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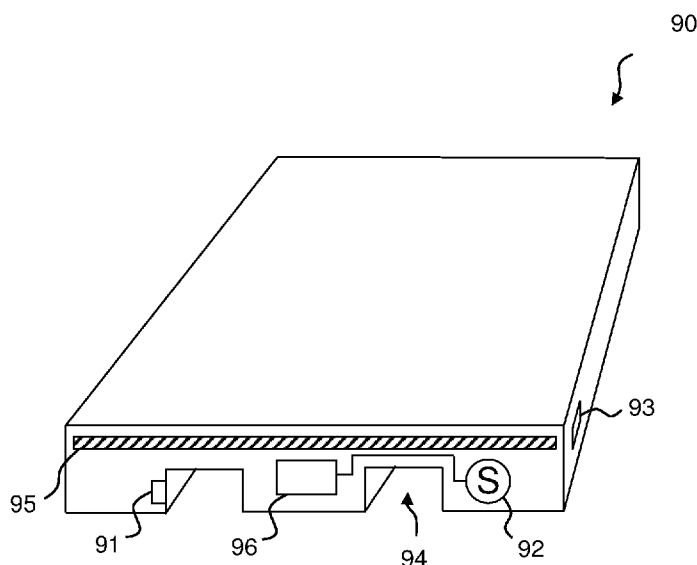


FIG. 2

(57) Abstract: The present disclosure relates to techniques in the context of vehicles, and to an electronic pallet for transporting stacked objects. According to a first aspect, the disclosure relates to a method, performed by a control device (96) in an electronic pallet (90), for safeguarding the electronic pallet (90) when the electronic pallet (90) is loaded on a vehicle (1). The electronic pallet (90) comprises an energy storage device (95) configured to exchange energy with the vehicle (1). The method comprises detecting (S1) a displacement of the electronic pallet (90) and activating (S3) a safeguarding function in the electronic pallet (90) based on the detected displacement. The disclosure also relates to an electronic pallet (90), to a computer program for performing the proposed methods and to a computer program product.

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Electronic pallet with internal safeguarding function

Technical field

5 The present disclosure relates to techniques in the context of vehicles, and to an electronic pallet for transporting stacked objects. The disclosure also relates to a corresponding method and to a computer program for performing the proposed method.

Background

10 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 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
15 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.

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
20 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 embedded therein. The pallet is used within a leasing system and/or an inventory management system. However, with the increasing use of autonomous vehicles
25 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 loaded on
30 a vehicle from being stolen and that makes it easy to track the pallet if it is stolen.

According to a first aspect, the disclosure relates to a method, performed by a control device in an electronic pallet, for safeguarding the electronic pallet when the electronic pallet is loaded on a vehicle. The electronic pallet comprises an energy storage device configured to exchange energy with the vehicle. The

5 method comprises detecting a displacement of the electronic pallet and activating a safeguarding function in the electronic pallet based on the detected displacement. Thereby, theft of the electronic pallet can be prevented. In contrast to prior art solutions, the safeguarding function is performed by the electronic pallet itself and not by an off-board system.

10 In some embodiments, the method comprises determining whether the detected displacement is permissible and activating of the safeguarding function is performed in response to determining that the displacement is impermissible. Thereby, the safeguarding function will not be activated upon a permissible displacement, such as unloading of the pallet.

15 In some embodiments, the detecting comprises detecting a displacement of the electronic pallet in relation to the vehicle. Thereby, unloading of the goods, which may be an indication of theft, may be detected.

In some embodiments, the detecting of the displacement comprises detecting interruption of an electrical connection or a wireless communication connection
20 between the electronic pallet and the vehicle. These are simple ways of detecting the displacement, that does not require complex hardware that may be broken or destroyed.

In some embodiments, the method comprises obtaining position data defining a position of the electronic pallet, and one or more allowed routes of the electronic
25 pallet and the detecting of the displacement comprises detecting a deviation of the obtained position from the one more allowed routes of the electronic pallet. Thereby, the safeguarding function may be activated if someone steals the entire vehicle and drives away with the electronic pallet (and the goods).

