Title: RFID TAG WITH LF WAKE UP FUNCTION FOR ULD PALETTE

Fig. 4

Abstract: Disclosed herein is a Radio Frequency Identification (RFID) tag for a metallic Unit Load Device (ULD) pallet. The RFID tag is contained in the ULD pallet, which may be stacked on at least one other ULD pallet, holds air freight and is loaded in an airplane. The RFID tag includes a processor and memory, and is disposed in an installation space formed in a portion of the ULD pallet, so that it does not impede the loading of freight into the ULD pallet. The RFID tag is woken up in response to a wake-up signal in an LF band sent from a reader, and performs data communication with the reader.
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[DESCRIPTION]

[Invention Title]
RFID TAG WITH WAKE UP FUNCTION FOR ULD PALETTE

[Technical Field]

The present invention relates, in general, to Radio Frequency Identification (RFID) tags and, more particularly, to an RFID tag using the Low Frequency (LF) band, which is used in a metallic Unit Load Device (ULD) pallet, performs radio communication with an external reader using the LF band having excellent power to penetrate metallic material, and is configured to consume a battery only when receiving wake-up signals from the external reader, thereby increasing the expected lifespan of the RFID tag.

[Background Art]

Freight to be loaded in an airplane is generally disposed on a metallic plate, called a ULD pallet, and is then loaded into the airplane. Meanwhile, when ULD pallets are stored in the state of being stacked one on top of one another, as shown in Fig. 3, radio communication between RFID tags and an external reader is hindered by the metallic ULD pallets.

Accordingly, in the case where a passive RFID tag,
not having its own battery, is contained in a metallic ULD pallet, it is difficult for the tag to perform radio communication with an external reader, so that it is difficult to mount a passive RFID on the ULD pallet.

Generally, a passive RFID tag rectifies radio waves from an external reader, uses the rectified radio waves as driving power, inserts its own data into radio waves transmitted from the external reader, and then performs back scattering, so that the passive RFID tag has a relatively short communication range in which it can communicate with the external reader.

Accordingly, an RFID tag that can be applied to a ULD pallet must be an active RFID tag, capable of transmitting radio signals to an external reader using its own battery. However, in the case of frequencies in the UHF band (300 MHz to 900 MHz), the output of reception and transmission frequencies is considerably reduced by adjacent ULD pallets in the case where the RFID tag is disposed within metallic material.

Fig. 1 conceptually illustrates an active RFID tag and an external reader that sends and receives radio signals to and from the RFID tag.

As shown in the drawing, an RFID tag 20 contains a battery, and a Micro-Control Unit (MCU) 22, an RF reception unit 21 and an RF transmission unit 23 are supplied with power, so that the RFID tag 20 periodically
enters a wake-up state. Accordingly, in the case of an active RFID tag, the lifespan of the battery 24 is directly related to the lifespan of the RFID tag 20. When the battery 24 is completely discharged, the RFID tag 20 cannot continue to perform its function.

Meanwhile, a passive-type or active RFID tag sends and receives radio signals to and from an external reader over a frequency band ranging from 300 MHz to 900 MHz. The frequency band, ranging from 300 MHz to 900 MHz, is affected by metallic material when a tag using the band is mounted on a metallic product or a metallic structure. In particular, in the case where an RFID tag is mounted on a ULD pallet used for the transportation of air freight, the communication distance of the RFID tag is shortened.

A ULD pallet is entirely made of metal, and the shape of the cut portion of the ULD pallet is shown in Fig. 2. The ULD pallet is devised to load air freight in the freight compartment of an airplane, and, in the case where ULD pallets are stacked one on top of one another in a ULD pallet depository after use, it is not easy for the RFID tag mounted in each of the ULD pallets to perform radio communication with an external reader. In order to solve this problem, the RFID tag must increase the output of radio waves sent to an external reader, which causes a problem in that the battery of the RFID tag is quickly consumed.
[Disclosure]

[Technical Problem]

Accordingly, an object of the present invention is to provide an RFID tag that performs radio communication with a reader in an environment in which there is a large amount of surrounding metallic material.

Furthermore, another object of the present invention is to provide an RFID tag that is woken up using the LF band, over which radio communication can be performed, in an environment that is surrounded by metallic material and consumes a battery only when it is woken up, thereby maximizing the lifespan of the battery.

