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(54) **ANTENNA DEVICE AND RELATED COMMUNICATION METHOD**

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(51) **Int. Cl.**
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(57) **ABSTRACT**

(52) **U.S. Cl.**
CPC **H04B 1/48** (2013.01)

A radiocommunication device, configured to implement a communication method, including an antenna for picking up at least one set of electromagnetic waves and/or for radiating at least one first group of data and/or at least one second group of data. The device further includes at least one first radiocommunication circuit, configured to receive at least one set of electromagnetic waves and/or to transmit at least one first group of data, and at least one second radiocommunication circuit, configured to receive at least one set of electromagnetic waves and/or to transmit at least one second group of data.

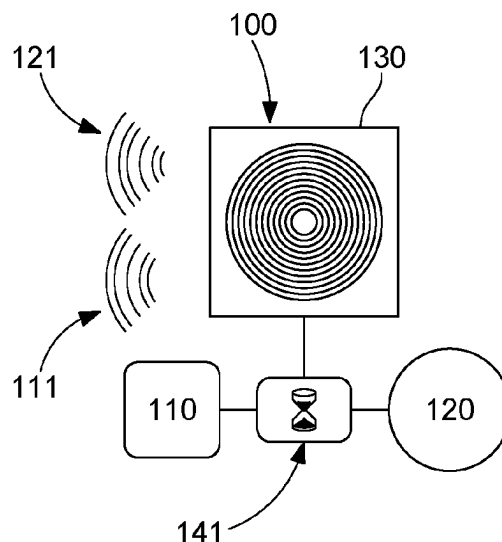
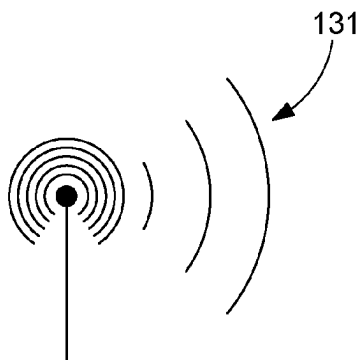
(58) **Field of Classification Search**
CPC G06K 19/072; G06K 19/0723; H04B 1/48
See application file for complete search history.

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7 Claims, 1 Drawing Sheet



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Fig. 1

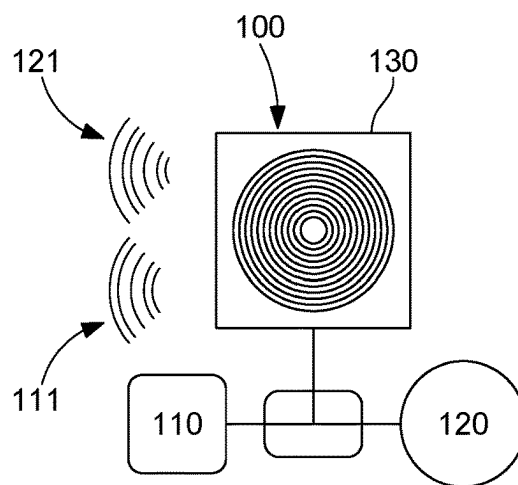
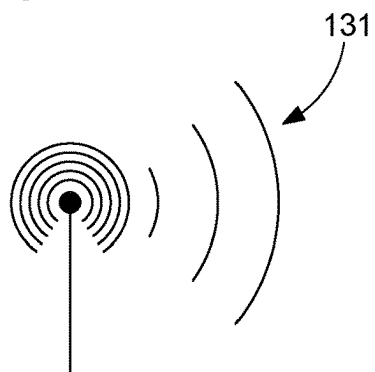