In some embodiments, the activating comprises disabling energy outtake from the and/or charging of the energy storage device. Thereby, the electronic pallet will be unusable when stolen.

5 In some embodiments, the activating comprises locking the electronic pallet to the vehicle. Thereby, theft of the electronic pallet may be prevented.

In some embodiments, the activating comprises sending an alert to an external device. Thereby, people in the surroundings, e.g. a driver of the vehicle, will be made aware about the displacement.

10 In some embodiments, the activating comprises inactivating a vehicle, on which the electronic pallet is loaded or obstructing unloading of the electronic pallet or the goods therein.

15 According to a second aspect, the disclosure relates to an electronic pallet, configured to be loaded at a vehicle. The electronic pallet comprises an energy storage device, a detection arrangement and a control device. The energy storage device is configured to exchange energy with the vehicle. The detection arrangement is configured to detect a displacement of the electronic pallet and the control device is configured to activate a safeguarding function of the electronic pallet based on a displacement detected by the detection arrangement.

20 In some embodiments, the control device is configured to determine whether the detected displacement is permissible and to activate the safeguarding function in response to determining that the displacement is impermissible.

In some embodiments, the detection arrangement is configured to detect a displacement of the electronic pallet in relation to the vehicle.

25 In some embodiments, the detection arrangement comprises a positioning device configured to determine a position of the electronic pallet and the control device is configured obtain one or more allowed routes of the electronic pallet and to activate the safeguarding function in response to detecting a deviation of the determined position from the one or more obtained allowed routes.

In some embodiments, the detection arrangement is configured to detect an interruption of an electrical connection or of a wireless communication connection between the electronic pallet and the vehicle.

- 5 In some embodiments, the electronic pallet comprises a securing device configured to secure the electronic pallet to a vehicle at which the electronic pallet is loaded and the control device is configured to lock the electronic pallet to the vehicle in response to detecting the displacement.

- 10 In some embodiments, the electronic pallet comprises a first communication interface configured to enable communication with a vehicle at which the electronic pallet is loaded and the control device is configured to send a deactivation signal to the vehicle using the communication interface, based on the determined displacement.

- 15 In some embodiments, the electronic pallet comprises a second communication interface configured to enable communication with an external device and the control device is configured to send an alert to an external device using the communication interface, based on the determined displacement.

In some embodiments, the control device is configured to disable energy outtake from the and/or charging of the energy storage device based on the detected the displacement.

- 20 In some embodiments, the control device is configured to turn off a vehicle on which the electronic pallet is loaded or to obstruct unloading of the electronic pallet or the goods therein.

According to a third aspect, the disclosure relates to a vehicle comprising the electronic pallet of the second aspect.

- 25 According to a fourth 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 first aspect.

According to a fifth 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

- 5 Fig. 1 illustrates a vehicle carrying an electronic pallet.
Fig. 2 illustrates an electronic pallet.
Fig. 3 illustrates a flow chart of a method performed by a control device in an electronic pallet.
Fig. 4 is a control device configured to implement the proposed method in more
10 detail.

Detailed description

- An electronic pallet is 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
15 matched with a logistics information system. An electronic pallet typically comprises an integrated energy storage such as a battery. The battery generally powers electronic circuitry such that the electronic pallet can send and receive signals using a transmitter and a receiver.

- The energy storage of an electronic pallet may also be used by a vehicle on which
20 the pallet is loaded. For example, the energy storage may be used to propel the vehicle. Thereby, the energy storage of the pallet will allow the electric vehicle to travel a longer distance and avoid that the vehicle stands still for a long time to "charge" energy. The owner of the goods or pallet may then charge the energy storage on its own premises. This basically means that the goods that are
25 transported can fully or partly stand for their own energy consumption, i.e. the energy required to transport the goods. An energy storage that is used to provide power for propelling a vehicle needs to be of a significant size, which makes not only the good, but also the electronic pallet itself attractive to thieves.

