-lift truck 1 according to exemplary embodiments of the present disclosure is a pedestrian-controlled fork-lift truck 1 with protective side guards, not shown. The protective side guards protect the operator from falling of the fork-lift truck 1, when the protective side guards are in their protective position. According to one exemplary embodiment of the present disclosure the fork-lift truck is further arranged to provide the constant maximum lifting height when the protective side guards are in their protective position.

[0032] Figure 3 is a flowchart schematically illustrating embodiments of method steps of operating a fork-lift truck 1 to provide a constant maximum lifting height independent of the position of support arms 5, wherein the fork-lift truck 1 comprises a lifting device 4, carried by a mast structure 2 and movable along the mast structure 2.

[0033] In a first step S1, the fork-lift truck 1 sense the presence/absence of an elongated element 6 comprising a magnetic or ferromagnetic material arranged on the lifting device 4.

[0034] In a next step S2, the fork-lift truck 1 stops an upward movement of the lifting device 4 when sensing the presence of the elongated element 6 in a case where the support arms 5 are in an upright position.

[0035] In a further step S3, the fork-lift truck 1 ramps down the speed of the upward movement of the lifting device 4 in a case where the support arms 5 are in a lowered position and stops the movement of the lifting device 4 when the lifting device 4 has moved upwards a predetermined distance wherein the sensor 7 sense the absence of the elongated element 6.

[0036] The method of operating a fork-lift truck 1 to provide a constant maximum lifting height independent of the position of support arms 5, wherein the fork-lift truck 1 comprises a lifting device 4, can be performed by a fork-lift truck wherein the mast structure 2 comprises a first mast element, which carries the lifting device 4 and a second mast element, by which the first mast element is carried and along which the first mast element is movable 4.

[0037] According to another embodiment of the present disclosure, the method of operating a forklift truck 1 to provide a constant maximum lifting height independent of the position of support arms 5, wherein the fork-lift truck 1 comprises a lifting device 4, can be performed by a fork-lift truck, wherein the mast structure further comprises a third mast element, by which the second mast element is carried and along which the second mast element is movable.

[0038] In a yet another embodiment of the present disclosure, the method of operating a fork-lift truck 1 to provide a constant maximum lifting height independent of

the position of support arms 5, wherein the fork-lift truck 1 comprises a lifting device 4, can be performed by a fork-lift truck, wherein the mast structure further comprises a fourth mast element, by which the third mast element is carried and along which the third mast element is movable.

[0039] The fork-lift truck 1 according to an embodiment of the present disclosure is a pedestrian-controlled truck with protective side guards, and wherein the constant maximum lifting height is provided when the protective side guards are in their protective position.

[0040] According to an exemplary embodiment of the method of operating a fork-lift truck 1 to provide a constant maximum lifting height according to the present disclosure, the constant maximum lifting height is a maximum lifting height according to the International Standard for safety requirements of Industrial trucks, i.e. EN ISO 3691-1:2012.

[0041] According to another exemplary embodiment of the method of operating a fork-lift truck 1 to provide a constant maximum lifting height according to the present disclosure, the constant maximum lifting height is 1800 mm from the floor.

[0042] Turning now to figure 4, a schematic diagram is disclosed illustrating an exemplary embodiment of a fork-lift truck 1 with support arms and a mast structure, arranged to provide a constant maximum lifting height independent of the position of the support arms. The fork-lift truck 1 comprises a processor 110 and a memory 120, the memory 120 containing instructions executable by the processor 110. The processor 110 is a Central Processing Unit, CPU, microcontroller, Digital Signal Processor, DSP, or any other suitable type of processor capable of executing computer program code. The memory 120 is a Random Access Memory, RAM, a Read Only Memory, ROM, or a persistent storage, e.g. a single or combination of magnetic memory, optical memory, or solid state memory or even remotely mounted memory.

[0043] The processor 110 and the memory 120 are here disclosed as being situated in the body of the fork-lift truck, but the processor 110 and the memory 120 can also preferably be located in the tiller arm 8 or the tiller head of the fork-lift truck 1. In another embodiment of the present disclosure, the processor 110 and the memory 120 is an external unit. This means that the fork-lift truck 1 must communicate with the processor 110 and the memory 120 by means of a communication device (not shown). This can preferably be a wire-less link. The communication device comprises in this embodiment an antenna.

