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(54) **LUMINAIRE**

(57) The invention relates to a luminaire or lighting trunking system (100), comprising a housing (101), at least one lighting module (102), a control unit (103) controlling the operation of the lighting module (102), a RFID antenna (104) integrated in the luminaire, as well as a

RFID controller (105), designed to process signals detected by the RFID antenna (104) and sending the processed signals to a remote unit, via a wireless or wire-bound communication link.

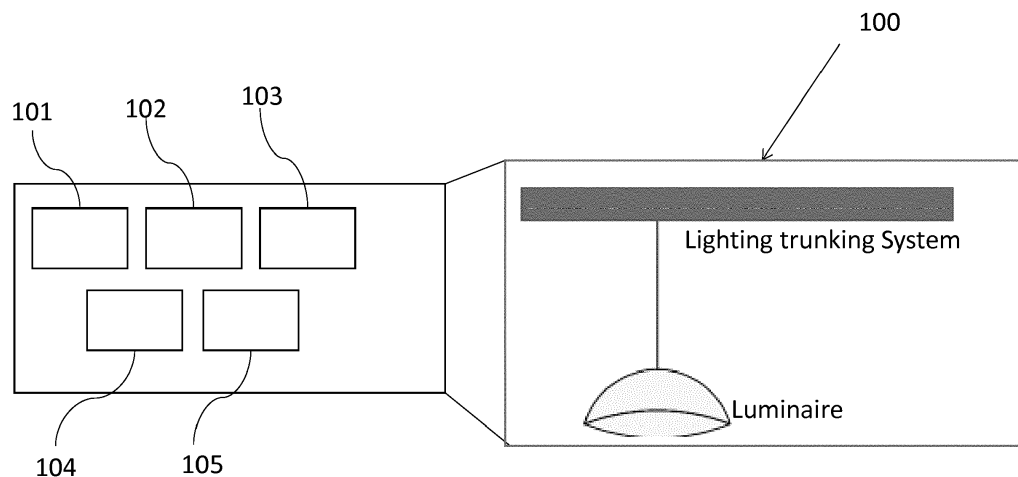


Fig. 1

Description

TECHNICAL FIELD OF THE INVENTION

[0001] The invention relates to a luminaire and lighting trunking systems, preferably for indoor applications. The invention further relates to a method for operating the luminaire and lighting system to scan, collect, process in the edge and in the cloud various data structures derived from RFID tags.

BACKGROUND OF THE INVENTION

[0002] Radio frequency identification (RFID) systems are currently the most widely used technology for tracking assets. The system is expensive on infrastructure but very cheap on tags.

[0003] RFID is used in different applications in order to provide unique identification codes related with a set of particular items. These items may comprise products in a store or pallets in a warehouse, persons in a race, pets, racehorses, farm animals, cars passing a tollbooth or entering a parking lot, etc.

[0004] Usually, singular RFID "tags" are attached to each item where each tag comprises a "chip" encoding digital identification data and an antenna that can communicate wirelessly to an RFID "reader." In some cases "passive" tags are used, where the power necessary to receive a query and transmit identification data back to the reader is also provided via the wireless connection.

[0005] In some cases use is made of "active" tags which incorporate batteries to provide a higher power signal that can be read from greater distances.

[0006] RFID systems have been implemented over a wide range of radio frequencies. Common embodiments exist using frequencies near 100 kHz, 10 MHz, and various UHF frequencies (100s of MHz to a few GHz). The choice of the range of frequencies is dictated on the one hand by available radio bands not designated for other applications and on the other hand by the performance needs of particular applications.

[0007] Most of production, logistics and retails systems make use of such tags.

[0008] However, traditional RFID solutions are expensive for the infrastructure and implementation and do not match the expectations.

[0009] Thus, there is a need for an improved luminaire and lighting trunking system.

SUMMARY OF THE INVENTION

[0010] The object of the present invention is achieved by the solution provided in the enclosed independent claims. Advantageous implementations of the present invention are further defined in the dependent claims.

[0011] According to a first aspect, the invention relates to a luminaire and lighting trunking system, comprising a housing, at least one lighting module or lighting trunking

system, a control unit controlling the operation of the lighting module, a RFID antenna integrated in the luminaire or lighting trunking system, as well as a RFID controller, designed to process signals detected by the RFID antenna and sending the processed signals to a edge processing or cloud based remote unit, via a wireless or wire-bound communication link.