- This disclosure proposes an electronic pallet with internal energy storage
30 comprising built-in anti-theft protection. More specifically, this disclosure proposes

to activate a safeguarding function in the electronic pallet upon detecting that a pallet is lost, e.g. because the electronic pallet is removed from the vehicle. The proposed technique will now be described with reference to the figures.

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 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. However, for simplicity only some parts of the vehicle 1 that are associated with the proposed method 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.

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.

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 typically 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
10 electronic pallet 90 e.g. via an inductive interface (not shown).

Fig. 2 illustrates the electronic pallet 90 in further detail. The electronic pallet comprises a structural foundation, which allows handling and storage goods. The electronic pallet 90 is configured to be loaded at a vehicle 1. The electronic pallet 90 comprises a securing device 91, a detection arrangement 92, an energy transfer
15 interface 93, fork lift slots 94, an energy storage device 95 and a control device 96.

The energy storage device 95 is configured to power the various components of the electronic pallet 90. The energy storage device 95 is also configured to exchange energy with the vehicle 1. The energy storage device 95 may both deliver energy to and receive energy from the vehicle 1. This is typically done via
20 the energy transfer interface 93, which may be physically or inductively connected to a corresponding interface (not shown) of the vehicle 1.

The securing device 91 is configured to secure the electronic pallet 90 to the vehicle 1 at which the electronic pallet 90 is loaded. For example, the securing device 91 is configured to lock the pallet to the vehicle 1 using electromagnetism.
25 In other words, in some embodiments the securing device 91 comprises an electromagnet e.g. a coil wrapped around an iron core, that may be activated using an electric current generated by power provided the energy storage device 95. Alternatively, a mechanic lock that can be activated (and deactivated) by an electric actuator may be used.

The detection arrangement 92 is configured to detect a displacement of the electronic pallet 90. In some embodiments, the detection arrangement 92 is configured to detect a displacement of the electronic pallet 90 in relation to the vehicle 1. In other words, the detection arrangement 92 may detect that the pallet
5 is separated from the vehicle 1, on which it is loaded. This may be done in different ways. In some embodiments, the detection arrangement 92 is configured to detect an interruption of an electrical connection or of a wireless communication connection between the electronic pallet 90 and the vehicle 1. For example, if a short-range wireless connection (using e.g. Bluetooth or Near Field
10 Communication, NFC) is established between the vehicle 1 and the electronic pallet 90 at loading, then this communication will be interrupted if the electronic pallet is unloaded. Hence, an interruption of the connection may serve as an indication about a displacement. In the same way an interruption of an electrical connection for energy transfer between the electronic pallet and the vehicle 1 is
15 an indication of a displacement of the electronic pallet 90.

The detection arrangements alternatively use other types of sensors, e.g. proximity sensors or optical sensors, suitable to detect that the pallet is displaced in relation to the vehicle 1, e.g. unloaded from the vehicle.

In some embodiments, the detection arrangement 92 comprises a positioning
20 device 92a configured to determine a position of the electronic pallet 90. The displacement of the pallet from the vehicle 1 may then be determined by comparing the position of the pallet with a position of the vehicle 1. Alternatively, a displacement in relation to e.g. a pre-defined route of a current mission may be determined. In other words, in some embodiments the detecting S1 comprises
25 detecting that both the electronic pallet 90 and the vehicle are lost.

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 securing device 91, the detection arrangement 92, the energy transfer interface 93 and the
30 energy storage device 95. In particular, the control device 96 is configured to

activate a safeguarding function of the electronic pallet 90 based on a displacement detected by the detection arrangement 92, as will now be described in further detail with reference to Fig. 3 and Fig. 4.