[0044] According to one aspect, the disclosure further relates to a computer program, comprising computer readable code which, when run on the fork-lift truck 1 causes the fork-lift truck 1 to perform any of the aspects of the method described above.

[0045] When the above-mentioned computer program code is run in the processor 110 of the fork-lift truck 1 it causes the fork-lift truck 1 to sense the presence/ab-

sence of an elongated element 6 comprising a magnetic or ferromagnetic material arranged on the lifting device 4. The computer program codes further causes the fork-lift truck 1 to stop an upward movement of the lifting device 4 when sensing the presence of the elongated element 6 in a case where the support arms 5 are in an upright position, or ramp down the speed of the upward movement of the lifting device 4 in a case where the support arms 5 are in a lowered position and stop the movement of the lifting device 4 when the lifting device 4 has moved upwards a predetermined distance wherein the sensor 7 sense the absence of the elongated element 6.

[0046] The present disclosure also relates to a method of modifying a fork-lift truck, with support arms and a mast structure, such that the fork-lift truck is able to provide a constant maximum lifting height independent of the position of the support arms. The method comprising the steps of; providing a lifting device carried by the mast structure and movable along the mast structure with an elongated element comprising a magnetic or ferromagnetic material; providing the mast structure with sensor configured to sense a presence/absence of the elongated element; and providing a computer-readable storage medium in the fork-lift truck with a computer program which, when run in a processor of the fork-lift truck causes the fork-lift truck to perform any of the method as disclosed above.

[0047] Aspects of the disclosure are described with reference to the drawings, e.g., block diagrams and/or flowcharts. It is understood that several entities in the drawings, e.g., blocks of the block diagrams, and also combinations of entities in the drawings, can be implemented by computer program instructions, which instructions can be stored in a computer-readable memory, and also loaded onto a computer or other programmable data processing apparatus. Such computer program instructions can be provided to a processor of a general purpose computer, a special purpose computer and/or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer and/or other programmable data processing apparatus, create means for implementing the functions/acts specified in the block diagrams and/or flowchart block or blocks.

[0048] In some implementations and according to some aspects of the disclosure, the functions or steps noted in the blocks can occur out of the order noted in the operational illustrations. For example, two blocks shown in succession can in fact be executed substantially concurrently or the blocks can sometimes be executed in the reverse order, depending upon the functionality/acts involved. Also, the functions or steps noted in the blocks can according to some aspects of the disclosure be executed continuously in a loop.