[0012] The lighting trunking systems are well known in the prior art and they are provided by different providers. For example, LED linear trunking systems are continuous-row lighting assemblies that utilize trunking rails in order to integrate individual lighting fixtures which may include LED light modules, power supplies, lighting controls, and emergency battery packs. The flexible trunking systems can be configured in different ways in order to meet challenging demands for interior lighting in commercial and industrial buildings.

[0013] This provides the advantage that a very efficient real time asset tracking system can be created. Luminaires and associated trunking systems, are often installed at locations which are also suitable for RFID identification and tracking. The detection angle of the antenna may correspond to the area covered by the light emitted by the luminaire - thus the light cone can give a user a visualization of the RFID coverage area.

[0014] Moreover, thanks to the utilization of RFID technology, high inventory accuracy can be achieved.

[0015] In an implementation form of the luminaire and lighting trunking system, according to the first aspect, the RFID controller is a controller separate to the control unit controlling the operation of the lighting module.

[0016] This provides the advantage that the RFID controller and the control unit can be operated independently from each other, conferring more flexibility to the luminaire.

[0017] In an implementation form of the luminaire lighting trunking system according to the first aspect, the RFID controller is designed to process signals detected by the RFID antenna in order to extract an RF ID sent from a RFID tag.

[0018] This provides the advantage that objects having the RFID tag can easily be identified and, therefore, processes requiring the identification of objects can be made faster.

[0019] In an implementation form of the luminaire lighting trunking system according to the first aspect, the RFID controller sends the RF ID to said remote unit.

[0020] In an implementation form of the luminaire according to the first aspect, the communication link is a DALI bus or a RF wireless link such as Bluetooth, Tread (6lowpan) or WLAN link.

[0021] This provides the advantage that well known communication links are used and, therefore, are easier to implement.

[0022] In an implementation form of the luminaire according to the first aspect, the RFID antenna is integrated in the housing of the luminaire or attached to the associated lighting trunking system.

[0023] In an implementation form of the luminaire or lighting trunking system according to the first aspect, the RFID antenna covers frequencies from 30 KHz to 300 KHz.

[0024] In an implementation form of the luminaire or lighting trunking system according to the first aspect, the RFID antenna covers frequencies from 3 to 30 MHz.

[0025] In an implementation form of the luminaire or lighting trunking system according to the first aspect, the RFID antenna covers frequencies from 300 MHz to 3 GHz.

[0026] In an implementation form of the luminaire or lighting trunking system according to the first aspect, the luminaire is a LED luminaire.

[0027] In an implementation form of the luminaire or lighting trunking system according to the first aspect, the lighting module comprises a LED-driver.

[0028] In an implementation form of the luminaire or lighting trunking system according to the first aspect, the luminaire comprises integrated asset track technology.

[0029] According to a second aspect, the invention relates to a method for operating a luminaire, comprising controlling an operation of a lighting module, processing signals detected by an RFID antenna, and sending the processed signals to a remote unit, via a wireless or wire-bound communication link.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The invention will be explained in the followings together with the figures.

Fig. 1 shows a luminaire or lighting trunking system according to an embodiment;

Fig. 2 shows an RFID system according to an embodiment;

Fig. 3 shows an RFID system according to an embodiment;

Fig. 4 shows an antenna system comprising a luminaire and lighting trunking system according to an embodiment;

Fig. 5 shows a method for operating a luminaire according to an embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0031] Aspects of the present invention are described herein in the context of a luminaire and lighting trunking system.

[0032] The present invention is described more fully hereinafter with reference to the accompanying drawings, in which various aspects of the present invention are shown. This invention however may be embodied in

many different forms and should not be construed as limited to the various aspects of the present invention presented through this disclosure. Rather, these aspects are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the present invention to those skilled in the art. The various aspects of the present invention illustrated in the drawings may not be drawn to scale. Rather, the dimensions of the various features may be expanded or reduced for clarity. In addition, some of the drawings may be simplified for clarity. Thus, the drawings may not depict all of the components of a given apparatus.

[0033] Various aspects of a luminaire and lighting trunking system will be presented. However, as those skilled in the art will readily appreciate, these aspects may be extended to aspects of luminaires without departing from the invention.

[0034] The term "LED luminaire" shall mean a luminaire with a light source comprising one or more LEDs. LEDs are well-known in the art, and therefore, will only briefly be discussed to provide a complete description of the invention.