5 The proposed technique will now be described in further detail with reference to the flow chart of Fig. 3. Fig. 3 illustrates a flow chart of a method performed by a control device 96 in an electronic pallet 90, for safeguarding the electronic pallet 90 when the electronic pallet is loaded on vehicle 1, such as the vehicle of Fig. 1. The method is typically performed when the electronic pallet is carrying goods 70 while transported by (i.e. loaded on) the vehicle 1. In other words, the method is
10 performed when the electronic pallet 90 is loaded on a vehicle 1. In some embodiments, there is an electrical and/or wireless connection is established between the electronic pallet 90 and the vehicle 1 upon loading.

The method is typically implemented as a computer program comprising instructions which, when the program is executed by a computer, cause the
15 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.

The method comprises detecting S1 a displacement of the electronic pallet 90. A
20 displacement may either be a displacement of the pallet in relation to the vehicle 1 or in relation to an allowed route or area, e.g. in relation to a pre-determined route. Stated differently, the displacement is an indication that the electronic pallet 90 is lost or abducted from its owner.

In some embodiments, the detecting S1 comprises detecting a displacement of
25 the electronic pallet 90 in relation to the vehicle 1. In other words, the detecting comprises that the pallet is separated from the vehicle 1, which typically means that the pallet has been unloaded. As described above, the electronic pallet is typically electronically paired with the vehicle 1, upon loading. The pairing means that communication is established between the vehicle and the electronic pallet.

One way of detecting the displacement is to detect that such a communication is interrupted. Another way to detect the displacement is to detect that the energy transfer over the energy transfer interface 93 is interrupted. This may e.g. be done by measuring a current flow over the energy transfer interface 93. In other words, 5 in some embodiments, the detecting S1 of the displacement comprises detecting interruption of an electrical connection or a wireless communication connection between the electronic pallet 90 and the vehicle 1.

In some embodiments, the method comprises obtaining S0 position data defining a position of the electronic pallet 90. A displacement from the vehicle 1 may then 10 be detected by comparing the positioning data with a position of the vehicle 1. The position of the vehicle 1 is typically determined by a GPS of the vehicle 1 and may be communicated from a control unit 20 of the vehicle to the control device 96.

In some embodiments the method comprises obtaining one or more allowed routes of the electronic pallet 90. For example, the control device 96 receives 15 information about allowed routes from an off-board system. The routes may also be pre-programmed. For example, an electronic pallet 90 may only be allowed to be moved within a certain region or country. The displacement is then the detected by detecting a deviation of the obtained position from the one more allowed routes of the electronic pallet 90. In other words, the electronic pallet will 20 be considered to be displaced if it is moved away from, e.g. a predetermined distance from, an allowed route or region. For example, if an electronic pallet deviates more than 1 km from a certain route it will be considered displaced. Alternatively, if the electronic pallet 90 leaves a certain community or country it will be considered displaced.

25 A detected displacement may be an indication that the electronic pallet 90 is stolen or is about to be stolen. Thus, a safe guarding function is activated in order to try to attempt to prevent the theft. In other words, the method further comprises activating S3 a safeguarding function in the electronic pallet 90 based on the detected displacement.

However, in some embodiment, a detected displacement may be permissible, e.g. when unloading the vehicle, or when driving an alternate route due to certain traffic circumstances. Thus, it may be needed to check if the detected displacement is permissible. For example, if the displacement coincides with a
5 planned unloading or traffic jam, then the safeguarding function would not be activated. In other words, in some embodiments, the method comprises determining S2 whether the detected displacement is permissible and activating S3 of the safeguarding function is performed in response to determining that the displacement is impermissible.

- 10 There are many different ways to activate a safe-guarding function that attempts to prevent or mitigate the theft. It must be appreciated that for higher security, those ways may be combined.

One way is to simply inactivate the energy storage device 95. This may e.g. be done by opening a controllable switch between the energy storage device 95 and
15 the energy transfer interface 93. In other words, in some embodiments, the activating S3 comprises disabling energy outtake from the and/or charging of the energy storage device 95. This would make the electronic pallet 90 unusable and would hopefully cause a to refrain from stealing the pallet.