Fig. 2

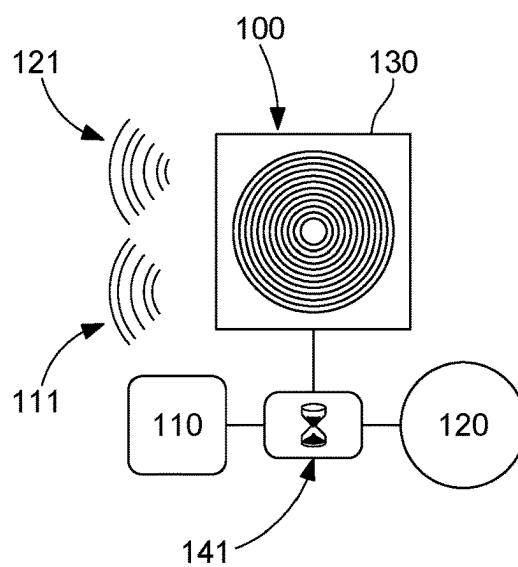
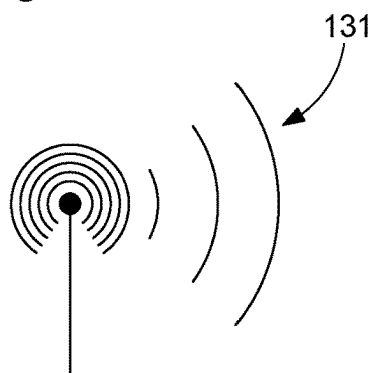
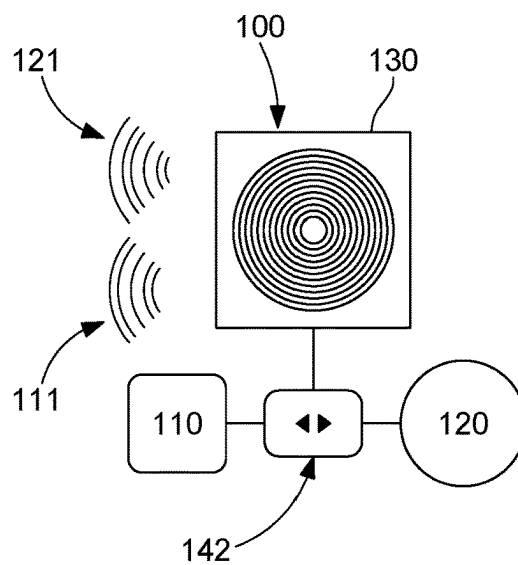
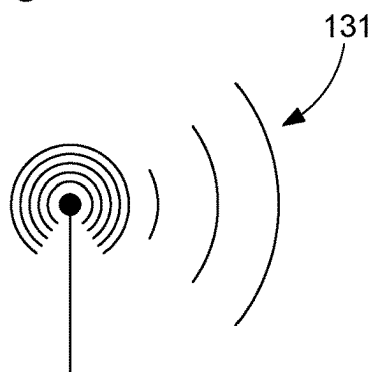


Fig. 3



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**ANTENNA DEVICE AND RELATED
COMMUNICATION METHOD****CROSS-REFERENCE TO RELATED
APPLICATION**

This application claims priority to European Patent Application No. 21158733.2 filed on Feb. 23, 2021, the entire disclosure of which is hereby incorporated herein by reference.

TECHNICAL FIELD OF THE INVENTION

The present invention relates to the field of radiocommunication and more particularly the field of short-distance radiocommunications of the RFID or NFC type. More specifically, the present invention relates to the antenna devices, combinations of functions, as well as related communication methods.

TECHNOLOGICAL BACKGROUND

RFID devices or more particularly NFC devices, acronym for Near Field Communication, also known under the name of contactless short-distance communication devices, are devices disposed on or in objects or products so as to allow an identification of said object and/or product by means of electromagnetic waves. These devices comprise an antenna associated with a single electronic chip that allows them to receive and respond to radio requests transmitted from the transceiver.

RFID or NFC devices are increasingly used for making payments, access controls, recharging, etc.

However, electronic chips intended for bank payments, for example, are complex, because of secure operations and in addition subject to numerous regulations, and are not adapted for simple and conventional applications such as access control or new applications such as the WLC, acronym for WireLess Charging, which requires an open and easily accessible platform.

Moreover, it is not even possible to use an electronic banking chip for other applications, because no access is granted to its secure memory except to a restricted community such as that of the banking community, for example.

SUMMARY OF THE INVENTION

The invention relates to a short-distance radiocommunication device comprising an antenna configured to pick up at least one set of electromagnetic waves and/or to radiate at least one first group of data and/or at least one second group of data, and at least one:

First radiocommunication circuit; said at least one first radiocommunication circuit being configured to receive said at least one set of electromagnetic waves and/or to transmit said at least one first group of data;

Second radiocommunication circuit; said at least one second radiocommunication circuit being configured to receive said at least one set of electromagnetic waves and/or to transmit said at least one second group of data;

Said antenna being configured to be connected, preferably directly, to said at least one first radio-communication circuit and to said at least one second radio-communication circuit.

Thanks to this arrangement, the radiocommunication device allows to have two radio-communication circuits

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connected to an antenna, preferably to a single antenna, which allows to simplify the integration into a product with a small footprint, the manufacturing and assembly methods, and/or to combine at least two radiocommunication circuits into a single RFID or NFC module and at the same time increase the functionality number on a single device. Short-distance radiocommunication device means a radiocommunication device configured to communicate within a radius of a few centimetres to a few metres.