[0035] It is further understood that the aspect of the present invention might contain integrated circuits that are readily manufacturable using conventional semiconductor technologies, such as complementary metal-oxide semiconductor technology, short "CMOS". In addition, the aspects of the present invention may be implemented with other manufacturing processes for making optical as well as electrical devices. Reference will now be made in detail to implementations of the exemplary aspects as illustrated in the accompanying drawings. The same references signs will be used throughout the drawings and the following detailed descriptions to refer to the same or like parts.

[0036] Fig. 1 shows a luminaire 100 according to an embodiment.

[0037] The luminaire or lighting trunking system 100 comprises a housing 101, at least one lighting module 102, a control unit 103 controlling the operation of the lighting module 102, a RFID antenna 104 integrated in the luminaire, as well as a RFID controller 105, designed to process signals detected by the RFID antenna 104 and sending the processed signals to a remote unit, via a wireless or wire-bound communication link.

[0038] The RFID controller 105 can be a controller separate to the control unit 103 controlling the operation of the lighting module 102.

[0039] The luminaire 100 can be a LED luminaire or lighting trunking systems.

Lighting control system provide to LED luminaires common functions such as power supply, mechanical attachments and multipole conducting section.

[0040] Advantageously, the integrate RFID technology with the light luminaire or lighting trunking systems 100 according to the invention is capable of scanning in real time inventory, integrate asset tracking system with design of basic light availability services.

[0041] Moreover, the luminaire or lighting trunking systems 100 provides the advantage of maintaining and supporting asset tracking with basic luminaire contract, simple integration to existing production, logistics and warehouse management systems.

[0042] Advantageously, the RFID antennas are integrated within the luminaires or lighting trunking systems allowing better output power and sensitivity.

[0043] The data or signals can be carried over the luminaire data network.

[0044] Furthermore, the luminaire or lighting trunking systems 100 provides the advantage of optimizing RFID overall solution costs, while improving business value. Moreover, the integrated RFID embodiment with the light solution allows for easy installation, commissioning and integration to other systems.

[0045] Moreover, the luminaire or lighting trunking systems 100 provides the advantage of locating parts at the right time allowing to speed up the production process.

[0046] Moreover, the luminaire or lighting trunking systems 100 provides the advantage that total transparency on assembly, production and manufacturing processes can be obtained.

[0047] Furthermore, real time information on the location and amount of raw materials can be obtained, and run out of materials or overstock unnecessarily can be avoided.

[0048] Moreover, high quality, security, and safety standards now that can be achieved, since the luminaire 100 allows to accurately validate item authenticity every time.

[0049] The luminaire 100 or lighting trunking systems ensures further that the right amount of parts or materials needed are in the correct locations in order to optimize the manufacturing process.

[0050] Advantageously, real time information on the flow of materials allowed by the luminaire or lighting trunking systems 100 brings the transparency needed to cut out the warehouse and send materials directly to shops. This speeds up the production with total track and trace of in-transit items.

[0051] Fig. 2 shows an RFID system according to an embodiment.

[0052] In this embodiment, in step 1, the RFID emits a UHF signal, via the antenna system, which UHF signal is received by a tag.

[0053] In step 2, the (typically) passive tag reflects part of the signal back to the reader.

[0054] In step 3, the antenna system captures the reflected signal and the RFID gate interprets the signal, especially in order to extract an ID modulated by the tag into the reflected signal, and sends the received data for further processing.

[0055] In step 4, external (remote) systems, such as business systems make use of the asset information.

[0056] By reusing the luminaire or lighting trunking systems location and power, the new system can be more efficient and simpler to maintain for the lifetime of the

projects.

[0057] Fig. 3 shows an RFID antenna system according to an embodiment.

[0058] Similarly to Fig. 2, in this case as well the RFID antenna system can send a UHF signal to a RFID tag. Then, the antenna system can detect the reflected signal and the RFID reader can interpret the signal and, finally, send the received data for further processing to an RFID system.

[0059] Fig. 4 shows an antenna system integrated in the housing of a luminaire or lighting trunking systems 100 according to the invention.

[0060] The luminaire or lighting trunking systems 100 can comprise the RFID controller 105 which can be designed to process signals detected by the RFID antenna 104 in order to extract an RF ID sent from a RFID tag.

