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(71) Applicant: **Deutsche Post AG**
53113 Bonn (DE)

(72) Inventors:
- **Romas Martin, José**
  28038 Madrid (ES)
- **Mendez Ortiz, Sonia**
  28005 Madrid (ES)
- **Barrera Perez, Antonio**
  28980 Parla - Madrid (ES)

(74) Representative: **Jostarndt, Hans-Dieter**
Jostarndt Patentanwalts-AG
Brüsseler Ring 51
52074 Aachen (DE)

(54) **traffic pylon with sensors and system with such a traffic pylon and fork lift**

(57) The invention relates to to a device, system and method used for decreasing of the number of accidents in a warehouse. The invention discloses a traffic pylon (10) exhibiting an exterior shell (11) and a hollow interior (12). It is equipped at least with a proximity sensor (20), a contact sensor (21), a tilting over sensor (22) and a radio communication module (25) and exhibits a control device (26). Further disclosed are a system and method including a fork lift, which circulates in a warehouse equipped with such traffic pylons and is equipped with an identification sensor identifying the fork lift and a radio communication module, the control device of the traffic pylon receiving the information via the radio communication system as to which fork lift is near by.

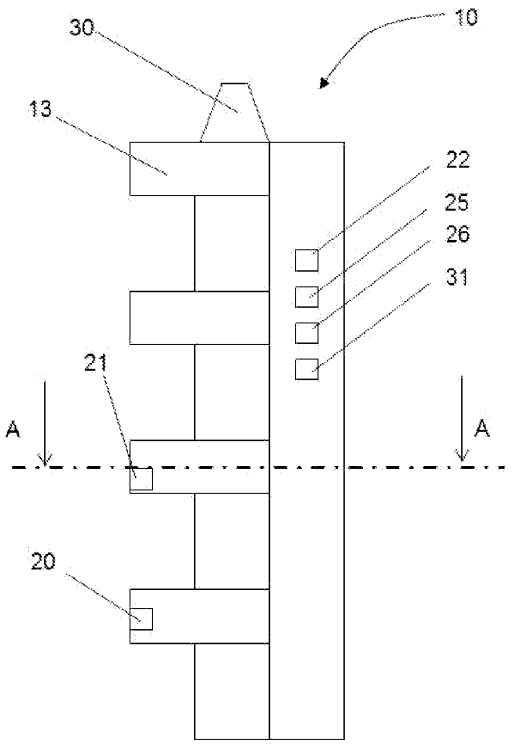

Fig. 1

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Description

[0001] The invention relates to a device used for decreasing of the number of accidents in a warehouse.

[0002] The invention also relates to a system for decreasing of the number of accidents goods in a warehouse.

[0003] Furthermore, the invention relates to a method for decreasing of the number of accidents in a warehouse, using the system and the device described as before.

[0004] In warehouses, fork lifts are used for internal transportation. Goods usually are stored on pallets, which can be operated by fork lifts. Quite often, circulation areas in such warehouses are narrow, and operation time for the fork lift drivers is short. There is a risk of damaging of the goods by the fork lifts, especial in sharp turns.

[0005] The document JP 7127872 (A) discloses a method for protecting goods in warehouses, especially in turns, by the positioning of protective guards especially in sharp turns. But such protective guards cannot safeguard that there will be no damage at the goods in case a fork lift crashes towards the protective guard. Moreover, the protective guard itself will be damaged in such case.

[0006] The German patent application DE 10 2009 006 174 A1 discloses an industrial truck, especially a fork lift, with an accident documentation system. The truck has an accident sensor i.e. glass breakage sensor, located in an area of a component formed by a mast, where the accident sensor and a central accident sensor i.e. acceleration sensor, are used for detecting accidental events. The component is designed to be damaged by the accidental events. A piezoelectric microphone or an extension sensor serves as the glass breakage sensor. The accident sensor is wirelessly connected to a central accident detection controller of the truck via an antenna.

[0007] Industrial trucks, especially fork lifts, equipped with radio communication systems are also known from other documents, for example EP 1 932 798 A2 and DE 10 2008 009 583 A1. The documents disclose the automatic detection of the identification of an industrial truck via RFID transponder as well.

[0008] Such method facilitate the documentation in case an accident has occurred but cannot prevent an accident or at least decrease the number of accidents.

[0009] The objective of the invention is to provide a device for decreasing the number of accidents in warehouses with fork lifts and thus to decrease the number of damages at the goods caused by accidents with fork lifts.

[0010] The objective of the invention is also to provide a system of a warehouse equipped with the device as described before and fork lifts.