Moreover, still another object of the present invention is to provide an RFID tag that is used after being inserted into a ULD pallet for transporting air freight, can perform data communication with a reader without interference from air freight stored on a metallic ULD pallet, and does not radiate radio waves related to an ordinary wake-up function in an airplane.

[Technical Solution]

In order to accomplish the above objects, the present invention provides a tag for an air a ULD pallet, the RFID tag having an LF ordinary wake-up function, wherein the RFID tag is contained in the ULD pallet, which
may be stacked on at least one other ULD pallet, holds air freight, and is loaded into an airplane, and comprises a processor and memory, the RFID tag is disposed in an installation space formed in a portion of the ULD pallet, so that it does not impede loading of freight into the ULD pallet, and the RFID tag is woken up in response to a wake-up signal in an LF band sent from a reader, and performs data communication with the reader.

Preferably, the installation space contains a battery, and the battery supplies the processor and the memory with power in response to the wake-up signal in the LF band.

Preferably, the wake-up signal is in a frequency band ranging from 19 kHz to 300 kHz.

The reader and the RFID tag may perform data communication using frequencies in a frequency band ranging from 19 kHz to 300 kHz.

The reader and the RFID tag may perform data communication using frequencies in HF ~ UHF bands.

Preferably, the wake-up signal is a signal that is agreed upon between the reader and the RFID tag, and, if a signal under examination is determined to be the wake-up signal, the RFID tag is woken up.

Preferably, the RFID tag for an air ULD pallet further includes a sensor for detecting any one of temperature and humidity around the ULD pallet, and the
sensor is connected to the processor.

Preferably, the wake-up signal is created by modulating pulses, previously agreed upon with the reader, into an LF band frequency.

The RFID tag may be attached to the freight which is carried into an air transportation company, and the external reader may be disposed in a truck dock into and in which the freight is carried and loaded, reads the RFID tag attached to the freight which is disposed in the truck dock, and selects a gate through which the freight is loaded.

The external reader may be disposed in a warehouse for temporarily storing freight carried into an air transportation company, the RFID tag may be attached to the freight carried into the air transportation company, and the external reader may read the RFID tag attached to the freight, determines a destination of the freight, and provide information about the destination to a terminal for managing the carrying in and out of the freight.

The external reader may be disposed along a route to an airplane, and the external reader may read the RFID tag attached to the freight carried into an air transportation company, and provide information about a path of movement of the RFID tag to a server of the air transportation company, so that the server of the air transportation company determines the path of the movement
of the freight.

Preferably, the RFID tag does not radiate radio waves when the RFID tag is installed in an airplane.

**[Advantageous Effects]**

The RFID tag according to the present invention performs radio communication with a reader in an environment surrounded by metallic material, and uses a wake-up signal in the LF band, in which signal loss attributable to metallic material is low, thereby consuming a battery only when data communication between the reader and the RFID tag is required.

Furthermore, the RFID tag according to the present invention is disposed in edge rails provided on one side of a ULD pallet for storing air freight, so that it does not impede the intrinsic function of the ULD pallet, that is, the storage of freight. The RFID tag according to the present invention is woken up over the LF band, so that it can support a wake-up function from within its installation space.

Furthermore, the RFID tag according to the present invention drives a processor and memory only when receiving wake-up signals, so that it has low power consumption. Accordingly, the RFID tag according to the present invention can be used longer than typical active RFID tags.
Moreover, since the RFID tag according to the present invention is directly contained in a metallic ULD pallet, the RFID tag has advantages in that the current location and a record of locations based on the path of movement of the metallic ULD pallet can be tracked and a record of use of the metallic ULD pallet can be easily managed.

[Description of Drawings]

Fig. 1 is a diagram conceptually illustrating an active RFID tag and an external reader that sends and receives radio signals to and from the RFID tag;

Fig. 2 is a view showing the appearance of part of a ULD pallet;

Fig. 3 is a view showing an example in which ULD pallets, on which RFID tags according to the present invention are mounted, are stacked one on top of one another in a depository;

Fig. 4 is a view showing an example in which an RFID tag is inserted into a ULD pallet;

Fig. 5 is a diagram conceptually illustrating an example of the operation of the RFID tag according to the present invention;

Fig. 6 is a view conceptually illustrating another example of the operation of the RFID tag according to the present invention;
Fig. 7 is a block diagram of an RFID tag according to an embodiment of the present invention;

Fig. 8 is a block diagram of an RFID ID according to another embodiment of the present invention;

Fig. 9 is a diagram illustrating a process in which the RFID tags illustrated in Figs. 3 to 8 are applied to air freight;

Fig. 10 is a diagram illustrating the structure of a truck dock that stores freight that is carried into an air transportation company; and

Fig. 11 is a diagram showing an example in which, in an air freight terminal, readers (fixed or mobile) disposed in respective areas read information from tags contained in ULD pallets or tags attached to freight, and connect to an external network (a WiFi network) through APs (Access Points).