Another option is to try to secure the electronic pallet 90 to the vehicle 1, when a
20 displacement is detected. This is e.g. done by controlling the securing device 91 to secure the electronic pallet 90 to the vehicle 1. In other words, in some embodiments, the activating S3 comprises locking the electronic pallet 90 to the vehicle 1.

Alternatively, or in addition the electronic pallet 90 may send an alert to an
25 external system, informing about the displacement and/or its current position. An operator may then immediately take measures to prevent a theft. In other words, in some embodiments, the activating S3 comprises sending an alert to an external device. Another possibility is to activate a loud sound, e.g. a siren.

In some embodiments, the activating S3 comprises inactivating a vehicle 1 at which the electronic pallet 90 is loaded or obstructing unloading of the electronic pallet 90 or the goods therein. For example, a current surge may be emitted that makes the casing of the electronic pallet 90 energized, whereby it will be
5 inconvenient to unload or break up the electronic pallet 90. If the pallet has been stolen one option is to let the electronic pallet 90 generate a significant current surge to turn off or inactivate the vehicle 1 on which it is loaded.

Now to Fig. 4 which illustrates a control device 96 configured to implement the proposed method in more detail. In some embodiments, the control device 96 is a
10 "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
15 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
20 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 to detect a displacement of the electronic pallet 90 and activating S3 a safeguarding function in the electronic
25 pallet 90 based on the detected displacement.

In some embodiments, the control device 96 is configured to determine whether the detected displacement is permissible and to activate the safeguarding function in response to determining that the displacement is impermissible.

In some embodiments, the control device 96 is configured obtain one or more allowed routes of the electronic pallet 90 and to activate the safeguarding function in response to detecting a deviation of the determined position from the one or more obtained allowed routes.

- 5 In some embodiments, the control device 96 is configured to lock the electronic pallet 90 to the vehicle 1 in response to detecting the displacement, e.g. using the securing device 91.

In some embodiments, the control device 96 comprises a first communication interface 963a configured to enable communication with a vehicle 1 at which the
10 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 displacement.

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

In some embodiments, the control device 96 is configured to disable energy
outtake from the and/or charging of the energy storage device 95 based on the detected the displacement. For example, the control device is configured to
25 deactivate the energy storage device 95 or simply opening a switch between the energy storage device 95 and the and the energy transfer interface 93. In some embodiments, the first and second communication interfaces 963a, 963b are physically separated from the processor 961. For example, they may be implemented as stand-alone circuits that are connected to the processor 961.

In some embodiments, the control device 96 is configured to deactivate a vehicle 1 on which the electronic pallet 90 is loaded or to obstruct unloading of the electronic pallet 90 or the goods therein. This is e.g. done by controlling the energy storage device 95 to emit a current surge on the energy transfer interface 93.

In some embodiments, this disclosure relates to a vehicle 1 comprising electronic 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 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 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. A method, performed by a control device (96) in an electronic pallet (90),
for safeguarding the electronic pallet (90) when the electronic pallet is
loaded on vehicle (1), wherein the electronic pallet (90) comprises an
energy storage device (95) configured to exchange energy with the vehicle
(1), the method comprising:
- detecting (S1) a displacement of the electronic pallet (90), and
 - activating (S3) a safeguarding function in the electronic pallet (90)
based on the detected displacement.
2. The method according to claim 1, comprising:
- determining (S2) whether the detected displacement is permissible
and wherein the activating (S3) of the safeguarding function is performed in
response to determining that the displacement is impermissible.
3. The method according to claim 1 or 2, wherein the detecting (S1)
comprises detecting a displacement of the electronic pallet (90) in relation
to the vehicle (1).
4. The method according to any of the preceding claims, wherein the
detecting (S1) of the displacement comprises detecting interruption of an
electrical connection or a wireless communication connection between the
electronic pallet (90) and the vehicle (1).
5. The method according to any of the preceding claims, comprising:
- obtaining (S0) position data defining a position of the electronic
pallet (90), and one or more allowed routes of the electronic pallet
(90),
- and wherein the detecting (S1) of the displacement comprises detecting a
deviation of the obtained position from the one more allowed routes of the
electronic pallet (90).