[0061] The RFID antenna 104 can be integrated in the housing 101 of the luminaire or lighting trunking systems 100.

[0062] Moreover, the RFID controller 105 can send the RF ID to a remote unit such as the cloud platform, wherein the communication link can be a DALI or wireless (RF) technology, bus as in Fig. 4. To this regard, the luminaire comprises a wireless or wire-bound interface, the DALI bus being one example for a wire-bound communication link.

[0063] The communication send by the RFID controller may use a communication link/interface which is also used for the control of the luminaire, i.e. for the exchange of signals in relation to the light generation. However, the communication send by the RFID controller may use a dedicated communication link/interface which not used for the control of the luminaire.

[0064] Fig.5 shows a method 500 for operating a luminaire 100 according to an embodiment.

[0065] The method 500 comprises the following steps:

- controlling 501 an operation of a lighting module 102,
- processing 502 signals detected by an RFID antenna 104, and
- sending 503 the processed signals to a remote unit, via a wireless or wire-bound communication link.

[0066] All features of all embodiments described, shown and/or claimed herein can be combined with each other.

[0067] While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only and not limitation. Numerous changes to the disclosed embodiments can be made in accordance with the disclosure herein without departing from the spirit of scope of the invention. Thus, the breadth and scope of the present invention should not be limited by any of the above-described embodiments. Rather, the scope of the invention should be defined in accordance with the fol-

lowing claims and their equivalence.

[0068] Although the invention has been illustrated and described with respect to one or more implementations, equivalent alternations and modifications will occur to those skilled in the art upon the reading of the understanding of the specification and the annexed drawings. In addition, while a particular feature of the invention may have been disclosed with respect to only of the several implementations, such features may be combined with one or more other features of the other implementations as may be desired and advantage for any given or particular application.

Claims

1. Luminaire or lighting trunking systems (100), comprising:

- a housing (101),
- at least one lighting module (102),
- a control unit (103) controlling the operation of the lighting module (102),
- a RFID antenna (104) integrated in the luminaire, as well as
- a RFID controller (105), designed to process signals detected by the RFID antenna (104) and sending the processed signals to a remote unit, via a wireless or wire-bound communication interface of the luminaire or lighting trunking systems (100).

2. The luminaire or lighting trunking systems (100) of claim 1, wherein the RFID controller (105) is a controller separate to the control unit (103) controlling the operation of the lighting module (102).

3. The luminaire or lighting trunking systems (100) of claim 1 or 2, wherein the RFID controller (105) is designed to process signals detected by the RFID antenna (104) in order to extract an RF ID sent from a RFID tag.

4. The luminaire or lighting trunking systems (100) of any one of the preceding claims, wherein the RFID controller (105) sends the RF ID to said remote unit.

5. The luminaire or lighting trunking systems (100) of any one of the preceding claims, wherein the communication link is a DALI bus or a WLAN link.

6. The luminaire or lighting trunking systems (100) of any one of the preceding claims, wherein the RFID antenna (104) is integrated in the housing (101) of the luminaire or lighting trunking systems (100).

7. The luminaire or lighting trunking systems (100) of any one of the preceding claims, wherein the RFID antenna (104) covers frequencies from 30 KHz to 300 KHz.

8. The luminaire or lighting trunking systems (100) of any one of the preceding claims, wherein the RFID antenna (104) covers frequencies from 3 to 30 MHz.

9. The luminaire or lighting trunking systems (100) of any one of the preceding claims, wherein the RFID antenna (104) covers frequencies from 300 MHz to 3 GHz.

10. The luminaire or lighting trunking systems (100) of any one of the preceding claims, wherein the luminaire (100) is a LED luminaire or lighting trunking systems.

11. The luminaire or lighting trunking systems (100) of claim 10, wherein the lighting module (102) comprises a LED-driver.

12. The luminaire or lighting trunking systems (100) of any one of the preceding claims, wherein the luminaire or lighting trunking systems (100) comprises integrated asset track technology.

13. The luminaire according to any of the preceding claims, wherein the communication send by the RFID controller uses a communication link/interface which is also used for the control of the luminaire, i.e. for the exchange of signals in relation to the light generation.

14. The luminaire according to any of the preceding claims, wherein the communication send by the RFID controller may use a dedicated communication link/interface which not used for the control of the luminaire.

