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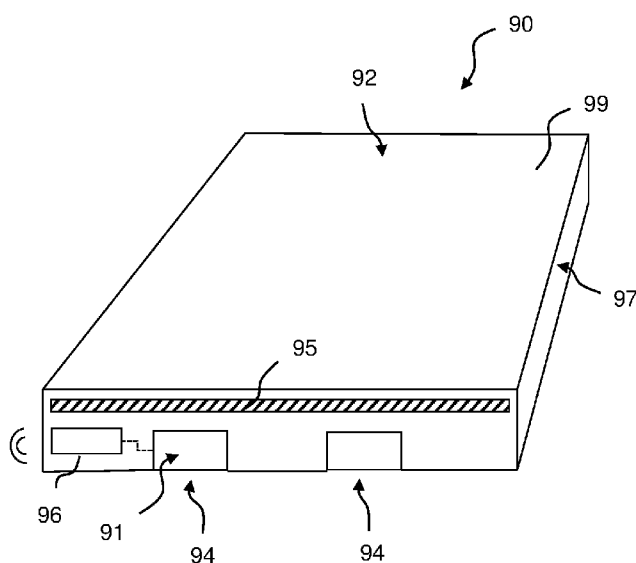


FIG. 2

(57) Abstract: The present disclosure relates to techniques in the context of vehicles, and to an electronic pallet comprising a blocking mechanism arranged to selectively block and unblock its fork openings. According to a first aspect, the disclosure relates to an electronic pallet (90), arranged to be loadable onto a vehicle (1). The electronic pallet (90) comprises fork openings (94), arranged to receive lifting forks (31). The electronic pallet (90) also comprises a blocking mechanism (91) arranged to selectively block and unblock the fork openings (94) and a control device (96) configured to control the blocking mechanism (91) to selectively block and unblock the fork openings (94) based on one or more predetermined criteria. Thereby, the fork openings (94) may be blocked during transport and storage, whereby theft is prevented. The disclosure also relates to a corresponding method, computer program and to a computer program product for performing the proposed method.





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ELECTRONIC PALLET AND METHOD FOR SELECTIVELY BLOCKING FORK OPENINGS OF AN ELECTRONIC PALLET

Technical field

- 5 The present disclosure relates to techniques in the context of vehicles, and to an electronic pallet comprising a blocking mechanism arranged to selectively block and unblock its fork openings. The disclosure also relates to a corresponding method, computer program and to a computer program product for performing the proposed method.

10 Background

- In vehicle transportation, pallets are commonly used to move goods from place to place (e.g., warehouse to retail store). When a desired amount of goods has been loaded or stacked on the pallet, a fork lift, hand jack, or other device is typically slid under and/or through the pallet such that the pallet can be lifted vertically off
15 the ground. When hoisted up, the pallet and the products stacked thereon may be transported to a storage area in a warehouse, loaded onto a truck used to distribute the goods, or taken to some other location as desired. Using pallets, numerous products may be conveniently moved and stored in groups to increase shipping and transportation delivery.
- 20 However, loss of goods due to theft during transportation on vehicles is a recognized problem, as pallets may relatively easily be unloaded using a fork lift or similar. One way of preventing theft is to equip the pallets with electronic tags, that enables tracking the pallets. For example, United States Patent Application US2008/103944 (A1) describes an intelligent pallet having an active RFID tag
25 embedded therein. The pallet is used within a leasing system and/or an inventory management system. However, with the increasing use of autonomous vehicles where no driver is present that can prevent the theft, further measures to also actually prevent the theft beforehand are also desirable.

Summary

It is an object of the disclosure to alleviate at least some of the drawbacks with the prior art. Thus, it is an object to provide a solution that prevents a pallet from being stolen.

According to a first aspect, the disclosure relates to an electronic pallet, arranged
5 to be loadable onto a vehicle. The electronic pallet comprises fork openings, arranged to receive lifting forks. The electronic pallet also comprises a blocking mechanism arranged to selectively block and unblock the fork openings and a control device configured to control the blocking mechanism to selectively block and unblock the fork openings based on one or more predetermined criteria.

10 Thereby, the fork openings may be blocked during transport and storage, whereby theft is prevented.

In some embodiments, the electronic pallet comprises a wireless communication interface and the control device is configured to receive authentication data using the wireless communication interface and to cause the blocking mechanism to
15 control the fork openings based on the authentication data. Thereby, a user such as a driver may easily unblock the fork openings (e.g. for loading and unloading the electronic pallet) by being authorized using a wireless user device.

In some embodiments, the wireless communication interface is configured to receive the authentication from a fork lift, from a mobile terminal or from an off-
20 board system. Thereby, the mere presence of an authorized vehicle or user may cause the fork openings to open. Alternatively, an authorized user may unblock the fork openings using an application installed in a user device (e.g. a mobile phone).