6. The method according to any of the preceding claims, wherein the activating comprises disabling energy outtake from the and/or charging of the energy storage device (95).

5 7. The method according to any of the preceding claims, wherein the activating comprises locking the electronic pallet (90) to the vehicle (1).

8. The method according to any of the preceding claims wherein the activating comprises sending an alert to an external device.

10

9. The method according to any of the preceding claims wherein the activating comprises turning off a vehicle (1) at which the electronic pallet (90) is loaded or obstructing unloading of the electronic pallet (90) or the goods therein.

15

10. An electronic pallet (90), configured to be loaded at a vehicle (1), the electronic pallet (90) comprising:

- an energy storage device (95) configured to exchange energy with the vehicle (1),
- 20 - a detection arrangement (92) configured to detect a displacement of the electronic pallet (90), and
- a control device (96) configured to activate a safeguarding function of the electronic pallet (90) based on a displacement detected by the detection arrangement (92).

25

11. The electronic pallet (90) according to any of claims 10, wherein the control device (96) is configured to determine whether the detected displacement is permissible and to activate the safeguarding function in response to determining that the displacement is impermissible.

30

12. The electronic pallet (90) according to claim 10 or 11, wherein the detection arrangement (92) is configured to detect a displacement of the electronic pallet (90) in relation to the vehicle (1).

13. The electronic pallet (90) according to any one of claims 10 to 12, wherein the detection arrangement (92) comprises a positioning device (92a) configured to determine a position of the electronic pallet (90) and wherein the control device (96) is configured obtain one or more allowed routes of the electronic pallet (90) and to activate the safeguarding function in response to detecting a deviation of the determined position from the one or more obtained allowed routes.

14. The electronic pallet (90) according to any one of claims 10 to 13, wherein the detection arrangement (92) is configured to detect an interruption of an electrical connection or of a wireless communication connection between the electronic pallet (90) and the vehicle (1).

15. The electronic pallet (90) according to any one of claims 10 to 14, comprising:
- a securing device (91) configured to secure the electronic pallet (90) to a vehicle (1) at which the electronic pallet (90) is loaded and wherein the control device (96) is configured to lock the electronic pallet (90) to the vehicle (1) in response to detecting the displacement.

16. The electronic pallet (90) according to any one of claims 10 to 15, comprising:
- a first communication interface (963a) configured to enable communication with a vehicle (1) at which the electronic pallet (90) is loaded,
and wherein the control device (96) is configured to send a deactivation signal to the vehicle using the first communication interface (963a), based on the determined displacement.

17. The electronic pallet (90) according to any one of claims 10 to 15, comprising:

- a second communication interface (963b) configured to enable communication with an external device,

and wherein the control device (963b) is configured to send an alert to an external device using the second communication interface (963b), based on the determined displacement.

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18. The electronic pallet (90) according to any of claims 10 to 17, wherein the control device (96) is configured to disable energy outtake from the and/or charging of the energy storage device (95) based on the detected the displacement.

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19. The electronic pallet (90) according to any of claims 10 to 17, wherein the control device (96) is configured to turn off a vehicle (1) on which the electronic pallet (90) is loaded or to obstruct unloading of the electronic pallet (90) or the goods therein.

15

20. A vehicle (1) comprising the electronic pallet (90) according to any one of claims 10 to 18.

21. 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 1 to 9.

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22. 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 1 to 9.