15. Method (500) for operating a luminaire (100), comprising:

- controlling (501) an operation of a lighting module (102),
- processing (502) signals detected by an RFID antenna (104); and
- sending (503) the processed signals to a remote unit, via a wireless or wire-bound communication link.

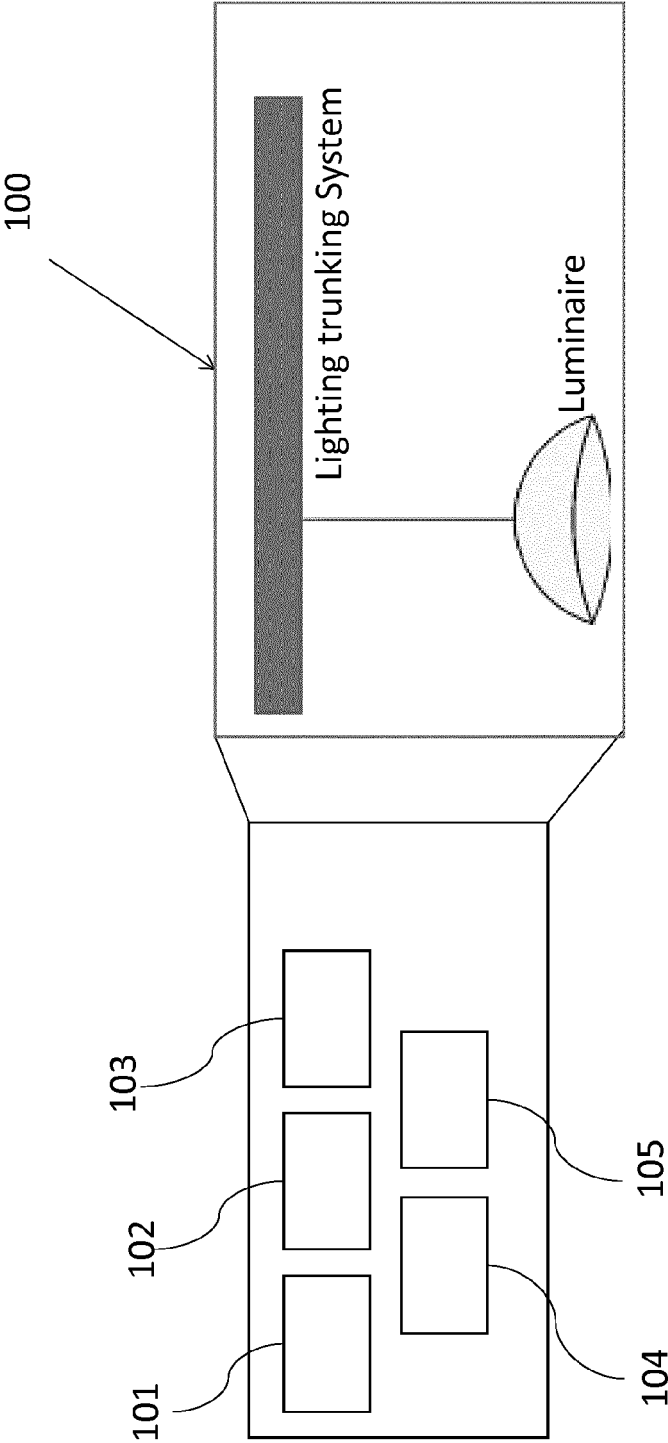


Fig. 1

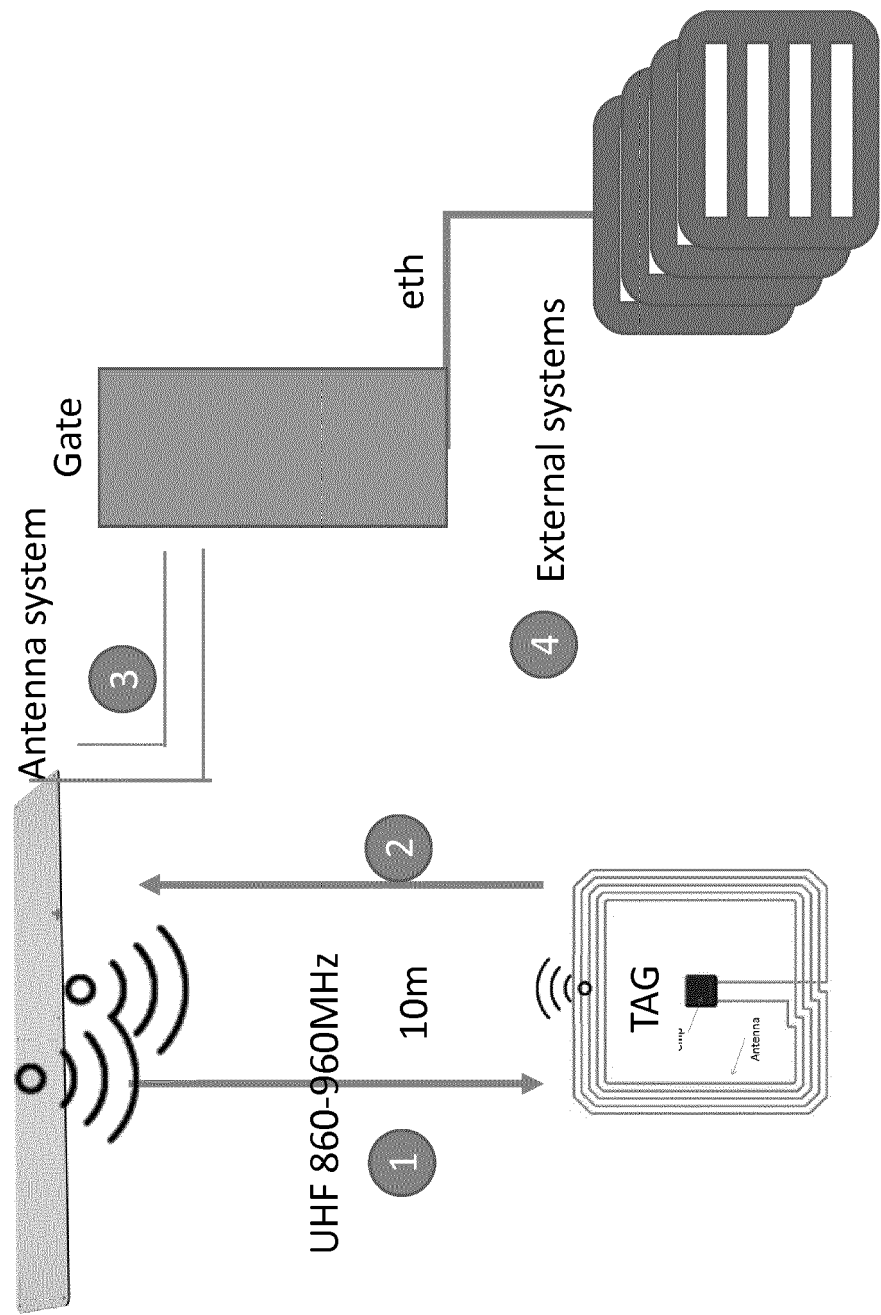


Fig. 2