In some embodiments, the control device is configured to control the blocking
25 mechanism to automatically block the fork openings upon detecting that a lifting fork is removed from the fork openings or upon expiry of a predefined time period since unblocking of the fork openings. Thereby security is enhanced, as no explicit action is required to block the fork openings.

In some embodiments, the blocking mechanism comprises pivotable and/or sliding covers arranged to be moved between a closed position, where the fork openings are blocked, and an open position where the fork openings are unblocked. The covers may be arranged to partly or entirely block the fork openings in the closed position.

In some embodiments, the electronic pallet comprises an actuator arranged to move the covers between the first position and the second position. Thus, the locking and unlocking may be electrically controlled.

In some embodiments, the blocking mechanism comprises a locking mechanism arranged to lock the covers in the closed position and/or in the open position. Thereby, the position of the covers cannot be changed without unlocking the locking mechanism. For example, only authorized users that have access to an electronic key may unblock the fork openings.

According to a second aspect, the disclosure relates to a method, performed by a control device in an electronic pallet arranged to be loadable onto a vehicle. The electronic pallet comprises fork openings arranged to receive lifting forks and a blocking mechanism configured to selectively block and unblock the fork openings. The method comprises controlling the blocking mechanism to selectively block and unblock the fork lift entries based on one or more predetermined criteria.

In some embodiments, the method comprises receiving authentication data and the controlling of the blocking mechanism is based on the received authentication data.

In some embodiments, the method comprises receiving the authentication from a fork lift, from a mobile terminal or from an off-board system.

In some embodiments, the controlling comprises automatically blocking the fork openings upon detecting that a lifting fork is removed or upon expiry of a predefined time period since unblocking of the fork openings.

According to a third aspect, the disclosure relates to a computer program comprising instructions which, when the program is executed by a computer, cause the computer to carry out the method according to the second aspect.

- 5 According to a fourth aspect, the disclosure relates to a computer-readable medium comprising instructions which, when executed by a computer, cause the computer to carry out the method according to the first aspect.

Brief description of the drawings

Fig. 1 illustrates a vehicle carrying an electronic pallet.

Fig. 2 illustrates an electronic pallet.

- 10 Fig. 3 illustrates an electronic pallet with four-sided accessibility seen from above.
Figs. 4a and 4b illustrate an example implementation of a blocking mechanism according to some embodiments.

Figs. 5a and 5b illustrate an example implementation of a blocking mechanism according to some embodiments.

- 15 Fig. 6 illustrates a flow chart of a method performed by a control device in an electronic pallet.

Fig. 7 is a control device configured to implement the proposed method in more detail.

20 Detailed description

- The term electronic pallet herein refers to a pallet that cannot only carry goods but that also can carry information e.g. about the goods on the pallet using e.g. an electronic tag that is matched with a logistics information system. An electronic pallet typically comprises an integrated energy storage such as a battery. The
25 battery generally powers electronic circuitry such that the electronic pallet can send and receive signals using a transmitter and a receiver.

- This disclosure proposes an electronic pallet with physical theft-protection. More specifically, this disclosure proposes an electronic pallet comprising fork openings, arranged to receive lifting forks, and a blocking mechanism arranged to
30 selectively block and unblock the fork openings. In order to unblock the fork lift

openings, a vehicle (e.g. a fork lift truck) that is about to move the electronic pallet, or an operator, must communicate with the electronic pallet to make the blocking mechanism unblock the fork openings. Thereby, the electronic pallet can only be moved by an authorised operator and/or vehicle.

- 5 Fig. 1 illustrates a vehicle 1, here a lorry, having an electronic pallet 90 carrying goods 70 loaded thereon. A vehicle will normally transport a plurality of pallets, but for simplicity only one pallet is described in this example. The vehicle 1 is herein embodied as a lorry, but it must be appreciated that the electronic pallet 90 may be loaded on any manned or unmanned vehicle. The vehicle 1 may be
- 10 autonomously or remotely operated. In other words, it may be driverless. An autonomous vehicle is for example controlled by an off-board system that instructs the vehicle to perform missions. A mission is e.g. to drive a route between a first position and a second position.

The vehicle 1 comprises a plurality of electrical systems and subsystems.

- 15 However, for simplicity only some parts of the vehicle 1 that are associated with the proposed technique are shown in Fig. 1. Thus, the vehicle 1 of Fig. 1 comprises an electrical engine 21, an energy storage device 22 and a control unit 20.

- 20 The electrical engine 21 is configured to propel, a possibly also to brake, the vehicle 1. The energy storage device 22 is configured to supply power to the electrical engine 21.

- 25 The control unit 20 (or Electrical Control Unit, ECU) is basically a digital computer that controls one or more electrical systems of the vehicle 1 based on e.g. information read from sensors and meters placed at various parts and in different components of the vehicle 1. ECU is a generic term for a control unit that is used in automotive electronics for any embedded system that controls one or more functions of the electrical system or sub systems in a transport vehicle.