[0011] Another objective of the invention is to provide a method for decreasing the number of accidents in warehouses caused by fork lifts, using the system described before.

[0012] According to the invention, this objective is achieved by a traffic pylon having the features of the independent Claim 1. Advantageous refinements of the traffic pylon are set forth in the subordinate Claims 2 through 5. The objective is also achieved by a system according to Claim 6. An advantageous embodiment of the system is et forth in the subordinate Claim 7. Further, the objective is achieved by a method according to Claim 8 or 9. Advantageous embodiments of the method are likewise set forth in the subordinate Claims 10 and 11.

[0013] The traffic pylon according to the invention exhibits an exterior shell and a hollow interior and is equipped at least with a proximity sensor, a contact sensor, a tilting over sensor and a radio communication module and exhibits a control device and a radio communication system. In case, fork lifts, which circulate in a warehouse equipped with traffic pylons like described before, are equipped with an identification sensor identifying the fork lift and a radio communication module, the control device of the traffic pylon gets the information via the radio communication system, which fork lift is near by. A threshold for the allowable proximity of a fork lift to a traffic pylon is predefined and stored in the control device. In case of an incident of violation of the proximity threshold by a fork lift, and/or the contact between the fork or the body of a fork lift and the traffic pylon with or without the tilting over of the traffic pylon, the control device of the control device of the traffic pylon registers and stores the incident together with the fork lift identification. At a due date, all data may be read out of the control device of the traffic pylon, and a ranking may be generated, which fork lift caused most incidents.

[0014] In an advantageous system according to the invention, the system contains a warehouse equipped with a traffic pylon like described before, and a fork lift, equipped with an identification sensor identifying the fork lift and a radio communication module. The fork lift furthermore contains a sensor identifying the fork and a control system for the log-in of a driver and for controlling the radio communication, and the radio communication system of the fork lift and of the traffic pylon are able to communicate with each other, whereby the system furthermore contains a database running on a central computer wirelessly connected with the control system of each fork lift and of the traffic pylon with at least a data set for each fork lift driver. All incidents may be recorded by the database running on the central computer. A ranking of all fork lift drivers may be generated to a due date, using the criteria, who caused most of the single incidents. A total ranking system for all incidents may be created by allocating values to the single incidents. For example, a malus system may be set up, in which the violation of the proximity threshold charges one minus point, a contact of the fork with a traffic pylon charges two points, a contact of the fork lift body with a traffic pylon charges five points, and in case the traffic pylon tilts over in succession of such contact, it costs four respectively five points, depending whether the contact was made by the fork or the body of the fork lift. It is

possible to generate the ranking on time by recording the incidents on time as well. Such ranking may be displayed on time, too. A warehouse championship is created by this method. For example, the best driver may receive a bonus.

[0015] Of course, a bonus system operating in a contrariwise way is possible, too. Also it is possible, to allocate the data of the incidents in the control device of the fork lift.

[0016] In an advantageous embodiment of the invention, the traffic pylon in filled with pourable material such as sand, or a fluid, water for instance, in order to increase stability.

[0017] In another advantageous embodiment of the invention, the traffic pylon exhibits a warning light and/ or a warning sound system. In case of the violation of the proximity threshold, the control device of the traffic pylon switches on the warning light and/or the warning sound system. The fork lift driver will be warned and is able to adjust the route of his fork lift.

[0018] The advantage of the method according to the invention and of the appertaining device for carrying out the method lies in the effective and reliable lowering of accidents in a warehouse caused by fork lifts. Goods stored in the warehouse will be damaged less numerous, costs will be saved.

[0019] An additional advantage of the system like described before lies in the possibility of analyzing of all accidents in general without directly identifying of the drivers. Such analysis can be used to identify when, where and by which machine the most accidents or near accidents were caused. With such information, reasons for accidents and risks for potential further accidents can be identified and possibly eliminated. For example, analyzing such data may give hints for an accumulation of accidents with a single fork lift, which may be caused by a technical defect of this fork lift. Technical service of this fork lift may result in a decrease of accidents. It is imaginable that such hints result in technical improvements of fork lifts or parts of fork lifts as well. In another example, it is possible that an accumulation of special accidents at a special location of the warehouse is analyzed. An expert may analyze this location after such hint and may take action to relieve the situation an this location. An decreasing number of accidents at this location and therefore in general may result from such action.

[0020] Additional advantages, special features and practical refinements of the invention can be gleaned from the subordinate claims and from the presentation below of preferred embodiments making reference to the figures.