*Description of reference numerals of principal elements in the accompanying drawings*

30: external reader 40: RFID tag
42, 150: processor 50: battery
160: memory 170: sensor
180: UHF radio signal transceiver module
190: impedance matching circuit

[Mode for Invention]

The present invention will be described in detail
with reference to the accompanying drawings below.

Fig. 3 shows an example in which ULD pallets, on which RFID tags according to the present invention are mounted, are stacked one on top of one another in a depository.

As shown in the drawing, ULD pallets have a plate shape to hold air freight, and respective ULD pallets are stacked and stored in a ULD depository after use. When in use, respective ULD pallets are loaded with air freight, and the ULD pallets, loaded with freight, are loaded into an airplane.

Meanwhile, ULD pallets are generally made of metal to hold air freight safely. Accordingly, in the case where RFID tags are attached to respective ULD pallets, the RFID tags attached to the ULD pallets experience hindrance to communication with an external reader because radio waves are interrupted by the metallic material of the ULD pallets. The RFID tags according to the present invention are inserted into first sides of respective ULD pallets, and perform data communication with an external reader via frequencies in the LF band so that radio waves are little affected by the metallic material.

Fig. 4 shows an example in which an RFID tag is inserted into a ULD pallet.

The RFID tag according to the present invention is inserted into and fastened to an installation space that
is formed in one side of the ULD pallet.

The drawing shows a state in which the RFID tag and a battery for operating the RFID tag are installed in the installation space that is provided on one side of the ULD pallet so as to hold the RFID tag according to the present invention. In the case where General RFID tags, that is, RFID tags that perform direct data communication with an external reader via frequencies in HF ~ UHF bands, are used in the illustrated environment, they experience serious hindrance to data communication, and do not support an ordinary wake-up function.

Accordingly, it is difficult to adopt passive RFID tags as RFID tags that are used for metallic ULD pallets, but active RFID tags capable of implementing the high power of a transceiver unit must be used for the metallic ULD pallets. However, in the case where active RFID tags, supporting no ordinary wake-up function, perform data communication with an external reader using HF ~ UHF frequency bands, even though active RFID tags are used, the consumption of batteries is increased, so that the lifespan of the RFID tags is reduced.

Even in the environments shown in Figs. 1 and 3, the RFID tag according to the present invention is activated in response to the transmission of a wake-up signal by the external reader and maintained in an inactive state in other cases so as to minimize the
consumption of the battery, thereby minimizing the consumption of the battery.

The operation of the RFID tag according to the present invention will be described below with reference to Figs. 5 and 6.

Fig. 5 is a diagram conceptually illustrating an example of the operation of the RFID tag according to the present invention.

As shown in the drawing, the RFID tag 40 according to the present embodiment activates the internal modules 42 and 43 of the RFID tag 40 in response to a wake-up signal that is sent using the LF band (19 kHz to 300 kHz) by the external reader 30. The LF band is a frequency band that is close to ultrasonic, and has an advantage in that it exhibits excellent communication characteristics between metallic ULD pallets.

The RFID tag 40 according to the present invention responds to a radio signal that is sent by the external reader 30 using the LF band, and can send radio signals to the external reader 30 using the UHF frequency band. The RFID tag 40 according to the present invention can minimize the power consumption of the battery 50 because the internal modules 42 and 43 are maintained in an off state until a wake-up signal is transferred to the RFID tag 40.

The RFID tag according to the present embodiment is
an active RFID tag, and minimizes power consumption in such a way that it consumes little power at normal times and activates the internal modules only when a wake-up signal in the LF band is sent from the external reader 30. Accordingly, the RFID tag according to the present invention is realized on the condition that an external reader (not shown) for generating wake-up signals exists. A typical external reader is configured to send a radio signal, including an instruction, to an RFID tag and receive data corresponding to the instruction from the RFID tag, while the external reader 30 according to the present invention sends a wake-up signal to the RFID tag 40 before the transmission of data and the RFID tag 40 wakes up the modules (the MCU and the UHF TX/RX) thereof in response to the wake-up signal. Here, the wake-up signal is based on a magnetic coupling technique using a pulse train that is previously agreed upon between the external reader 30 and the RFID tag 40, and such a wake-up signal is received by an antenna provided in the RFID tag 40 in a magnetic coupling manner.