The control unit 20 illustrated in Fig. 1 is a control unit configured to control the load of the vehicle 1.

The control unit 20 typically comprises one or more communication interfaces. Typically, the control unit 20 comprises one interface, e.g. a Controller Area Network, CAN, used to handle communication between the various control units in the vehicle 1. The CAN uses a message-based protocol. Often, several connected
5 CAN networks are arranged in the vehicle 1.

In some embodiments, the control unit 20 also comprises an interface configured to communicate with the electronic pallet 90. For example, the electronic pallet performs some kind of hand-shake with the control unit 20 of the vehicle 1 upon loading. Then energy may be exchanged between the vehicle 1 and the electronic
10 pallet 90 e.g. via an inductive interface (not shown).

Fig. 2 illustrates an electronic pallet 90 with physical theft protection in further detail. The electronic pallet 90 is e.g. a standard European pallet (or EURO-pallet) as specified by the European Pallet Association. The electronic pallet 90 is designed to be loaded at a vehicle 1. The electronic pallet 90 comprises a structural
15 foundation 99, which allows handling and storage of goods. The structural foundation 99 is commonly wooden, but can also be made of plastic, metal, paper, and/or other materials. The structural foundation 99 comprises an upper side 92, a lower side (not shown) and four side walls 97. Wooden pallets typically consist of three or four stringers that support several deck boards, on top of which goods are
20 placed. However, other designs are also possible, and the proposed technique may in general be implemented on any type of electronic pallet 90. Therefore, in the illustration of the electronic pallet 90 of Fig. 2, the structural foundation 99 is only schematically illustrated.

The electronic pallet 90 further comprises a blocking mechanism 91, fork openings
25 94, an energy storage device 95 and a control device 96.

The fork openings 94 are openings in the side walls 97 that are arranged to receive lifting forks of for example a forklift, i.e. a powered industrial truck used to lift and move materials over short distances. In other words, the fork openings 94 are e.g.

arranged to allow lifting forks 31 (Fig. 3) to access the pallet in order to lift it. The electronic pallet 90 may have fork openings 94 on one or more of its side walls 97.

Fig. 3 illustrates an electronic pallet 90, more specifically an EURO-pallet, with four-sided accessibility seen from above. In this example, all four sides of the structural foundation 99 comprise fork openings 94. In other embodiments, the electronic pallet 90 may have fork openings 94 only on its short sides, or only on one side. Fork lift slots 98 extend from the fork openings 94 into the pallet. The fork lift slots 98 are tracks arranged to guide lifting forks 31 of a vehicle 1, while lifting the electronic pallet 90. In other words, in some embodiments the fork openings 94 defines openings of fork lift slots 98.

The blocking mechanism 91 will now be described in more detail, with reference to Fig. 2, Fig. 4a-4b and Fig. 5a-5b. The blocking mechanism 91 is a mechanism arranged to selectively block and unblock the fork openings 94. In some embodiments the blocking mechanism 91 comprises pivotable and/or sliding covers 911 arranged to be moved between a closed position, where the fork openings 94 are blocked, and an open position where the fork openings 94 are unblocked. In the following embodiments a pivotable cover is denoted 911a and a sliding cover 911b. The covers 911 may completely cover the fork openings 94, or they may partly cover the fork openings. In the closed position a fork is prevented from entering the fork openings 94 and consequently also from lifting and/or moving the electronic pallet 90. In the open position a fork may enter the fork openings 94 to lift and/or move the electronic pallet 90. The blocking mechanism 91 may alternatively use other means to selectively block and unblock the fork openings 94, such as rods or other blocking devices.

Fig. 4a and 4b illustrates an example implementation of a blocking mechanism 91 arranged at a fork opening 94. In this embodiment, the blocking mechanism 91 comprises a pivotable cover 911a that is arranged to be moved between a closed position, where the fork opening 94 is blocked, and an open position where the fork opening 94 is unblocked. In this embodiment, the pivotable cover 911a is pivotably attached to the electronic pallet 90 using hinges 912. In Fig. 4a and 4b

the hinges arranged on the upper side of the pivotable cover 911a. It must be appreciated that the hinges 912 may alternatively be positioned for example at the side of the pivotable cover 911a.

In Fig. 4a the pivotable cover 911a is in a closed position, whereby the pivotable cover 911a covers the fork opening 94. The blocking mechanism 91 comprises a locking mechanism 913 arranged to lock the pivotable cover 911a in the closed position. The locking mechanism 913 may e.g. comprise a latch. When the pivotable cover 911a is locked in a closed position, a fork 31 is prevented from entering the fork opening 94, as the locking mechanism 913 stops the pivotable cover 911a from pivoting.

In Fig. 4b the pivotable cover 911a is in an open position, where the pivotable cover 911a is pivoted inwards into the electronic pallet 90. Thereby, a fork 31 may enter the fork openings 94 in order to lift and/or move the electronic pallet 90.