According to one embodiment, said at least one first standard is identical to said at least one second standard.

Thanks to this arrangement, the radio-communication circuit transmits a group of data, which is preferably simultaneous, to the recipient and it is said recipient who will select the group of data appropriate to his request.

According to one embodiment, said at least one first radiocommunication circuit is configured to transmit said at least one first group of data according to at least one first standard and said at least one second radiocommunication circuit is configured to transmit said at least one second group of data according to at least one second standard, preferably said at least one first standard is different from said at least one second standard.

Thanks to this arrangement, the radiocommunication circuit only transmits a group of data when said at least one set of electromagnetic waves corresponds to said at least one first standard and/or to said at least one second standard.

According to one embodiment, said radiocommunication device comprises at least one delay device configured to delay the reception and/or transmission of said at least one set of electromagnetic waves by said at least one first radiocommunication circuit or by said at least one second radiocommunication circuit.

According to one embodiment, said radiocommunication device comprises at least one switch configured to switch the reception of said at least one set of electromagnetic waves between said at least one first radiocommunication circuit and said at least one second radiocommunication circuit.

Thanks to either one of these preceding arrangements, a prioritisation or hierarchisation between said at least one first radiocommunication circuit and by said at least one second radiocommunication circuit is carried out.

According to one embodiment, said antenna consists of a single antenna.

Thanks to this arrangement, the radiocommunication device allows to have two radiocommunication circuits connected to a single antenna, which allows to simplify the manufacturing methods and/or to combine at least two radiocommunication circuits into a single RFID or NFC module.

According to one embodiment, said at least one first standard is an RFID standard or an NFC standard and/or said at least one second standard is an RFID standard or an NFC standard.

The invention relates to a communication method implemented by said radiocommunication device according to the present invention; said communication method comprising:

Receiving said at least one set of electromagnetic waves;

Selecting said at least one first radiocommunication circuit and/or said at least one second radiocommunication circuit; and,

Transmitting said at least one first group of data and/or said at least one second group of data.

Thanks to this arrangement, the radiocommunication device allows to have two radiocommunication circuits communicating with an antenna, preferably a single antenna, which allows to simplify the manufacturing methods and/or

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to combine at least two radiocommunication circuits into a single RFID or NFC module.

According to one embodiment, said selection is carried out by recognition of said at least one first standard by said at least one first radiocommunication circuit and/or of said at least one second standard by said at least one second radiocommunication circuit.

Thanks to this arrangement, the radiocommunication circuit only transmits a group of data when said at least one set of electromagnetic waves corresponds to said at least one first standard and/or to said at least one second standard.

According to one embodiment, said selection is carried out by delaying said reception of said at least one set of electromagnetic waves by said at least one first radiocommunication circuit or by said at least one second radiocommunication circuit and/or by delaying said transmission of said at least one first group of data and/or of said at least one second group of data.

According to one embodiment, said selection is carried out by switching said reception of said at least one set of electromagnetic waves between said at least one first radiocommunication circuit and said at least one second radiocommunication circuit.

Thanks to either one of these preceding arrangements, a prioritisation or hierarchisation between said at least one first radiocommunication circuit and by said at least one second radiocommunication circuit is carried out.

BRIEF DESCRIPTION OF THE FIGURES

The invention will be described in more detail below using the appended drawings, given by way of non-limiting examples, wherein:

FIG. 1 shows a radiocommunication device **100** according to one embodiment;

FIG. 2 illustrates a radiocommunication device **100** comprising at least one delay device **141** according to one embodiment; and,

FIG. 3 shows a radiocommunication device **100** comprising at least one switch **142** according to one embodiment.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 shows a schematic representation of a radiocommunication device **100** according to one embodiment. Said radiocommunication device **100** comprises an antenna **130**, preferably said antenna **130** consists of a single antenna **130**, configured to pick up at least one set of electromagnetic waves **131** and/or to radiate at least one first group of data **111** and/or at least one second group of data **121**, as shown in the various figures. To this is added at least one first radiocommunication circuit **110**, configured to receive said at least one set of electromagnetic waves **131** and/or to transmit said at least one first group of data **111**, and at least one second radiocommunication circuit **120**, configured to receive said at least one set of electromagnetic waves **131** and/or to transmit said at least one second group of data **121**. It should be noted that said at least one set of electromagnetic waves **131** can comprise a request in the form of a group of data for example, to which, said at least one first radiocommunication circuit **110** responds by transmitting said at least one first group of data **111**, and/or said at least one second radiocommunication circuit **120** responds by transmitting said at least one second group of data **121**.