Even though the RFID tag 40 is installed inside a ULD pallet, the RFID tag 40 can communicate with the external reader 30 in the metallic environment of the ULD pallet.

Fig. 6 is a view conceptually illustrating another example of the operation of the RFID tag according to the
present invention.

As shown in the drawing, the RFID tag 40 according to the present embodiment operates in the same manner as the RFID tag illustrated in Fig. 3, but is different from the other RFID tag in that a radio signal sent from the RFID tag 40 to the external reader 30 is processed in the LF band.

If the RFID tag 40 sends a radio signal to the external reader 30 using the LF band, the RFID tag 40 sends the radio signal to the external reader 40 inside the metallic ULD pallet. This is possible because the LF band exploits a magnetic coupling method. However, the LF band can carry a small amount of data per unit time (for example, 1 minute) compared to the UHF frequency band, that is, the LF band supports only a low transmission rate, thus increasing the consumption of a battery.

Fig. 7 is a block diagram of an RFID tag according to an embodiment of the present invention.

The illustrated RFID tag includes a resonator 110, a wake-up module 140, a processor 150, memory 160, a sensor 170, a battery 50, a UHF radio signal transceiver module 180, and an impedance matching circuit 190.

The resonator 110 is provided in an antenna and the wake-up module 140, and selects a desired LF signal (a wake-up signal). Preferably, the resonator 110 includes a resonance circuit that responds to the transmission
frequency of a wake-up signal.

The wake-up module 140 compares a radio wave, received through the resonator 110, with a pulse train provided in the wake-up module 140, and determines that a wake-up signal has been received if the radio wave is identical to the pulse train. The wake-up module 140 wakes up respective modules (the MCU and the UHF Transceiver module) provided inside the RFID tag, if it is determined that the wake-up signal has been received.

Respective elements 110 ~ 190 (except for 140) are supplied with power from the battery 50 and activated by the wake-up module 140. The processor 150 is switched to an activated state, responds to an instruction from the external reader, and sends data, stored in the memory 160, or a value, detected by the sensor 170, to the external reader through the UHF transceiver module 180. Here, the sensor 170 may be any one of sensors for detecting the temperature, humidity and impulse of a ULD pallet.

The wake-up module 140 receives a wake-up signal, activates the UHF Transceiver module, and sends and receives data via frequencies between the HF-UHF bands (3 MHz to 3000 MHz).

The wake-up signal is formed using frequencies in the LF band so as to wake up the RFID tag mounted in the metallic ULD pallet. However, as described above, the LF band can carry a very small amount of data per unit time.
(for example, 1 minute), so that it is preferable to send and receive instructions (or data) to and from the RFID tag using the HF ~ UHF bands.

Fig. 8 is a block diagram of an RFID ID according to another embodiment of the present invention.

The illustrated embodiment is similar to the embodiment illustrated in Fig. 5, but is different from that embodiment in that the RFID tag communicates with an external reader using the LF band. Accordingly, the same reference numerals are assigned to the elements of Fig. 8 similar or identical to the elements of Fig. 7, and redundant descriptions will be omitted below.

In the present embodiment, the RFID tag receives a wake-up signal in the LF band and is activated, the external reader sends an instruction, modulated into the LF band, to the RFID tag, and the RFID tag modulates data requested by the external reader (or a value detected by the sensor) into the LF band, and sends the modulated data (or value) in response to the transmission of the instruction.

When the RFID tag and the external reader communicate with each other over the LF band, circuits can be simplified in a metallic environment, compared to circuits in the case of the use of frequencies in the HF ~ UHF bands. However, the amount of data that can be sent and received by the RFID tag and the external reader
per unit time is reduced, thereby shortening the lifespan of the battery due to the low speed. The embodiment illustrated in Fig. 8 is suitable for the case where the amount of data that is sent by the RFID tag to the external reader is not large. The UHF transceiver module 180 modulates data to be sent to the external reader into the LF band, and provides the modulated data to the resonator 110.

As described in the two embodiments of the present invention, the RFID tag according to the present invention can minimize the power consumption thereof that is required to send radio waves to the external reader.