In the embodiment of Fig. 4a and 4b, an actuator 914 (here illustrated as a steel spring), is arranged to push the pivotable cover 911a towards the closed position. In other words, the actuator 914 is arranged to move the pivotable cover 911a from the open position to the closed position. More generally, in some embodiments the blocking mechanism 91 comprises an actuator 914 arranged to move the covers between the first position and the second position. The actuator 914 may be implemented using e.g. suspension device, solenoid and/or an electrical engine arranged to move the covers between the first position and the second position.

In some embodiments, a locking mechanism 913 is arranged to selectively lock and unlock the pivotable cover 911a in the closed position, based on control data provided by the control device 96, as will be further explained below. If the pivotable cover 911a is unlocked, then a fork 31 may push the pivotable covers 911a inwards and enter the fork lift slot 98 in order to lift the electronic pallet 90. In other words, the pivotable cover 911a may be opened by an object (e.g. a fork 31) pushing the pivotable cover 911a inwards. If the pivotable cover 911 is locked,

then a fork 31 is prevented from opening the pivotable cover 911a and consequently from entering the fork lift slot 98. The locking mechanism may also be arranged to lock the pivotable covers 11a in the open position. More generally, in some embodiments the blocking mechanism 91 comprises a locking
5 mechanism 913 arranged to lock the covers 911 in the closed position and/or in the open position. The locking mechanism 913 may be implemented using e.g. a solenoid and/or a latch.

Figs. 5a and 5b illustrate another example implementation of the blocking mechanism 91. In this embodiment, the blocking mechanism 91 comprises a
10 sliding cover 911b arranged to be vertically slid between a closed position, where the fork opening 94 is blocked, and an open position where the fork opening 94 is unblocked. In this embodiment, the sliding cover 911b is attached to the electronic pallet 90 using rails (not shown). It must be appreciated that the sliding cover 911b may alternatively be arranged to be horizontally slid.

15 In Fig. 5a the sliding cover 911b is in a closed position, where it prevents a fork 31 from entering the fork opening 94. In Fig. 5b the pivotable cover 911b is in an open position, where the sliding cover 911b is slid upwards such that it does not cover the fork opening 94. Thus, in the open position a fork 31 may enter the fork opening 94 in order to lift and/or move the electronic pallet 90. In Fig. 5a and 5b,
20 an actuator 914, e.g. an electromagnet or a motor, is arranged to move the sliding cover 911b between the closed position and the open position, based on control data provided by the control device 96. The actuator 914 may also serve as a locking mechanism that holds the sliding cover 911b in the closed position.

Turning back to Fig. 2, the other components of the electronic pallet 90 will be
25 described in more detail.

The energy storage device 95 is configured to power the various components of the electronic pallet 90 e.g. to power the components of the blocking mechanism 91.

The control device 96 is configured to control the operation of the electronic pallet 90 and the components of the electronic pallet 90. Typically, the electronic pallet 90 is arranged to receive data from, and to send control data to, the blocking mechanism 91 and the energy storage device 95. In particular, the control device 96 is configured to control the blocking mechanism 91 to selectively block and unblock the fork openings 94 based on one or more predetermined criteria, as will now be described in further detail with reference to Fig. 6 and Fig. 7.

The proposed technique will now be described in further detail with reference to the flow chart of Fig. 6 and the electronic pallet described in Fig. 2 to 5. Fig. 6 illustrates a flow chart of a method performed by a control device 96 in an electronic pallet 90 arranged to be loadable onto a vehicle 1, such as the vehicle 1 of Fig. 1. The method is for example performed when the electronic pallet 90 is carrying goods 70 for example while transported by (i.e. loaded on) the vehicle 1 or when stored in a warehouse.

The method is typically implemented as a computer program comprising instructions which, when the program is executed by a computer, cause the computer to carry out the method. According to some embodiments the computer program is stored in a computer-readable medium that comprises instructions which, when executed by a computer, cause the computer to carry out the method.

As the purpose of blocking the fork openings is typically to prevent an unauthorized user from moving or lifting the electronic pallet, authentication is typically required to cause the blocking mechanism 91 to block and/or unblock the fork openings. Therefore, in some embodiments, the method comprises receiving S0 authentication data from an external device. The authentication data may be authentication data in any form, e.g. credentials or a cryptographic key that the control device 96 can authorize.

The proposed method comprises controlling S1 the blocking mechanism 91 to selectively block and unblock the fork lift entries based on one or more

predetermined criteria. For example, control data that controls the actuator 914 to move the cover 911 to an open position is sent to the actuator 914. The predetermined criteria may take parameters or data received from an external device, such as a forklift, a remote-control system or a user device (e.g. a mobile phone), as input. The predetermined criteria may alternatively take sensor data provided by sensors in the electronic pallet as input. In some embodiments, the predetermined criteria take time as input. For example, the fork openings 94 are unblocked at a certain point in time, when loading of the electronic pallet 90 is planned.