[0021] The figures show the following:

Fig. 1 a traffic pylon in a view from a side;

Fig. 2 a traffic pylon in a plan view;

Fig. 3. the cross section A-A from Fig. 1 ; and

Fig. 4 a pallet with goods protected by two traffic pylons in a plan view

[0022] Fig. 1 shows a traffic pylon 10 according to the invention in a view from a side. The traffic pylon 10 is shaped to cover an angle of goods in a warehouse. It exhibits swells 13 at its outer surface. At the top of the traffic pylon a warning light 30 is installed. In the traffic pylon, a proximity sensor 20, a contact sensor 21, a tilting over sensor 22, a radio communication module 25, a control device 26 and a warning sound system 31 are incorporated. The proximity sensor 20 and the contact sensor 21 are arranged at the outer edge of a swell 13, so that they are able to detect a passing fork lift or a contact from a fork lift respectively.

[0023] Fig. 2 shows the traffic pylon 1 in a plan view. In an imaginary diagonal of the lateral cut of the traffic pylon 1 a warning light 30 is arranged. In case, the traffic pylon is arranged at the angle of goods 40, the warning light 30 can be watched from both sides of the angle. Furthermore, two loudspeakers 32 are arranged on the top surface of the traffic pylon. The warning sound system is able to produce an alert played back by the loudspeakers 32, in case a fork lift violates the proximity threshold.

[0024] Fig. 3 is the cross section A-A from Fig 1. The traffic pylon 1 exhibits an exterior shell 11 and a hollow interior 12, which is filled with sand 15 in order to increase stability. Instead of sand every other pourable material such as plastic granulate for example is applicable as well. The material of the exterior shell 11 may be any applicable material, such as plastic or wood.

[0025] In Fig. 4 a possible arrangement of traffic pylons 10 and goods 40 stockpiled on pallets is shown. Two traffic pylons 10 are arranged at the angles of the stockpiled goods 40. The angles of stockpiled goods 40 are the most vulnerable areas for damages caused by contact with a fork lift. The traffic pylons 10 may also be arranged at other areas in the warehouse.

List of reference numerals

[0026]

10	traffic pylon
11	exterior shell
12	interior
13	swell
15	sand
20	proximity sensor
21	contact sensor
22	tilting over sensor

25 radio communication module

26 control device

30 warning light

31 warning sound system

32 loudspeaker

40 goods

Claims

1. Traffic pylon(1 0) with an exterior shell (11) and a hollow interior (12), **characterized in that,**
the traffic pylon (10) is equipped at least with a proximity sensor (20), a contact sensor (21), a tilting over sensor (22) and a radio communication module (25) and exhibits a control device (26).

2. Traffic pylon (10) according to claim 1,
characterized in that,
the hollow interior (12) of the traffic pylon (10) is filled with pourable material (15).

3. Traffic pylon (10) according to claim 1,
characterized in that,
the hollow interior (12) of the traffic pylon (10) is filled with a fluid.

4. Traffic pylon (10) according to one of the previous claims,
characterized in that,
the traffic pylon (10) exhibits a warning light (30).

5. Traffic pylon (10) according to one of the previous claims,
characterized in that,
the traffic pylon (10) exhibits a warning sound system (31).

6. System, containing a warehouse equipped with a traffic pylon (10) according to one of the previous claims, and a fork lift, equipped with an identification sensor identifying the fork lift and a radio communication module,
characterized in that,
the fork lift furthermore contains a sensor identifying the fork and a control controlling the radio communication, and the radio communication system of the fork lift and of the traffic pylon (10) are able to communicate with each other, whereby the system furthermore contains a database running on a central computer wireless connected with the control system of each fork lift and of the traffic pylon (10).

7. System according to claim 6,
characterized in that, the fork lift furthermore contains a control system for the log-in of a driver and that the database running on the central computer wireless connected with the control system of each fork lift and of the traffic pylon (10) has at least a data set for each fork lift driver.

8. Method for decreasing the number of accidents in a system according to claim 6, with the steps of

- Definition of a threshold for the allowable proximity of a fork lift to a traffic pylon (10);
- In case of an incident of
  - a fork lift driver violates the proximity threshold, and/or
  - a fork lift driver touches the traffic pylon (10) with the fork of his fork lift, and/or
  - a fork lift driver touches the traffic pylon (10) with the fork lift body, and/or
  - the traffic pylon (10) turns over, the fork lift and/or the traffic pylon (10) sends this information to the central computer;
- The central computer allocates predefined values to the incidents and safes the values in the database running on a central computer wireless connected with the control system of each fork lift and of the traffic pylon (10);
- the central computer calculates and provides an analysis of the frequency of incidents at each traffic pylon (10).

