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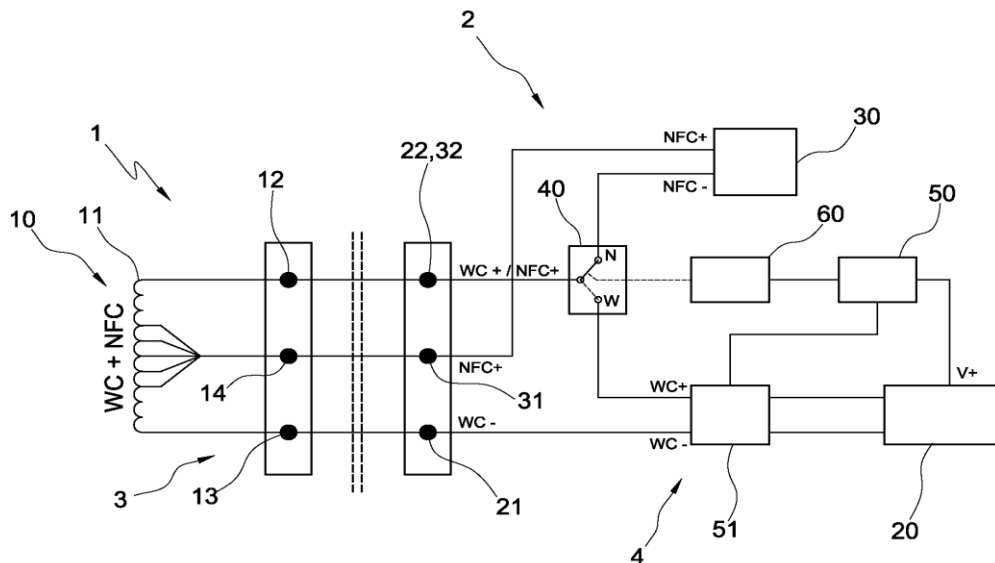
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(54) Title of Invention **ANTENNA FOR BOTH NON-CONTACT CHARGING AND NEAR FIELD WIRELESS COMMUNICATION IN MOBILE COMMUNICATION TERMINAL**

(57) Abstract

An antenna for both non-contact charging and near field wireless communication in a mobile communication terminal according to the present invention comprises a coil unit (11) wired in a spiral shape, a first terminal (12) formed at one end of the coil unit (11), a second terminal (13) formed on the other end of the coil unit (11), and a third terminal (14) drawn out from the coil unit (11) between the first terminal (12) and the second terminal (13), wherein the coil unit (11) between the first terminal (12) and the second terminal (13) generates an induced electromotive force of a frequency for non-contact charging, and the coil unit (11) between the first terminal (12) and the third terminal (14) has a characteristic of generating an induced electromotive force of a frequency for NFC, and comprises an antenna unit (10) installed in the battery cover (3) of a mobile communication terminal (2); a non-contact charging circuit (20) connected to the first terminal (12) and the second terminal (13) to realize the non-contact charging through the antenna unit (10) and installed in the main body (4) of the mobile communication terminal (2); and an NFC circuit (30) connected to the first terminal (12) and the third terminal (14) to realize the NFC through the antenna unit (10) and installed in the main body (4) of the mobile communication terminal (2).

Representative figure - Fig. 2



Scope of claims

Claim 1

An antenna for both non-contact charging and near field wireless communication in a mobile communication terminal comprising

a coil unit (11) wired in a spiral shape, a first terminal (12) formed at one end of the coil unit (11), a second terminal (13) formed on the other end of the coil unit (11), and a third terminal (14) drawn out from the coil unit (11) between the first terminal (12) and the second terminal (13), wherein the coil unit (11) between the first terminal (12) and the second terminal (13) generates an induced electromotive force of a frequency for non-contact charging, and the coil unit (11) between the first terminal (12) and the third terminal (14) has a characteristic of generating an induced electromotive force of a frequency for NFC, and comprising an antenna unit (10) installed in the battery cover (3) of a mobile communication terminal (2);

a non-contact charging circuit (20) connected to the first terminal (12) and the second terminal (13) to realize the non-contact charging through the antenna unit (10) and installed in the main body (4) of the mobile communication terminal (2); and

an NFC circuit (30) connected to the first terminal (12) and the third terminal (14) to realize the NFC through the antenna unit (10) and installed in the main body (4) of the mobile communication terminal (2).