Moreover, an advantage of having an antenna **130**, preferably a single antenna **130**, and said at least one first

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radiocommunication circuit **110** and the at least one second radiocommunication circuit **120** is to be able to combine several functionalities in said radiocommunication device **100**.

Indeed, said radiocommunication device **100** implements a communication method which allows the reception of said at least one set of electromagnetic waves **131**, the selection of said at least one first radiocommunication circuit **110** and/or of said at least one second radiocommunication circuit **120**; and the transmission of said at least one first group of data **111** and/or said at least one second group of data **121**.

In the embodiment of FIG. 1, said antenna **130** can be connected, preferably directly, to said at least one first radiocommunication circuit **110** and to said at least one second radiocommunication circuit **120**.

Indeed, said at least one first radiocommunication circuit **110** and said at least one second radiocommunication circuit **120** can share said antenna **130**. Thus, said radiocommunication device **100** can allow to have at least two radiocommunication circuits **110**, **120** connected to an antenna, preferably to a single antenna, which allows to simplify the manufacturing methods and/or to combine at least two radiocommunication circuits **110**, **120** into a single RFID or NFC module.

Still in FIG. 1, said at least one first radiocommunication circuit **110** can transmit said at least one first group of data **111** according to at least one first standard and said at least one second radiocommunication circuit **120** can transmit said at least one second group of data **121** according to at least one second standard. Thus, the radiocommunication circuit **110**, **120** only transmits a group of data **111**, **121** when said at least one set of electromagnetic waves **131** corresponds to said at least one first standard and/or to said at least one second standard. For example, said at least one first standard may be of the type ISO15693 and said at least one second standard may be of the type ISO14443. It is also possible that said at least one first standard is an RFID standard or an NFC standard and/or said at least one second standard is an RFID standard or an NFC standard for example.

It is also possible that said at least one first standard and at least one second standard are identical, and respond more or less simultaneously, for example. In this case, the recipient of said at least one first group of data **111** and/or of said at least one second group of data **121** will select the group of data corresponding to his request. For example, said at least one first radiocommunication circuit **110** can provide access to certain parts of a building and said at least one second radiocommunication circuit **120** can serve as a means of payment within a company. Thus, when said antenna **130** picks up said at least one set of electromagnetic waves **131**, said at least one first radiocommunication circuit **110** and said at least one second radiocommunication circuit **120** can respond to this request, and only the recipient will select the group of data correctly responding to his request from said at least one first group of data **111** and/or said at least one second group of data **121**.

In the case where the two standards are different, said selection, mentioned above, is carried out by recognition of said at least one first standard by said at least one first radiocommunication circuit **110** and/or of said at least one second standard by said at least one second radiocommunication circuit **120**. Thus, the radiocommunication device **100** operates using two different standards which avoids obstruction by a radiocommunication circuit **110**, **120**, whether this is said at least one first radiocommunication circuit **110** or

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said at least one second radiocommunication circuit **120**, since each radiocommunication circuit **110**, **120** only recognises interrogations and controls which correspond to its specific standard, for example.

In the embodiment of FIG. 2, said radiocommunication device **100** comprises at least one delay device **141** configured to delay the reception of said at least one set of electromagnetic waves **131** by said at least one first radiocommunication circuit **110** or by said at least one second radiocommunication circuit **120**. Said delay device may be in the form of a code line, for example, such as a loop, so that said selection is carried out by delaying said reception of said at least one set of electromagnetic waves **131** by said at least one first radiocommunication circuit **110** or by said at least one second radiocommunication circuit **120**. Said at least one delay device **141** can also allow to delay said at least one first radiocommunication circuit **110** or said at least one second radiocommunication circuit **120**, when said at least one first standard is identical to said at least one second standard for example, which will allow a better selection to the recipient.

It is also possible to consider that said selection is carried out by delaying said transmission of said at least one first group of data **111** and/or of said at least one second group of data **121**. Thus, a prioritisation or hierarchisation between said at least one first radiocommunication circuit **110** and by said at least one second radiocommunication circuit **120** is carried out which prevents said at least one first radiocommunication circuit **110** and said at least one second radiocommunication circuit **120** from responding to the same interrogation at the same time for example.