10 If authentication data has been received S0, then, the controlling S1 of the blocking mechanism 91 is based on the received authentication data. In other words, only an authorized external device is allowed to control the blocking mechanism. The authentication data may be received for example from a fork lift, a vehicle 1, from a mobile terminal or from an off-board system.

15 In one example scenario a fork lift approaching the electronic pallet broadcasts authentication data. The control device 96 receives the broadcasted signal and identifies the fork lift as being an authorized device and consequently the blocking mechanism 91 is controlled to unblock its fork openings. The electronic pallet 90 may then be moved by the fork lift. After 10 minutes the blocking
20 mechanism 91 is automatically controlled to block its fork openings 94.

Alternatively, the fork openings 94 are automatically blocked upon detecting that the lifting forks have been removed from the fork openings 94. For example, sensor data indicating that no fork is present in the fork lift slots 98 is received from a sensing mechanism (not shown) that is arranged to detect presence of a
25 fork in the fork lift slots 98. In other words, in some embodiments, the controlling S1 comprises automatically blocking the fork openings 94 upon detecting that a lifting fork is removed or upon expiry of a predefined time period since unblocking of the fork openings 94.

Now to Fig. 7 which illustrates a control device 96 configured to implement the
30 proposed method in more detail. In some embodiments, the control device 96 is a

“unit” in a functional sense. Hence, in some embodiments the control device 96 is a control arrangement comprising several physical control units that operate in corporation. The control device 96 comprises hardware and software. The hardware basically comprises various electronic components on a Printed Circuit Board, PCB. The most important of those components is typically a processor 961 e.g. a microprocessor, along with a memory 962 e.g. EPROM or a Flash memory chip. The software is typically lower-level software code that runs in the microcontroller.

The control device 96, or more specifically the processor 961 of the control device 96, is configured to cause the control device 96 to perform all aspects of the method described above and below. This is typically done by running computer program code stored in the memory 962 in the processor 961 of the control device 96.

More particularly, the control device 96 is configured control the blocking mechanism 91 to selectively block and unblock the fork openings 94 based on one or more predetermined criteria, as described in connection to Fig. 6.

In some embodiments, the control device 96 is configured to control the blocking mechanism 91 to automatically block the fork openings 94 upon detecting that a lifting fork is removed from the fork openings or upon expiry of a predefined time period since unblocking of the fork openings 94.

In some embodiments, the control device 96 comprises a wireless communication interface a wireless communication interface 963 and the control device 96 is configured to receive authentication data using the wireless communication interface 963 and to cause the blocking mechanism 91 to control the fork openings 94 based on the authentication data. In some embodiments, the wireless communication interface 963 is configured to receive the authentication from a fork lift, from a mobile terminal or from an off-board system.

In some embodiments the wireless communication interface 963 comprises a first communication interface configured to enable communication with a vehicle 1 at

which the electronic pallet 90 is loaded. The first communication interface is e.g. implemented using Near-Field-Communication, NFC, Bluetooth, Wi-Fi. In some embodiments, the control device 96 is configured to send a deactivation signal to the vehicle using the first communication interface 963a, based on the determined
5 displacement.

In some embodiments the wireless communication interface 963 comprises a second communication interface 963b configured to enable communication with an external device, such as an off-board system or a user device e.g. a mobile phone. The first communication interface is e.g. implemented using 2G, 3G, 4G, 5G
10 and the control device 96 is configured to send an alert to an external device using the second communication interface 963b, based on the determined displacement. In some embodiments, the second communication interface is integrated with, or same as, first communication interface.

In some embodiments, this disclosure relates to a vehicle 1 comprising electronic
15 pallet 90 according to any one of these embodiments.

The terminology used in the description of the embodiments as illustrated in the accompanying drawings is not intended to be limiting of the described method; control arrangement or computer program. Various changes, substitutions and/or alterations may be made, without departing from invention embodiments as
20 defined by the appended claims.

The term "or" as used herein, is to be interpreted as a mathematical OR, i.e., as an inclusive disjunction; not as a mathematical exclusive OR, unless expressly stated otherwise. In addition, the singular forms "a", "an" and "the" are to be interpreted as "at least one", thus also possibly comprising a plurality of entities of
25 the same kind, unless expressly stated otherwise. It will be further understood that the terms "includes", "comprises", "including" and/ or "comprising", specifies the presence of stated features, actions, integers, steps, operations, elements, and/ or components, but do not preclude the presence or addition of one or more other features, actions, integers, steps, operations, elements, components, and/ or

groups thereof. A single unit such as e.g. a processor may fulfil the functions of several items recited in the claims.