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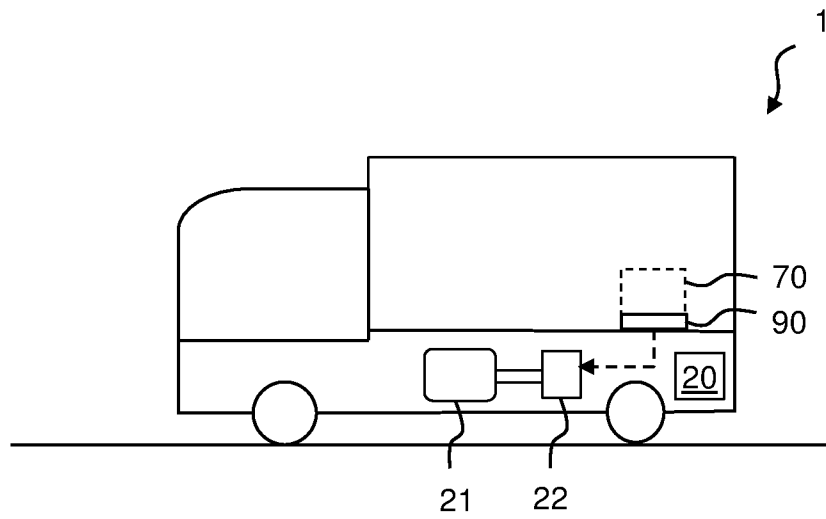