Fig. 9 is a diagram illustrating a process in which the RFID tags, illustrated in Figs. 3 to 8, are applied to air freight.

In the case of air freight, a consignor hands over freight to a forwarder, and the forwarder generally carries the freight into a truck dock, similar to the truck dock shown in Fig. 10, using a truck. The truck dock is provided with gates having various sizes corresponding to the sizes of freight. The RFID tag according to the present invention may be mounted to the freight by the forwarder, and an external reader for detecting the RFID tag may be installed in the truck dock. The RFID tag includes information about the size of freight, and the external reader may select the gate at
which the forwarder will park his or her truck based on information acquired from the RFID tag.

The truck dock includes a plurality of gates, and external readers for detecting the freight of trucks that enter through the gates are disposed in the truck dock. This will be described below with reference to Fig. 11.

Fig. 11 shows an example in which external readers are installed in respective areas and are connected to an external network (a WiFi network) through Access Points (APs) (fixed or mobile). The APs disposed in respective areas have overlapping areas that overlap those of adjacent APs, and thus eliminate dead zones from respective square areas. The external readers for reading the information and locations of RFID tags of freight loaded in trucks and RFID tags contained in ULD pallets are disposed in the respective areas.

Thereafter, the freight, carried through a gate, is unloaded by a forklift or conveyor belt provided inside a gate, and is inspected for the presence of dangerous objects, the inappropriate packing state of freight, and the inclusion of prohibited articles using a X-ray inspection apparatus. The freight, having passed through the-ray inspection apparatus, is measured to determine the size and weight thereof, and is classified into one of a plurality of groups according to the destination of the freight.
In this case, the classification of freight is conducted using RFID tags mounted on the freight. Conventionally, a bar code attached to freight is read, and the freight is manually classified with reference to the results of the reading. The classification scheme requires additional personnel, has a possibility of error in the classification of freight, and takes a long time. The RFID tags according to the present invention enable entry to a dock, the selection of gates, and the classification of freight according to the destination through the RFID tags that are attached to freight by forwarders. The external readers can read destination information recorded in RFID tags, and notify forklifts of the results of the reading, or select conveyer belts based on the results of the reading and put the freight into the corresponding conveyer belts.

Here, the work of classifying freight according to the destination is generally performed in a warehouse.

The warehouse (not shown) is a storehouse for temporarily storing freight, and temporarily stores freight in lattice-shaped storage spaces. In the warehouse, one or more external readers for reading RFID tags are provided. Thereafter, the freight is placed on pallets or is loaded into containers, and is carried into an airplane. In this case, if the volume of freight is small, pallets are stacked one on top of one another, and
are loaded into an airplane in the state of being stacked.

Freight, which is classified in a warehouse, is loaded into ULD pallets (or containers), and is transported to an airplane. In this case, RFID tags according to the present invention are attached to ULD pallets and freight, and external readers are disposed across a section through which ULD pallets or freight are carried. Accordingly, the locations and final destinations of freight, to which RFID tags according to the present invention are attached, are continuously monitored from the time at which the freight is carried through gates to the time at which the freight is loaded into airplanes by forwarders. This means that freight cannot be erroneously classified and cannot be erroneously loaded into other airplanes.

Furthermore, RFID tags attached to freight are woken up and consume batteries only when external readers call them, so that they guarantee the reliability of providing the lengthy operation thereof. Moreover, they perform data communication with external readers via LF communication, so that they can communicate with external readers when they are installed in vehicles made of metal and are carried to airplanes.

Furthermore, in the case where ULD pallets are installed in an airplane, the RFID tags never radiate radio waves in the airplane when there are no wake-up
signals from one or more external readers.

The RFID tag according to the present invention is woken up through LF communication when the RFID tag passes by a location at which an external reader is disposed, and notifies the external reader of the information and location thereof through UHF communication.

Although the preferred embodiments of the present invention have been illustrated and described, the present invention is not limited to the above-described specific embodiments. That is, anyone having ordinary skill in the technical field to which the present invention pertains can make various variations without departing from the gist of the present invention claimed in the attached claims, and such variations fall within the scope of the description of the claims.
[CLAIMS]

[Claim 1]

A Radio Frequency Identification (RFID) tag for an air Unit Load Device (ULD) pallet, the RFID tag having a Low Frequency (LF) ordinary wake-up function, wherein:

the RFID tag is contained in the ULD pallet, which may be stacked on at least one other ULD pallet, holds air freight, and is loaded into an airplane, and comprises a processor and memory,

the RFID tag is disposed in an installation space formed in a portion of the ULD pallet, so that it does not impede loading of freight into the ULD pallet, and

the RFID tag is woken up in response to a wake-up signal in an LF band sent from a reader, and performs data communication with the reader.