Claims

1. A fork-lift truck (1) with support arms (5) and a mast structure (2), arranged to provide a constant maximum lifting height independent of the position of the support arms (5), wherein said fork-lift truck (1) further comprises:
 - a lifting device (4), carried by the mast structure (2) and movable along the mast structure (2);
 - an elongated element (6) comprising a magnetic or ferromagnetic material arranged on the lifting device (4);
 - a sensor (7) arranged on the mast structure (2) configured to sense a presence/absence of the elongated element (6); wherein said fork-lift truck (1) is operative to stop an upward movement of the lifting device (4) when the sensor (7) sense the presence of the elongated element (6) in a case where the support arms (5) are in an upright position, to provide the constant maximum lifting height, or ramp down the speed of the upward movement of the lifting device (4) in a case where the support arms (5) are in a lowered position and stop the movement of the lifting device (4) when the lifting device (4) has moved upwards a predetermined distance wherein the sensor (7) sense the absence of the elongated element (6), to provide the constant maximum lifting height.
2. A fork-lift truck (1) according to claim 1, wherein the mast structure (2) comprises a first mast element, which carries the lifting device (4) and a second mast element, by which the first mast element is carried and along which the first mast element is movable.
3. A fork-lift truck (1) according to claim 2, wherein the mast structure (2) further comprises a third mast element, by which the second mast element is carried and along which the second mast element is movable.
4. A fork-lift truck (1) according to any of claims 1 to 3, wherein the fork-lift truck (1) is a pedestrian-controlled fork-lift truck with protective side guards, and wherein the fork-lift truck is further arranged to provide the constant maximum lifting height when the protective side guards is in their protective position
5. A fork-lift truck according to any of claims 1 to 4, wherein the constant maximum lifting height is a maximum lifting height according to the International Standard for safety requirements of Industrial trucks.
6. Method of operating a fork-lift truck (1) to provide a constant maximum lifting height independent of the position of support arms 5, wherein the fork-lift truck (1) comprises a lifting device (4), carried by a mast structure (2) and movable along the mast structure (2), the method comprising the steps of:
 - sensing the presence/absence of an elongated element (6) comprising a magnetic or ferromagnetic material arranged on the lifting device (4);