Claim 2

The antenna for both non-contact charging and near field wireless communication in a mobile communication terminal of claim 1 further comprising

a switch unit (40) for activating or deactivating the non-contact charging by selectively connecting the first terminal (12) to the non-contact charging circuit (20) and for activating or deactivating the NFC by selectively connecting the first terminal (12) to the NFC circuit (30);

a detection unit (50) for detecting the approach to a non-contact charger by using a coupling circuit (51) to recognize a frequency generated when the mobile communication terminal (2) approaches the non-contact charger; and

a control unit (60) in which the switch unit (40) connects the first terminal (12) to the non-contact charging circuit (20) to activate the non-contact charging when the detection unit (50) recognizes the frequency for non-contact charging and, otherwise, the switch unit (40) connects the first terminal (12) to the NFC circuit (30) to activate the NFC.

Claim 3

The antenna for both non-contact charging and near field wireless communication in a mobile communication terminal of claim 2,

wherein the antenna unit (10) gets connected to the non-contact charging circuit (20) when the power of the mobile communication terminal (2) is off;

the antenna unit (10) gets connected to the non-contact charging circuit (20) when the power of the mobile communication terminal (2) is on, and the NFC is in non-use mode; and

the antenna unit (10) gets connected to the NFC circuit (30) when the power of the mobile communication terminal (2) is on, and the NFC is in use mode.

Claim 4

The antenna for both non-contact charging and near field wireless communication in a mobile communication terminal of claim 1 further comprising

a low pass filter (70) installed between the first terminal (12) and the second terminal (13) and the non-contact charging circuit (20) to transmit only a frequency below a certain level including the frequency for the non-contact charging to the non-contact charging circuit (20); and

a band pass filter (80) installed between the first terminal (12) and the third terminal (14) and the NFC circuit (30) to transmit a frequency band of a certain range including the frequency for the NFC to the NFC circuit (30).

Claim 5

An antenna for both non-contact charging and near field wireless communication in a mobile communication terminal comprising

an antenna unit (10) comprising a coil unit (11) wired in a spiral shape, a first terminal (12) formed at one end of the coil unit (11), and a second terminal (13) formed on the other end of the coil unit (11), having a characteristic of generating an induced electromotive force of a frequency for non-contact charging and an induced electromotive force of a frequency for NFC, and installed in the battery cover (3) of a mobile communication terminal (2);

a non-contact charging circuit (20) connected to the first terminal (12) and the second terminal (13) to realize the non-contact charging through the antenna unit (10) and installed in the main body (4) of the mobile communication terminal (2);

an NFC circuit (30) connected to the first terminal (12) and the second terminal (13) to realize the NFC through the antenna unit (10) and installed in the main body (4) of the mobile communication terminal (2);

a low pass filter (70) installed between the first terminal (12) and the second terminal (13) and the non-contact charging circuit (20) to transmit only a frequency below a certain level including the frequency for the non-contact charging to the non-contact charging circuit (20); and

a band pass filter (80) installed between the first terminal (12) and the second terminal (13) and the NFC circuit (30) to transmit a frequency band of a certain range including the frequency for the NFC to the NFC circuit (30).

*Specification**Technical field*

[0001] The present invention relates to an antenna for non-contact charging and near field wireless communication equipped on a mobile communication terminal.

Background art

[0002] A power supply is required to operate various mobile communication terminals represented by a mobile phone and for this purpose, a battery needs to be installed, and a multi-use rechargeable battery is widely used instead of a single-use battery as the battery for mobile communication terminals.

[0003] Traditionally, the wired charging method has been widely used for charging batteries for mobile communication terminals, but wired charging not only limits mobility, which is the greatest advantage of a mobile communication terminal, but also has a problem in that the charging performance deteriorates due to aging of the charging terminal caused by repeated detachment.

[0004] Due to this background, a non-contact (wireless) charging method has been introduced for charging a mobile phone, which is the representative mobile communication terminal.

[0005] The principle of the most common non-contact charging is induced current, and according to this principle, when a mobile phone with a built-in secondary coil is placed on top of the primary coil installed in the non-contact charger, an induced electromotive force is generated in a frequency band of several hundred kHz (e.g., 300 kHz or less) between the primary and secondary coils, charging the battery of the mobile phone.

[0006] Such non-contact charging had a problem in that it was not compatible with each other because various communication methods were used for each developer company but recently, international standardization has been achieved through the WPC (Wireless Power Consortium).