The embodiment of FIG. 3, in turn, presents said radiocommunication device **100** comprising at least one switch **142**, for example a transistor or a set of transistors, configured to switch the reception of said at least one set of electromagnetic waves **131** between said at least one first radiocommunication circuit **110** and said at least one second radiocommunication circuit **120**. This has the effect of performing said selection by switching, and therefore by activating for example, said reception of said at least one set of electromagnetic waves **131** between said at least one first radiocommunication circuit **110** and said at least one second radiocommunication circuit **120** and thus a prioritisation or hierarchisation between said at least one first radiocommunication circuit **110** and said at least one second radiocommunication circuit **120** is carried out.

The invention claimed is:

1. A radiocommunication device comprising:

an antenna configured to receive at least one set of electromagnetic waves and/or to transmit at least one first group of data and/or at least one second group of data;

at least one first radiocommunication circuit, said at least one first radiocommunication circuit being configured to receive said at least one set of electromagnetic waves and/or to transmit said at least one first group of data;

at least one second radiocommunication circuit, said at least one second radiocommunication circuit being configured to receive said at least one set of electromagnetic waves and/or to transmit said at least one second group of data; and

at least one delay device, the at least one delay device is configured to delay the reception of said at least one set of electromagnetic waves by said at least one first radiocommunication circuit or by said at least one second radiocommunication circuit,

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wherein the antenna is configured to be connected to said at least one first radiocommunication circuit and to said at least one second radiocommunication circuit,

wherein the at least one first radiocommunication circuit is configured to receive the at least one first group of data according to at least one first standard and/or the at least one second radiocommunication circuit is configured to receive the at least one second group of data according to at least one second standard,

wherein the antenna is configured to select by way of the delay device, said at least one first radiocommunication circuit by delaying a transmission of said at least one first group of data or is configured to select by way of the delay device, said at least one second radiocommunication circuit by delaying a transmission of said at least one second group of data.

2. The radiocommunication device according to claim 1, wherein said at least one first radiocommunication circuit is configured to transmit said at least one first group of data according to one of the at least one first standard and said at least one second radiocommunication circuit is configured to transmit said at least one second group of data according to one of the at least one second standard, said at least one first standard is different from said at least one second standard.

3. The radiocommunication device according to claim 2, wherein said at least one first standard is an RFID standard or an NFC standard and/or said at least one second standard is an RFID standard or an NFC standard.

4. The radiocommunication device according to claim 1, wherein said at least one first radiocommunication circuit is configured to transmit said at least one first group of data according to the at least one first standard and said at least one second radiocommunication circuit is configured to transmit said at least one second group of data according to the at least one second standard, wherein said at least one first standard is identical to said at least one second standard.

5. The radiocommunication device according to claim 1, wherein said antenna consists of a single antenna.

6. A communication method implemented by said radiocommunication device having an antenna configured to receive at least one set of electromagnetic waves and/or to transmit at least one first group of data and/or at least one second group of data, at least one first radiocommunication circuit, said at least one first radiocommunication circuit being configured to receive said at least one set of electromagnetic waves and/or to transmit said at least one first group of data, at least one second radiocommunication circuit, said at least one second radiocommunication circuit being configured to receive said at least one set of electromagnetic waves and/or to transmit said at least one second group of data, and at least one delay device configured to delay the reception of said at least one set of electromagnetic waves by said at least one first radiocommunication circuit or by said at least one second radiocommunication circuit, wherein the antenna is configured to be connected to said at least one first radiocommunication circuit and to said at least one second radiocommunication circuit, wherein the at least one first radiocommunication circuit is configured to receive the at least one first group of data according to at least one first standard and/or the at least one second radiocommunication circuit is configured to receive the at least one second group of data according to at least one second standard, said communication method comprising:

receiving said at least one set of electromagnetic waves;

selecting said at least one first radiocommunication circuit and/or said at least one second radiocommunication circuit; and

transmitting said at least one first group of data and/or said at least one second group of data, wherein said selecting is performed by the antenna and is carried out by delaying with a delay device said transmitting of said at least one first group of data by the first radiocommunication circuit and/or by delaying with the delay device the transmitting of said at least one second group of data by the second radiocommunication circuit.

7. The communication method according to claim 6, wherein said at least one first radiocommunication circuit is configured to transmit said at least one first group of data according to the at least one first standard and said at least one second radiocommunication circuit is configured to transmit said at least one second group of data according to the at least one second standard, wherein said selection is carried out by recognition of said at least one first standard by said at least one first radiocommunication circuit and/or of said at least one second standard by said at least one second radiocommunication circuit.

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