Claims

1. An electronic pallet (90), arranged to be loadable onto a vehicle (1), the electronic pallet (90) comprising:
 - fork openings (94), arranged to receive lifting forks (31),
 - 5 - a blocking mechanism (91) arranged to selectively block and unblock the fork openings (94), and
 - a control device (96) configured to control the blocking mechanism (91) to selectively block and unblock the fork openings (94) based on one or more predetermined criteria.
- 10 2. The electronic pallet (90) according to claim 1, wherein the electronic pallet (90) comprises:
 - a wireless communication interface (963) andwherein the control device (96) is configured to receive authentication data
15 using the wireless communication interface (963) and to cause the blocking mechanism (91) to control the fork openings (94) based on the authentication data.
- 20 3. The electronic pallet (90) according to claim 2, wherein the wireless communication interface (963) is configured to receive the authentication from a fork lift, from a mobile terminal or from an off-board system.
- 25 4. The electronic pallet (90) according to any of the preceding claims, wherein the control device (96) is configured to control the blocking mechanism (91) to automatically block the fork openings (94) upon detecting that a lifting fork is removed from the fork openings or upon expiry of a predefined time period since unblocking of the fork openings (94).
- 30 5. The electronic pallet (90) according to any of the preceding claims, wherein the blocking mechanism (91) comprises pivotable and/or sliding covers (911) arranged to be moved between a closed position, where the fork

openings (94) are blocked, and an open position where the fork openings (94) are unblocked.

5 6. The electronic pallet (90) according to claim 5, wherein the blocking mechanism (91) comprises an actuator (914) arranged to move the covers between the first position and the second position.

10 7. The electronic pallet (90) according to claim 5 or 6, wherein the blocking mechanism (91) comprises a locking mechanism (913) arranged to lock the covers in the closed position and/or in the open position.

15 8. A method, performed by a control device (96) in an electronic pallet (90) arranged to be loadable onto a vehicle (1) comprising fork openings (94), arranged to receive lifting forks (31) and a blocking mechanism (91) configured to selectively block and unblock the fork openings (94), the method comprising:
- controlling (S1) the blocking mechanism (91) to selectively block and unblock the fork lift entries based on one or more predetermined criteria.

20

9. The method according to claim 8 comprising:
- receiving (S0) authentication data and
wherein the controlling (S1) of the blocking mechanism (91) is based on the received authentication data.

25

10. The method according to claim 9 comprising receiving the authentication data from a fork lift, from a mobile terminal or from an off-board system.

30 11. The method according to any one of claims 8 to 10, wherein the controlling (S1) comprises automatically blocking the fork openings (94) upon detecting that a lifting fork is removed or upon expiry of a predefined time period since unblocking of the fork openings (94).

12. A computer program comprising instructions which, when the program is executed by a computer, cause the computer to carry out the method of any one of the claims 8 to 11.

5

13. A computer-readable storage medium comprising instructions which, when executed by a computer, cause the computer to carry out the method of any one of the claims 8 to 11

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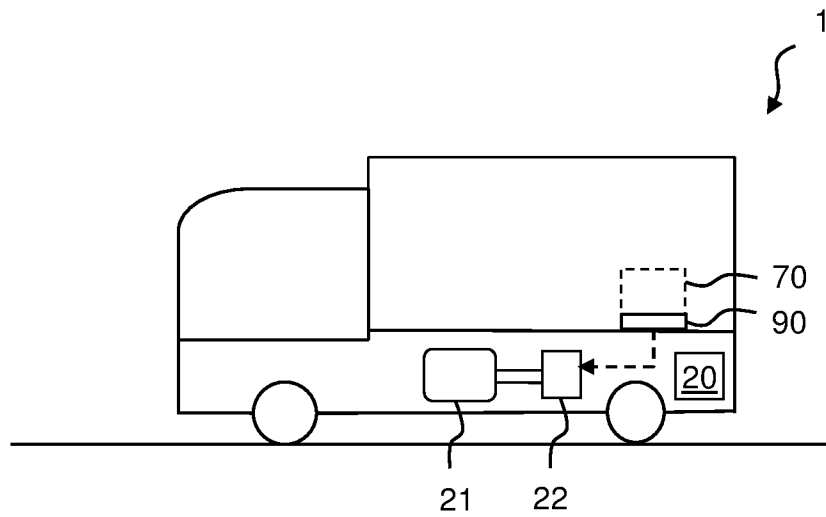