 - stopping an upward movement of the lifting device (4) when sensing the presence of the elongated element (6) in a case where the support arms (5) are in an upright position, or
 - ramping down the speed of the upward movement of the lifting device (4) in a case where the support arms (5) are in a lowered position and stopping the movement of the lifting device (4) when the lifting device (4) has moved upwards a predetermined distance wherein the sensor (7) sense the absence of the elongated element (6).
7. Method of operating a fork-lift truck (1) according to claim 6, wherein the mast structure (2) comprises a first mast element, which carries the lifting device (4) and a second mast element, by which the first mast element is carried and along which the first mast element is movable.
8. Method of operating a fork-lift truck (1) according to claim 7, wherein the mast structure (2) further comprises a third mast element, by which the second mast element is carried and along which the second mast element is movable.
9. Method of operating a fork-lift truck (1) according to any of claims 6 to 8, wherein the fork-lift truck (1) is a pedestrian-controlled truck with protective side guards, and wherein the constant maximum lifting height is provided when the protective side guards is in their protective position
10. Method of operating a fork-lift truck according to any of claims 6 to 9, wherein the constant maximum lifting height is a maximum lifting height according to the International Standard for safety requirements of Industrial trucks.
11. A computer-readable storage medium, having stored there on a computer program which, when run in a processor of a fork-lift truck (1), causes the fork-lift truck to perform the method as claimed in any of claims 6-10.
12. Method of modifying a fork-lift truck 1, with support arms (5) and a mast structure (2), such that the fork-lift truck (1) is able to provide a constant maximum lifting height independent of the position of the support arms (5), wherein the method comprising the steps of:

- providing a lifting device (4) carried by the mast structure (2) and movable along the mast structure (2) with an elongated element (6) comprising a magnetic or ferromagnetic material;
- providing the mast structure (2) with a sensor (7) configured to sense a presence/absence of the elongated element (6); and
- providing a computer-readable storage medium in the fork-lift truck with a computer program which, when run in a processor of the fork-lift truck causes the fork-lift truck to perform the method as claimed in any of claims 7-13.

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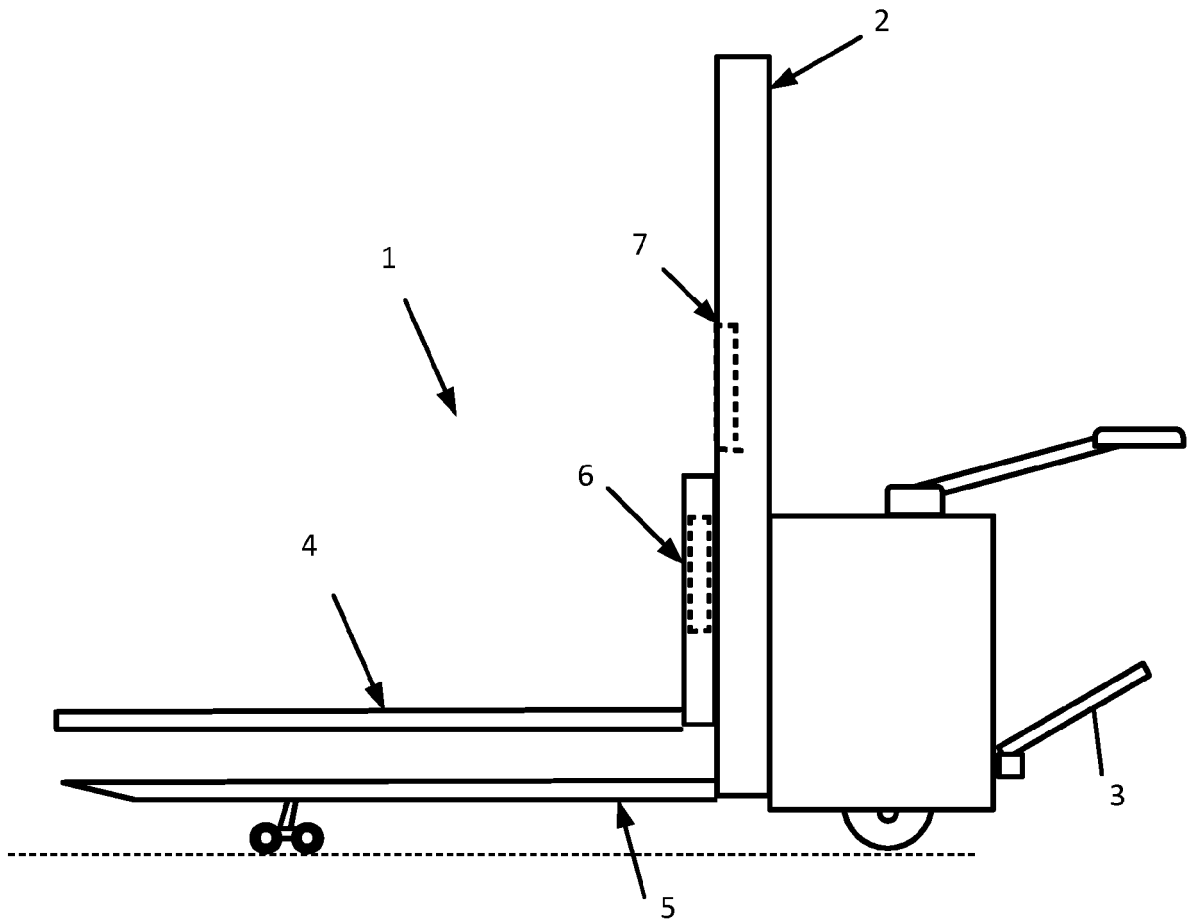