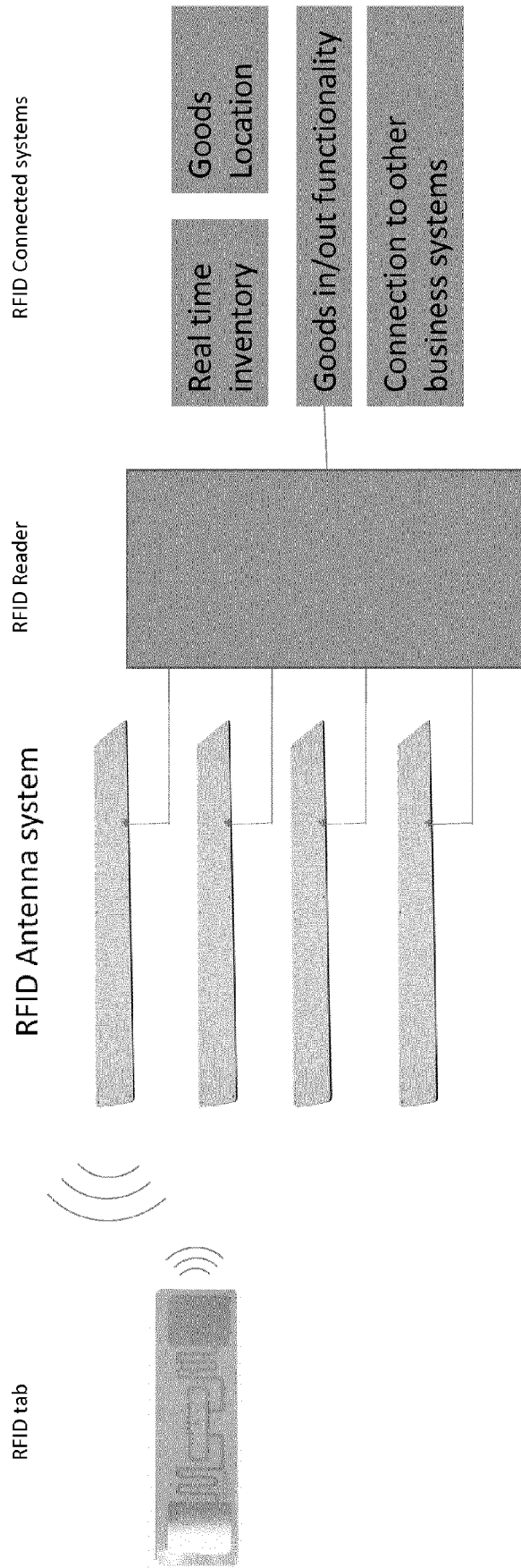


Fig. 3

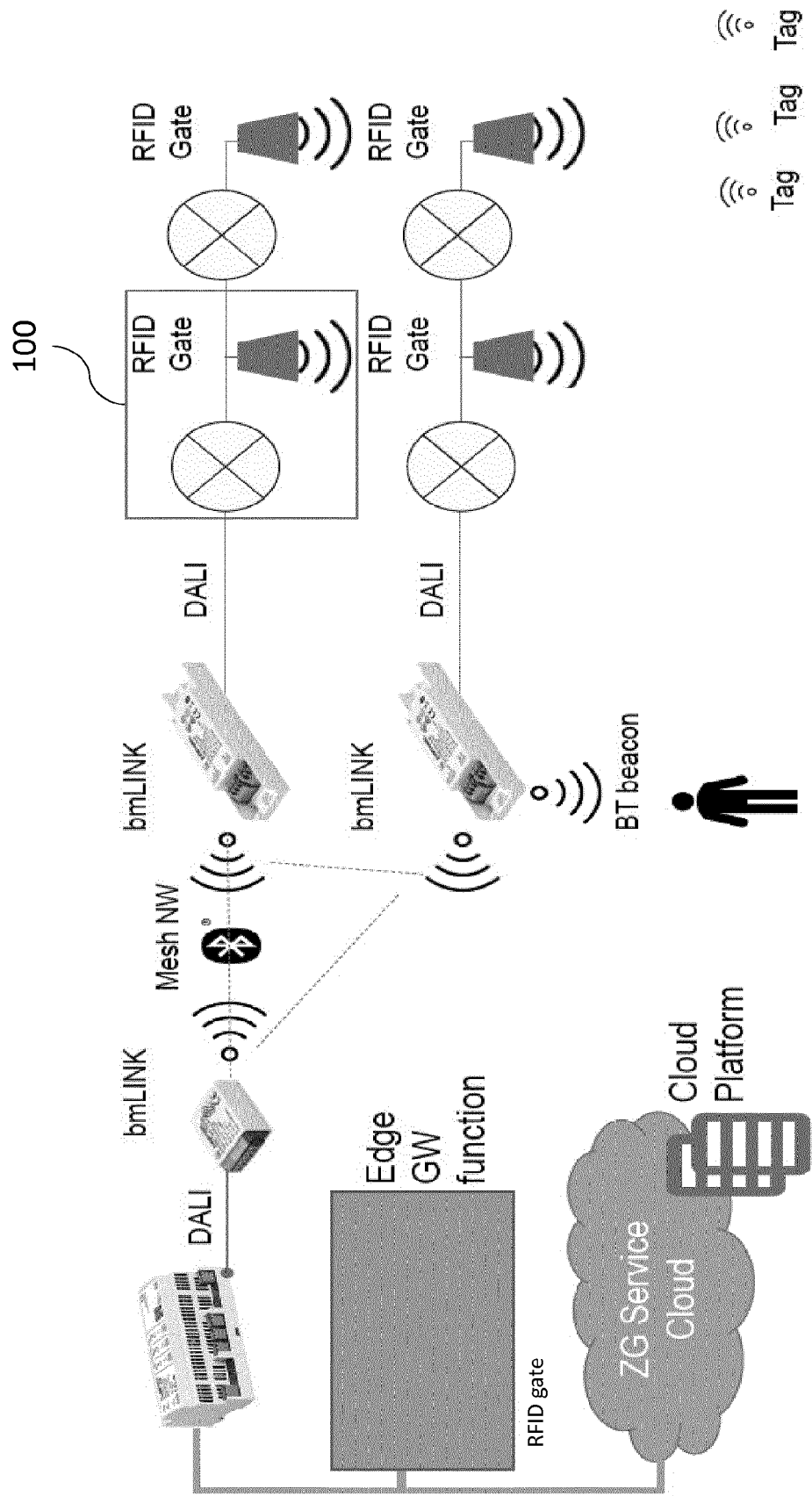


Fig. 4

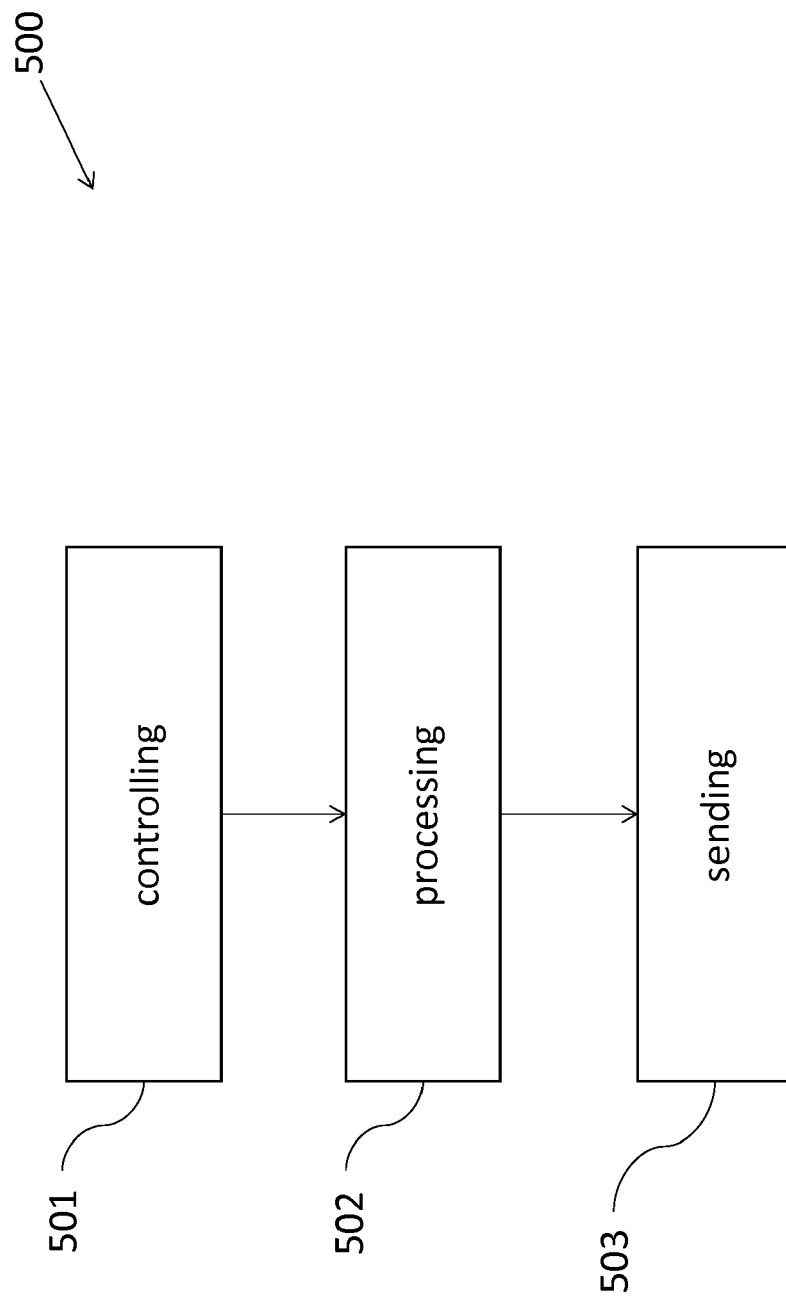


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 19 18 9352

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 8 January 2020	Examiner Brosa, Anna-Maria
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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