FIG. 1

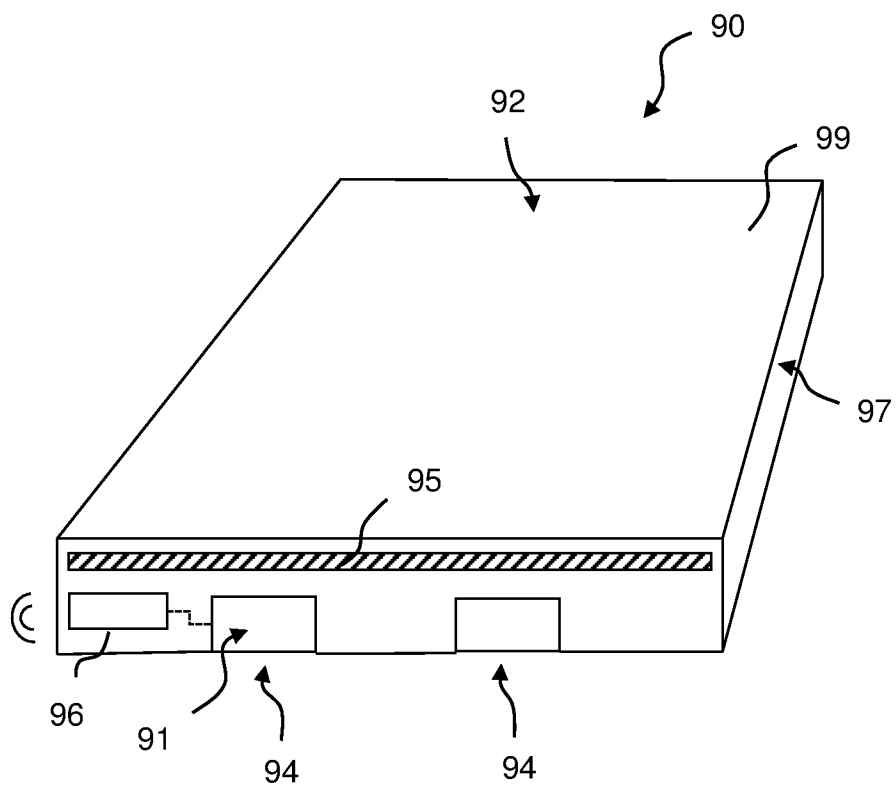


FIG. 2

2/3

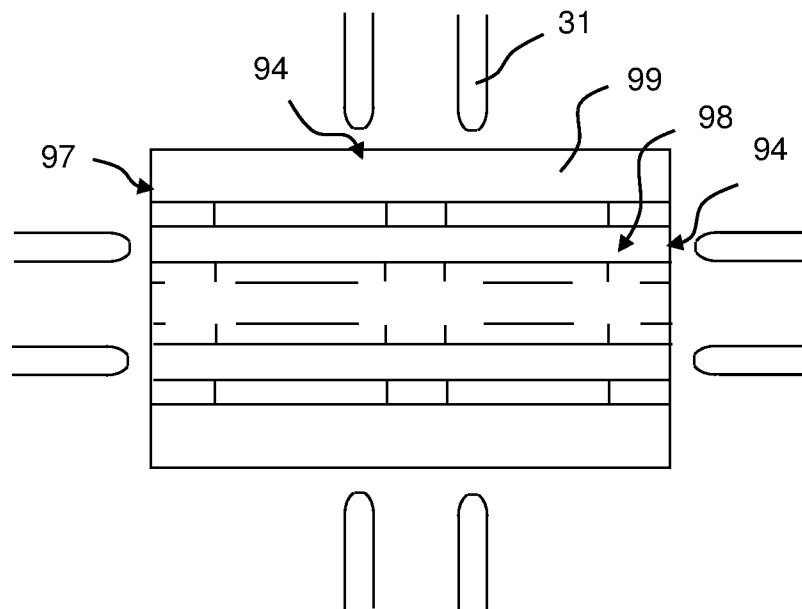


FIG. 3

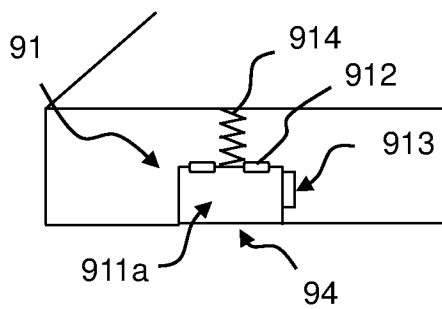


FIG. 4a

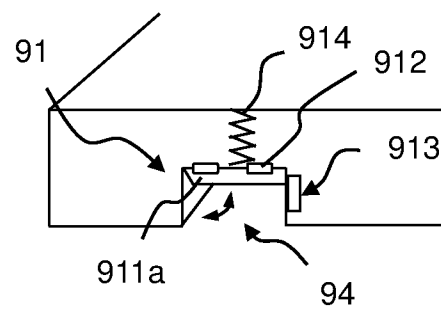


FIG. 4b

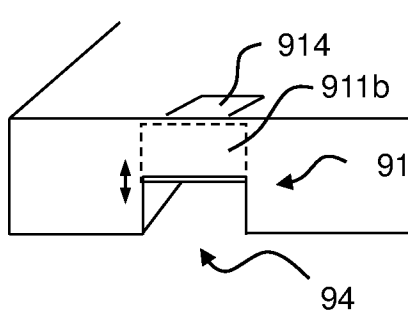


FIG. 5a

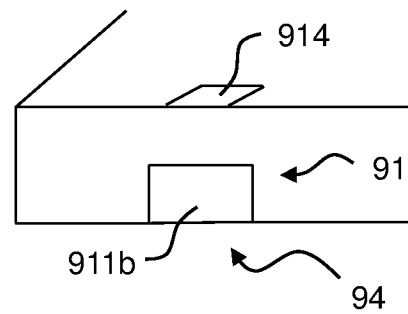


FIG. 5b

3/3

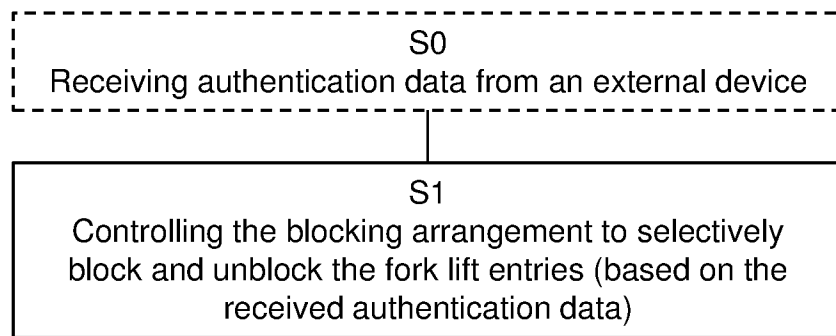


FIG. 6

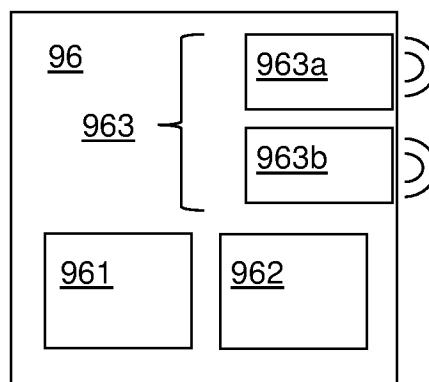


FIG. 7

INTERNATIONAL SEARCH REPORT

 International application No.
 PCT/SE2019/051174

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B65D, E05B, E05F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 4403150 A1 (JUERGENS WALTER), 3 August 1995 (1995-08-03); abstract; figures 1-3 --	1-13
A	US 20150266613 A1 (CANCE PAUL J ET AL), 24 September 2015 (2015-09-24); abstract; paragraphs [0003], [0020]- [0032]; figures 1C-4B --	1-13
A	JP 2007118988 A (CHUO YUSO KK), 17 May 2007 (2007-05- 17); figure 2C; WPI abstract --	1-13
A	US 20090193857 A1 (BEARZOT GEORGE), 6 August 2009 (2009-08-06); abstract; paragraphs [0007]-[0026]; figure 1 --	1-13



Further documents are listed in the continuation of Box C.



See patent family annex.

*

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document defining the general state of the art which is not
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document of particular relevance; the claimed invention cannot be
considered to involve an inventive step when the document is
combined with one or more other such documents, such combination
being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

05-02-2020