Figure 1

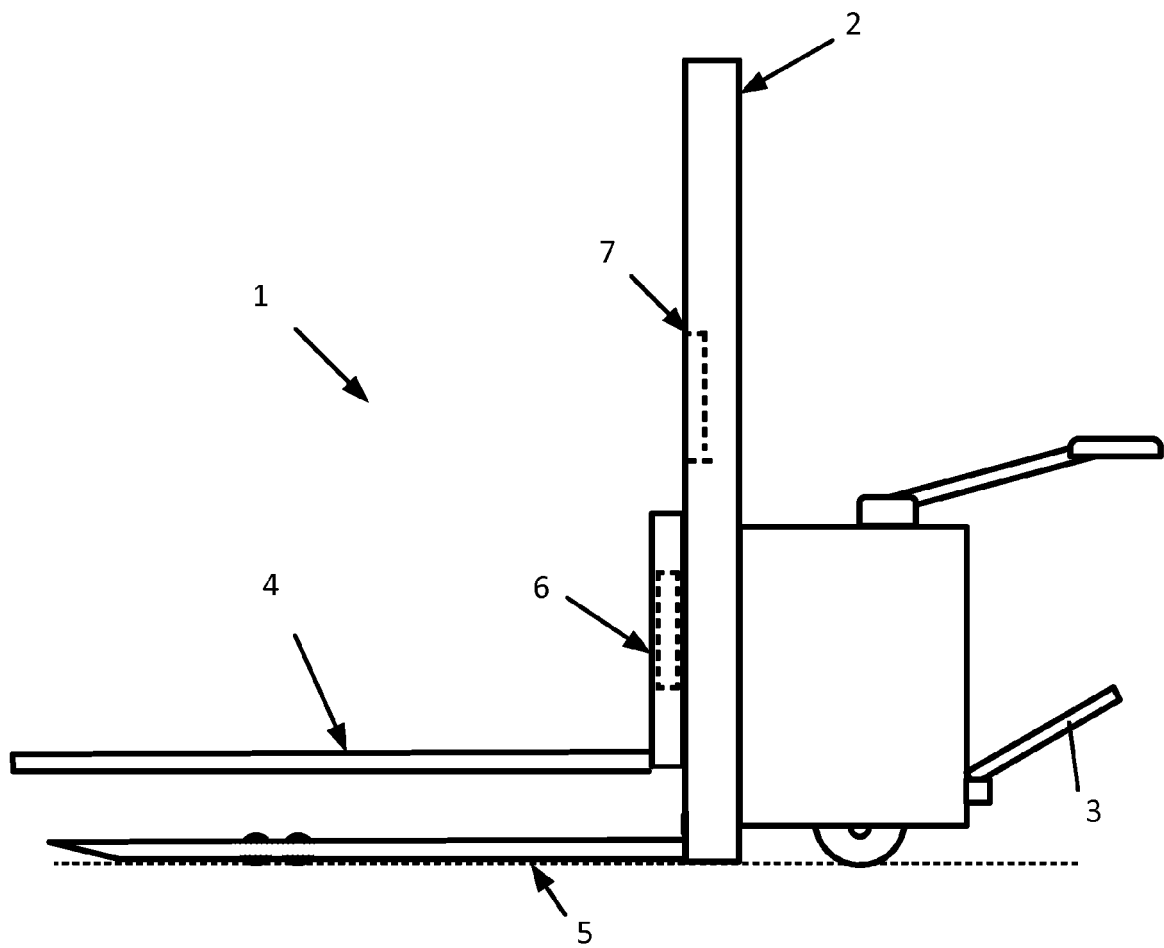


Figure 2

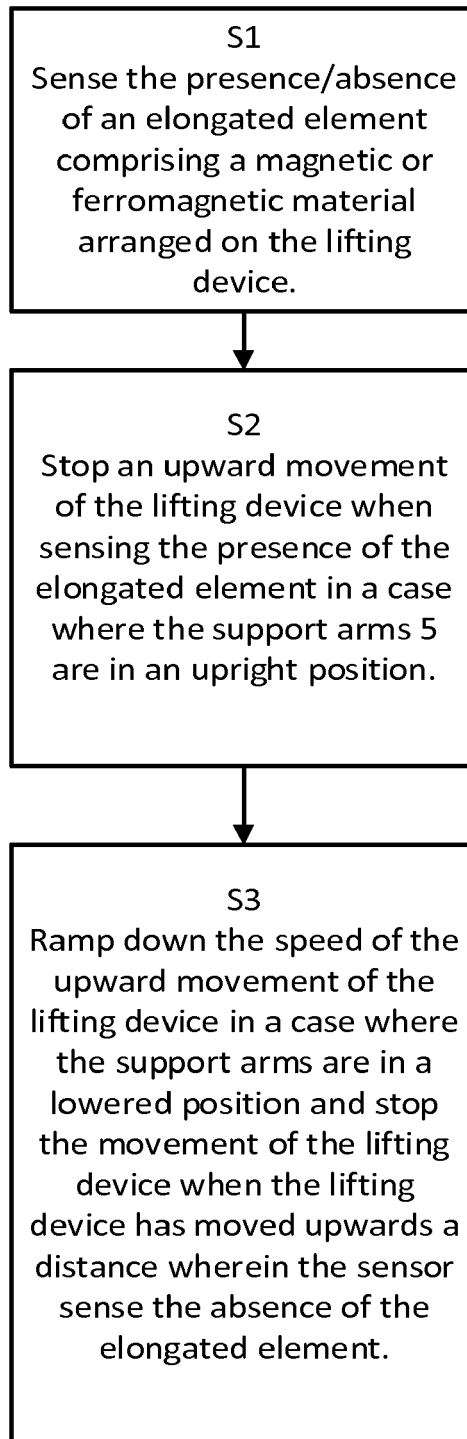


Figure 3

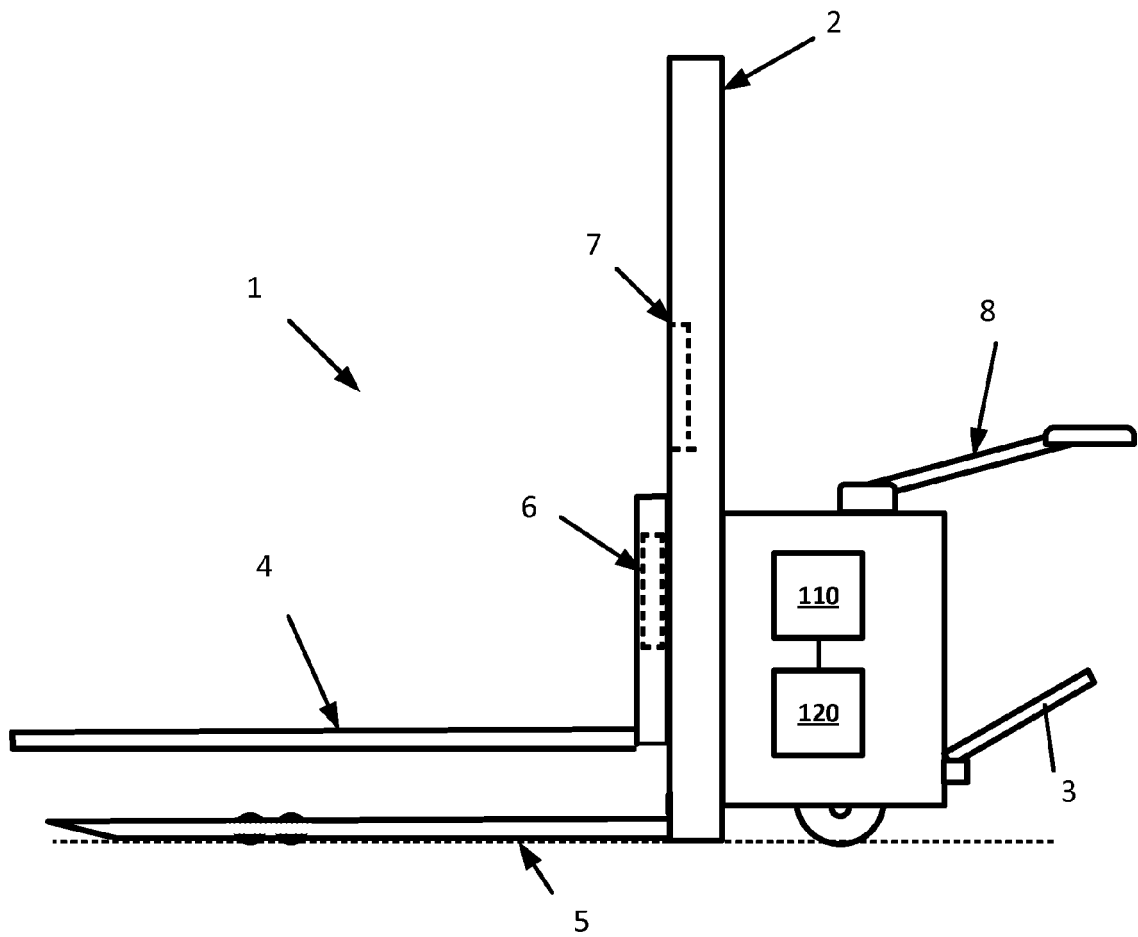


Figure 4



EUROPEAN SEARCH REPORT

Application Number
EP 14 17 2090

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	EP 2 251 298 A1 (JUNGHEINRICH AG [DE]) 17 November 2010 (2010-11-17) * abstract; figures 1-4 *	1-12	INV. B66F9/075 B66F9/24
A	US 2008/164101 A1 (STONE ROBERT M [US]) 10 July 2008 (2008-07-10) * abstract; figures 1-19 *	1-12	
A	EP 2 518 002 A1 (JUNGHEINRICH AG [DE]) 31 October 2012 (2012-10-31) * abstract; figures 1,2 *	1-12	
A	EP 2 390 222 A1 (JUNGHEINRICH AG [DE]) 30 November 2011 (2011-11-30) * abstract; figures 1-4 *	1-12	
			TECHNICAL FIELDS SEARCHED (IPC)
			B66F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		22 October 2014	Rupcic, Zoran
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 14 17 2090

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
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22-10-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2251298 A1	17-11-2010	DE 102009020947 A1	18-11-2010
		EP 2251298 A1	17-11-2010

US 2008164101 A1	10-07-2008	CN 101610968 A	23-12-2009
		EP 2102092 A2	23-09-2009
		JP 5575484 B2	20-08-2014
		JP 2010515635 A	13-05-2010
		KR 20090110305 A	21-10-2009
		US 2008164101 A1	10-07-2008
		WO 2008085295 A2	17-07-2008

EP 2518002 A1	31-10-2012	CN 102756996 A	31-10-2012
		DE 102011100914 A1	31-10-2012
		EP 2518002 A1	31-10-2012

EP 2390222 A1	30-11-2011	DE 102010022374 A1	01-12-2011
		EP 2390222 A1	30-11-2011