[0007] As such, to apply the non-contact charging to the mobile communication terminal, a coil capable of generating an induced electromotive force, that is, a loop antenna in the form of a spiral coil (hereinafter referred to as an antenna) is required.

[0008] In general, an antenna for non-contact charging is installed on the battery cover of a mobile phone and recently, as the charging circuit to which the antenna is connected became miniaturized and incorporated into the body of the mobile phone, only the antenna (unit) remains on the battery cover.

[0009] Meanwhile, separate from the environment of non-contact charging, the wireless environment of RFID (Radio Frequency Identification: wireless identification) is widely used in mobile communication terminals and for example, when an NFC chip that realizes Near Field Communication (NFC) is installed in a mobile phone, equipped with a non-contact smart card such as a USIM card, and brought nearby an external RF reader, the information of the USIM card of the mobile phone is read by the RF reader by near field communication and the necessary information is recorded, which realizes the equipped function (e.g. electronic money function) such as an electronic money function.

[0010] In this case, the information exchange between the NFC chip and the RF reader is accomplished by supplying power for operating the USIM card by induced electromotive force at 13.56 MHz between the primary coil (antenna) installed in the RF reader and the coil of the NFC chip installed in the mobile phone.

[0011] Furthermore, the NFC chip installed in mobile phones has been developed to function as an RFID reader as well to read the information recorded on an external RFID tag. When the NFC chip operates as an RF reader, the antenna (coil) connected to the NFC chip acts as a primary coil to transmit power, and an induced electromotive force is generated from the coil (antenna) installed on an external RFID tag, allowing wireless communication to be realized.

[0012] In other words, to apply the RFID system (NFC) to a mobile communication terminal, a loop antenna in the form of a spiral coil capable of generating an induced electromotive force is required. An antenna for NFC is also installed on the battery cover or battery.

[0013] As a result, to equip both a non-contact charging function and a near field wireless communication function in a mobile communication terminal represented by a mobile phone, two antennas (coils) for inducing an electromotive force to each are required, and therefore, two antennas are equipped on the battery cover.

[0014] Fig. 5 is a schematic diagram of the antenna connection for non-contact charging and near field wireless communication applied to a mobile phone.

[0015] As illustrated, an antenna for non-contact charging (120) and an antenna for NFC chip (130) are installed in the cover (110) of the battery, and to connect both ends of these two antennas to a charging circuit (220) and an NFC circuit (230) installed on the main board (210) of the mobile phone, the main board (210) requires a total of four terminals, two antenna terminals (WC+, WC-) for WPC-based non-contact charging, and two antenna terminals (NFC+, NFC-) for NFC. Reference numeral 101 indicates a non-contact charger.

Disclosure of invention

Problem to be solved

[0016] The object of the present invention is to, in relation to a mobile communication terminal equipped with both non-contact charging (WPC) and near field wireless communication (NFC), unify the antennas required for non-contact charging and near field wireless communication from two to one, and also, make it possible to use the antenna by selectively activating it for non-contact charging or for near field wireless communication depending on the use mode of non-contact charging and near field wireless communication, thereby reducing the burden of antenna installation for non-contact charging and near field wireless communication in a mobile communication terminal.

Means to solve the problem

[0017] According to the present invention, an antenna for both non-contact charging and near field wireless communication in a mobile communication terminal is provided.

[0018] The antenna for combined use according to the first embodiment of the present invention comprises an antenna unit, a contact charging circuit, and an NFC circuit.

[0019] The antenna unit comprises a coil unit wired in a spiral shape, a first terminal formed at one end of the coil unit, a second terminal formed on the other end of the coil unit, and a third terminal drawn out from the coil unit between the first terminal and the second terminal. The coil unit between the first terminal and the second terminal generates an induced electromotive force of a frequency for non-contact charging, and the coil unit between the first terminal and the third terminal has a characteristic of generating an induced electromotive force of a frequency for NFC. The antenna unit is installed in the battery cover of a mobile communication terminal.

[0020] The non-contact charging circuit is connected to the first terminal and the second terminal to realize the non-contact charging through the antenna unit and installed in the main body of the mobile communication terminal.

[0021] The NFC circuit is connected to the first terminal and the third terminal to realize the NFC through the antenna unit and installed in the main body of the mobile communication terminal.

[0022] Preferably, the antenna for combined use of the first embodiment according to the present invention further comprises a switch unit, a detection unit, and a control unit.