FIG. 1

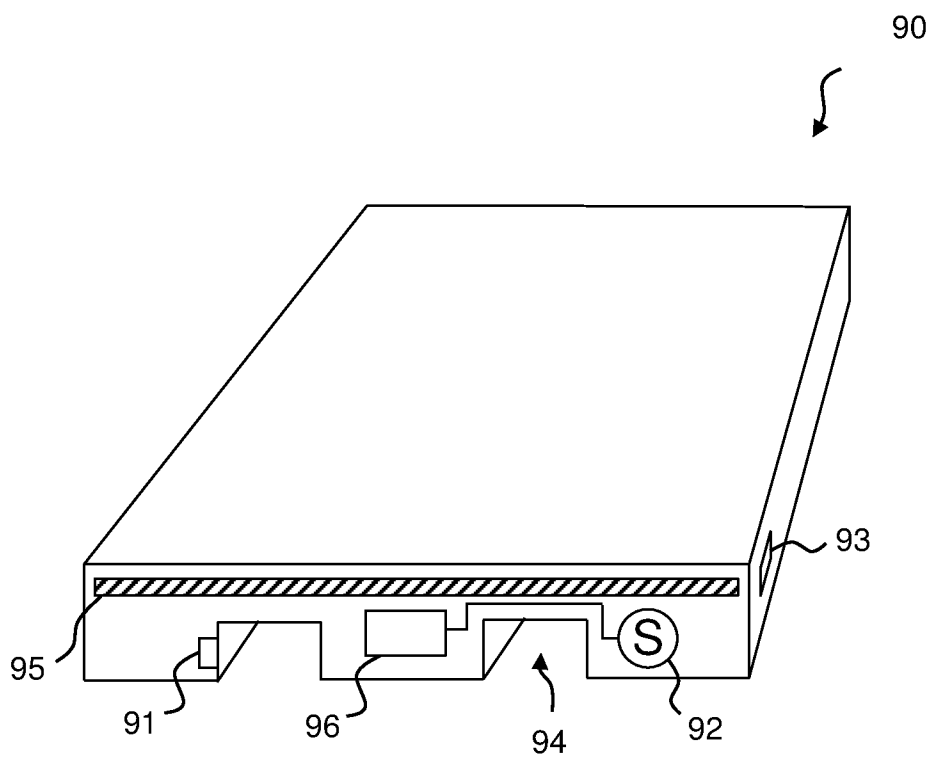


FIG. 2

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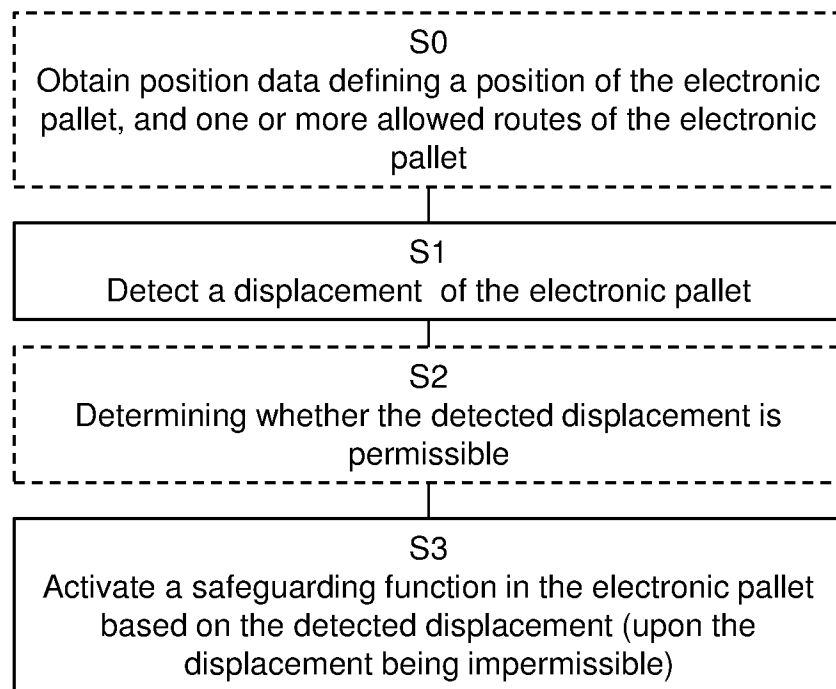


FIG. 3

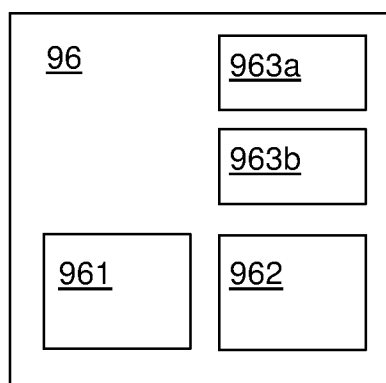


FIG. 4

INTERNATIONAL SEARCH REPORT

 International application No.
 PCT/SE2019/051175

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, G08B

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.
Y	US 20080297346 A1 (BRACKMANN ROGERS F ET AL), 4 December 2008 (2008-12-04); abstract; paragraphs [0003]-[0005], [0032]-[0040], [0082], [0102]-[0107], [0122]-[0131]; figures 1, 9, 12A-12B --	1-22
Y	GB 2512406 A (PERPETUAL V2G SYSTEMS LTD), 1 October 2014 (2014-10-01); abstract; page 2, line 22 - line 29; page 5, line 5 - page 7, line 29; figures 1-2 --	1-22
Y	US 20050017899 A1 (CERVINKA ALEXANDRE ET AL), 27 January 2005 (2005-01-27); abstract; paragraphs [0030], [0038]-[0044], [0051]-[0082]; figure 1 --	3-4, 12, 14



Further documents are listed in the continuation of Box C.



See patent family annex.

*

Special categories of cited documents:

“A”

document defining the general state of the art which is not considered to be of particular relevance

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document referring to an oral disclosure, use, exhibition or other means

“P”

document published prior to the international filing date but later than the priority date claimed

“T”

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X”

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y”

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/SE2019/051175

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 20170137235 A1 (THOMPSON JOHN P ET AL), 18 May 2017 (2017-05-18); abstract; paragraphs [0022]-[0032]; figure 2 --	1-22
A	US 20100264728 A1 (RICKRODE C JOSEPH), 21 October 2010 (2010-10-21); abstract; paragraph [0038]; figure 1 --	9, 16
A	US 5627519 A (HATCHIMONJI MIKE), 6 May 1997 (1997-05-06); abstract; column 1, line 4 - line 45; figure 1 -- -----	4, 14

Continuation of: second sheet

International Patent Classification (IPC)

B65D 19/38 (2006.01)

G08B 13/00 (2006.01)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/SE2019/051175

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US	5627519 A	06/05/1997	NONE		