9. Method for decreasing the number of accidents in a system according to claim 6, with the steps of

- Definition of a threshold for the allowable proximity of a fork lift to a traffic pylon (10);
- Log-in of a fork lift driver in the control system of the fork lift;
- The control system of the fork lift sends the information of the driver identity to the database;
- In case of an incident of
  - a fork lift driver violates the proximity threshold, and/or
  - a fork lift driver touches the traffic pylon (10) with the fork of his fork lift, and/or
  - a fork lift driver touches the traffic pylon (10) with the fork lift body, and/or
  - the traffic pylon (10) turns over, the fork lift and/or the traffic pylon (10) sends this information to the central computer;
- The central computer allocates predefined values to the incidents and safes the values in the data set of the fork lift driver;

- the central computer calculates and provides a ranking of the values of each fork lift driver to a due date.

10. Method according to claim 8 or 9, using a traffic pylon (10) according to claim 4 **characterized in that,** In case of an incident of

- a fork lift driver violates the proximity threshold, and/or
- a fork lift driver touches the traffic pylon (10) with the fork of his fork lift, and/or
- a fork lift driver touches the traffic pylon (10) with the fork lift body, and/or
- the traffic pylon (10) turns over, the control device (26) of the traffic pylon (10) switches on the warning light (30).

11. Method according to claim 8 or 9, using a traffic pylon (10) according to claim 5 **characterized in that,** In case of an incident of

- a fork lift driver violates the proximity threshold, and/or
- a fork lift driver touches the traffic pylon (10) with the fork of his fork lift, and/or
- a fork lift driver touches the traffic pylon (10) with the fork lift body, and/or
- the traffic pylon (10) turns over,
- the control device (26) of the traffic pylon (10) switches on the warning sound system (31).