[0023] The switch unit activates or deactivates the non-contact charging by selectively connecting the first terminal to the non-contact charging circuit and activates or deactivates the NFC by selectively connecting the first terminal to the NFC circuit.

[0024] A detection unit detects the approach to a non-contact charger by using a coupling circuit to recognize a frequency generated when the mobile communication terminal approaches the non-contact charger.

[0025] In the control unit, the switch unit connects the first terminal to the non-contact charging circuit to activate the non-contact charging when the detection unit recognizes the frequency for non-contact charging and, otherwise, the switch unit connects the first terminal to the NFC circuit to activate the NFC.

[0026] Preferably, in the antenna for combined use of the first embodiment, the antenna unit gets connected to the non-contact charging circuit when the power of the mobile communication terminal is off.

[0027] Preferably, in the antenna for combined use of the first embodiment, the antenna unit gets connected to the non-contact charging circuit when the power of the mobile communication terminal is on, and the NFC is in non-use mode.

[0028] Preferably, in the antenna for combined use of the first embodiment, the antenna unit gets connected to the NFC circuit when the power of the mobile communication terminal is on, and the NFC is in use mode.

[0029] Preferably, the antenna for combined use of the first embodiment according to the present invention further comprises a low pass filter and a band pass filter.

[0030] The low pass filter is installed between the first terminal) and the second terminal and the non-contact charging circuit to transmit only a frequency below a certain level including the frequency for the non-contact charging to the non-contact charging circuit.

[0031] The band pass filter is installed between the first terminal and the third terminal and the NFC circuit to transmit a frequency band of a certain range including the frequency for the NFC to the NFC circuit.

[0032] The antenna for combined use according to the second embodiment of the present invention comprises an antenna unit, a non-contact charging unit, an NFC circuit, a low pass filter, and a band pass filter.

[0033] The antenna unit comprises a coil unit wired in a spiral shape, a first terminal formed at one end of the coil unit, and a second terminal formed on the other end of the coil unit, has a characteristic of generating an induced electromotive force of a frequency for non-contact charging and an induced electromotive force of a frequency for NFC, and is installed in the battery cover of a mobile communication terminal.

[0034] The non-contact charging circuit is connected to the first terminal and the second terminal to realize the non-contact charging through the antenna unit and is installed in the main body of the mobile communication terminal.

[0035] The NFC circuit is connected to the first terminal and the second terminal to realize the NFC through the antenna unit and is installed in the main body of the mobile communication terminal.

[0036] The low pass filter is installed between the first terminal and the second terminal and the non-contact charging circuit to transmit only a frequency below a certain level including the frequency for the non-contact charging to the non-contact charging circuit (20).

[0037] The band pass filter is installed between the first terminal and the second terminal and the NFC circuit to transmit a frequency band of a certain range including the frequency for the NFC to the NFC circuit.

Effect of invention

[0038] According to the antenna for combined use according to the present invention, in a mobile communication terminal equipped with both non-contact charging and near field wireless communication, it is possible to unify the antennas required for non-contact charging and near field wireless communication from two to one to use it for combined use, and use the antenna for combined use selectively for non-contact charging and for near field wireless communication according to the encountered situation, and thus, it is possible to reduce the burden of antenna installation for non-contact charging and near field wireless communication in a mobile communication terminal.

Brief description of figures

[0039] Fig. 1 is a schematic diagram of an exemplary three-terminal antenna unit applied to the present invention,

Fig. 2 is a schematic diagram of an exemplary antenna for combined use according to the first embodiment of the present invention,

Fig. 3 is a schematic diagram of another exemplary antenna for combined use according to the first embodiment of the present invention,

Fig. 4 is a schematic diagram of an exemplary antenna for combined use according to the second embodiment of the present invention, and

Fig. 5 is a schematic diagram of the antenna connection for non-contact charging and near field wireless communication applied to a mobile phone.

Description of embodiments

[0040] Hereinafter, the antenna for both non-contact charging and near field wireless communication in a mobile communication terminal according to the present invention will be described in detail with reference to the accompanying figures. The following embodiments are only for illustratively describing the antenna for combined use according to the present invention and are not intended to limit the scope of the present invention.

[0041] **First embodiment**

[0042] As illustrated in Figs. 1 to 3, the antenna for combined use (1) of the first embodiment according to the present invention comprises an antenna unit (10), a non-contact charging circuit (20), and an NFC circuit (30).

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