Date of mailing of the international search report

05-02-2020

Name and mailing address of the ISA/SE

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2019/051174

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2473211 A (HAYES MATTHEW JOHN), 9 March 2011 (2011-03-09); abstract; figures 1-4; page 1, fourth paragraph --	1-13
A	CN 103979234 A (HE SHUAISONG), 13 August 2014 (2014-08-13); figure 1; WPI abstract --	1-13
A	CN 201172524 Y (NANTONG CIMC TANK EQUIPMENT CO), 31 December 2008 (2008-12-31); figures 2A-2B; WPI abstract --	1-13
A	US 20180213719 A1 (CRANDALL JUSTIN ET AL), 2 August 2018 (2018-08-02); abstract; paragraphs [0002]-[0014]; figures 1-3 --	1-13
A	US 9284773 B1 (FRIDLEY MARLENE E ET AL), 15 March 2016 (2016-03-15); abstract; figures 1, 5, 7-8 --	1-13
A	US 20020196123 A1 (DIEHL JOSEPH RAYMOND ET AL), 26 December 2002 (2002-12-26); abstract; figure 1 -- -----	1-13

Continuation of: second sheet

International Patent Classification (IPC)

B65D 19/38 (2006.01)

E05B 73/00 (2006.01)

E05F 15/70 (2015.01)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE2019/051174

DE	4403150 A1	03/08/1995	NONE		
US	20150266613 A1	24/09/2015	US	9174767 B2	03/11/2015
JP	2007118988 A	17/05/2007	NONE		
US	20090193857 A1	06/08/2009	NZ	563502 A	30/10/2009
			US	8151607 B2	10/04/2012
			WO	2006119581 A8	03/01/2008
GB	2473211 A	09/03/2011	NONE		
CN	103979234 A	13/08/2014	NONE		
CN	201172524 Y	31/12/2008	NONE		
US	20180213719 A1	02/08/2018	US	10159181 B2	25/12/2018
			WO	2019152066 A1	08/08/2019
US	9284773 B1	15/03/2016	NONE		
US	20020196123 A1	26/12/2002	WO	03003192 A1	09/01/2003