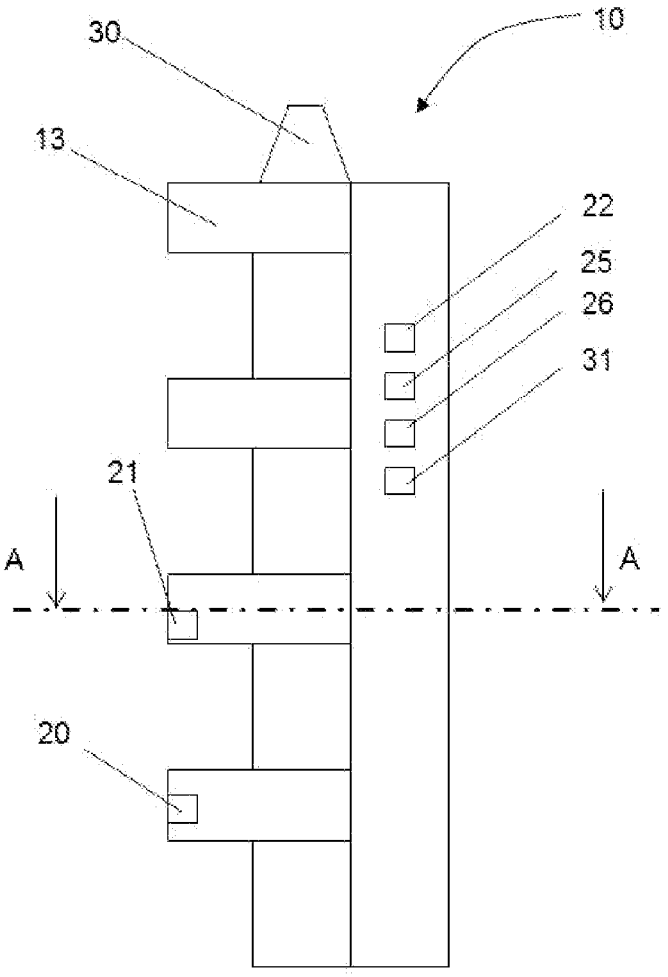

Fig. 1

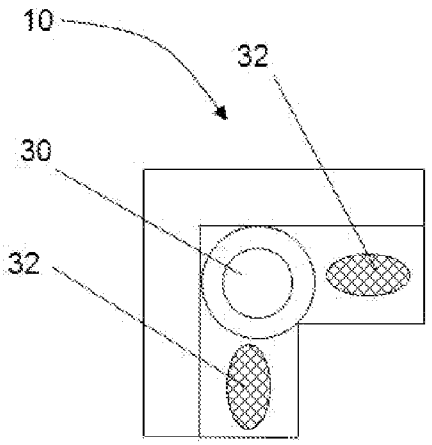

Fig. 2

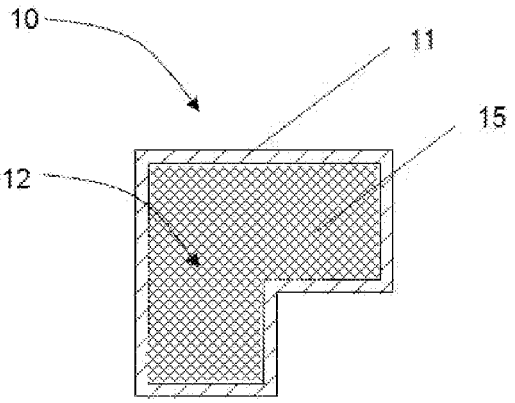

Fig. 3

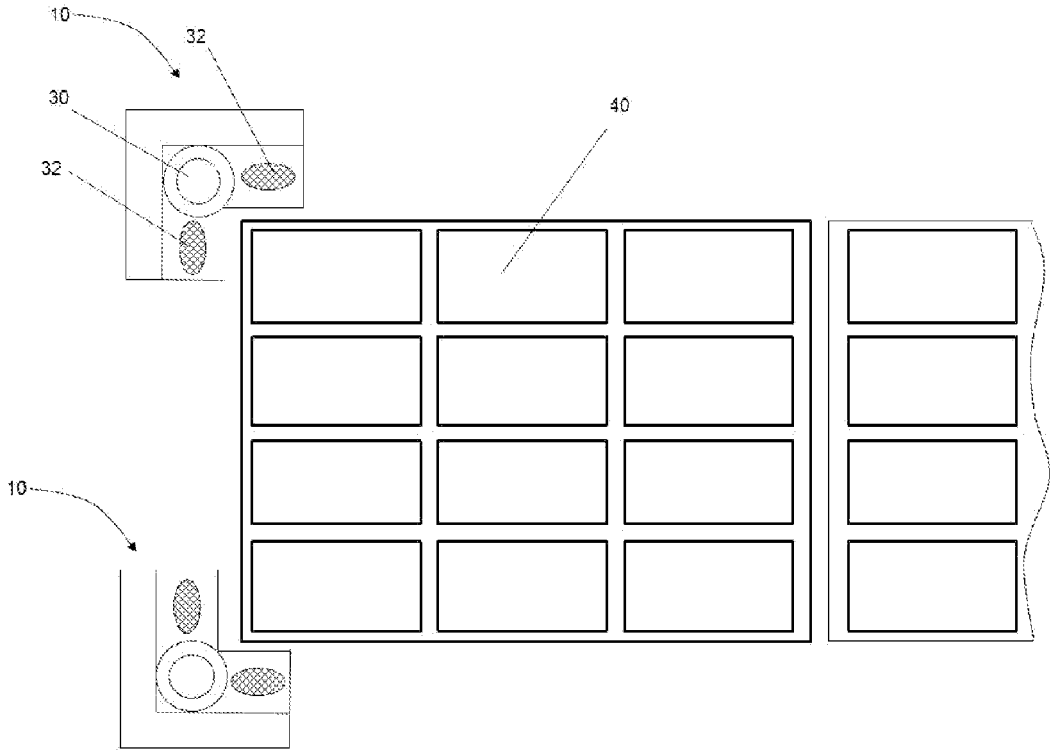

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 11 16 5683

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	GB 2 460 886 A (ORTON STEVE [GB]; BEAN DENNIS [GB]) 16 December 2009 (2009-12-16) * page 14, paragraph 1 * * page 19, paragraph 3 - page 23, paragraph 2 * * figures 2,4,5,7 * -----	1	INV. B66F17/00 E01F9/017
A	EP 1 029 985 A2 (WOLTERS N V [BE]) 23 August 2000 (2000-08-23) * abstract * * paragraph [0013] - paragraph [0014] * * claims 1,6,8,10 * * figures * -----	1,6,8	
A	DE 102 01 585 A1 (LOHRMANN SCHLOSSEREI UND KONST [DE] LOHRMANN SCHLOSSEREI UND KONSTRUKT) 7 August 2003 (2003-08-07) * abstract * * paragraph [0022] - paragraph [0027] * * figures * -----	1	
A	DE 199 08 859 A1 (TEPROTEC TECH PRODUKTE & SERVI [DE]) 9 September 1999 (1999-09-09) * the whole document * -----	1	TECHNICAL FIELDS SEARCHED (IPC) B66F E01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	1 February 2012	Sheppard, Bruce

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 16 5683

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

REFERENCES CITED IN THE DESCRIPTION

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