[Claim 2]

The RFID tag for an air ULD pallet as set forth in claim 1, wherein the installation space contains a battery, and the battery supplies the processor and the memory with power in response to the wake-up signal in the LF band.

[Claim 3]

The RFID tag for an air ULD pallet as set forth in claim 1, wherein the wake-up signal is in a frequency band
ranging from 19 kHz to 300 kHz.

[Claim 4]

The RFID tag for an air ULD pallet as set forth in claim 1, wherein the reader and the RFID tag perform data communication using frequencies in a frequency band ranging from 19 kHz to 300 kHz.

[Claim 5]

The RFID tag for an air ULD pallet as set forth in claim 1, wherein the reader and the RFID tag perform data communication using frequencies in HF ~ UHF bands.

[Claim 6]

The RFID tag for an air ULD pallet as set forth in claim 1, wherein:

the wake-up signal is a signal that is agreed upon between the reader and the RFID tag, and

if a signal under examination is determined to be the wake-up signal, the RFID tag is woken up.

[Claim 7]

The RFID tag for an air ULD pallet as set forth in claim 1, further comprising a sensor for detecting any one of temperature and humidity around the ULD pallet,

wherein the sensor is connected to the processor.
[Claim 8]

The RFID tag for an air ULD pallet as set forth in claim 1, wherein the wake-up signal is created by modulating pulses, previously agreed upon with the reader, into an LF band frequency.

[Claim 9]

The RFID tag for an air ULD pallet as set forth in claim 1, wherein:

the RFID tag may be attached to the freight which is carried into an air transportation company, and the external reader may be disposed in a truck dock into and in which the freight is carried and loaded, and

the external reader reads the RFID tag attached to the freight which is disposed in the truck dock, and selects a gate through which the freight is loaded.

[Claim 10]

The RFID tag for an air ULD pallet as set forth in claim 1, wherein:

the external reader is disposed in a warehouse for temporarily storing freight carried into an air transportation company,

the RFID tag may be attached to the freight carried into the air transportation company, and
the external reader reads the RFID tag attached to the freight, determines a destination of the freight, and provides information about the destination to a terminal for managing carrying in and out of the freight.

5  **[Claim 11]**

The RFID tag for an air ULD pallet as set forth in claim 1, wherein:

the external reader is disposed along a route to an airplane, and

10 the external reader reads the RFID tag attached to the freight carried into an air transportation company, and provides information about a path of movement of the RFID tag to a server of the air transportation company, so that the server of the air transportation company determines the path of movement of the freight.

15 **[Claim 12]**

The RFID tag for an air ULD pallet as set forth in claim 1, wherein the RFID tag does not radiate radio waves when the RFID tag is installed in an airplane.
Fig. 9

- Freight waiting
  - W/H or LAMP

- Freight loading

- Passenger airplane or air freighter

- Receipt of freight

- X-ray examination of packing state

- Freight classification, airplane assignment and reservation, and CBA

- Receipt of freight (receipt of document)

- Freight check
  - W/T, Size Check

- Carrying in of freight
  - Frequent freight carrying
  - In section

- Assignment of gate based on size of freight, etc.
INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2007/005318

A. CLASSIFICATION OF SUBJECT MATTER

G06K 19/07(2006.01)i

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 8 G06K, G06F, G08B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models since 1975
Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKIPASS (KIPO internal) "RFID", "tag", "wake up", "freight", "metal", "low frequency"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<th>Category</th>
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<td>KR 10-0692622 B1 (KOREA ELECTRONICS TECHNOLOGY INSTITUTE) (02 March 2007) See abstract, claims 1-7, figures 1-5.</td>
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Further documents are listed in the continuation of Box C. ☑ See patent family annex.

Special categories of cited documents:
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Date of the actual completion of the international search
25 MARCH 2008 (25.03.2008)

Date of mailing of the international search report
25 MARCH 2008 (25.03.2008)

Name and mailing address of the ISA/KR
Korean Intellectual Property Office
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Fax No. 82-42-472-7140

Authorized officer
LEE, Seung Joo
Telephone No. 82-42-481-8186
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