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(54) **Title:** METHOD AND DEVICE FOR CHARGING WIRELESSLY, TERMINAL AND COMPUTER READABLE STORAGE MEDIUM

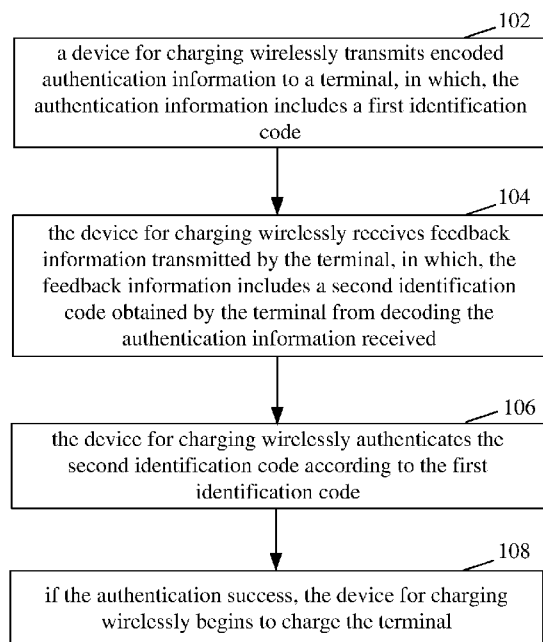


Fig. 1

(57) **Abstract:** The present disclosure provides a method for charging wirelessly, a device for charging wirelessly, a terminal, and a computer readable storage medium. The method includes: transmitting, by a device for charging wirelessly, encoded authentication information to a terminal, in which, the authentication information includes a first identification code; receiving, by the device for charging wirelessly, feedback information transmitted by the terminal, in which, the feedback information includes a second identification code, and the second identification code is obtained by the terminal from decoding the authentication information received; authenticating, by the device for charging wirelessly, the second identification code according to the first identification code; and beginning, by the device for charging wirelessly, to charge the terminal if the authentication is successful.

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METHOD AND DEVICE FOR CHARGING WIRELESSLY, TERMINAL AND COMPUTER READABLE STORAGE MEDIUM

CROSS-REFERENCE TO RELATED APPLICATION

5 This application claims priority to and benefits of Chinese Patent Application Serial No. 201511027310.3, filed with the State Intellectual Property Office of P. R. China on December 31, 2015, the entire content of which is incorporated herein by reference.

FIELD

10 The present disclosure relates to a wireless charging technology, specifically, relates to a method for charging wirelessly, a device for charging wirelessly, a terminal, and a computer readable storage medium.

BACKGROUND

15 As the rapid development of Internet, people increasingly rely on mobile terminals to connect to Internet. Nowadays, batteries of the mobile terminals are limited by current battery technology and cannot achieve large breakthrough in energy storage. Therefore the batteries cannot provide users with long-lasting using period, so the users need to charge the terminal frequently. At the present stage, in order to charge the terminal, the users generally need to connect the terminal with
20 the power device via a charging cable, so it will be very troublesome for the users to plug in and pull out the charging cable frequently for charging the terminal; and it affects the user experience greatly. As the emergence and development of wireless charging technology, as it no longer needs to use the charging cable to connect the terminal and power device, so being simple and convenient for the users to use, at present, the wireless charging has a great trend of replacing the
25 wired charging.

 The communication mode of present mainstream wireless charging technology has two main types of Carrier Modulation and Bluetooth Low Energy (BLE for short) technology. However, Carrier Modulation is very sensitive to circuit technology and electromagnetic environment, it is easy to be disturbed, thus easily leading to cannot charge the device properly; and BLE technology
30 is mainly used in medium and long distance communication, it would generate false connection in short distance communication, also easily leading to cannot charge the terminal properly.

SUMMARY

The present disclosure provides a method for charging wirelessly, a device for charging wirelessly, a terminal and a computer readable storage medium, being capable of solving the problem that the terminal is not charged correctly because Carrier Modulation is easy to be disturbed and BLE technology is easy to generate false connection in present mainstream wireless charging technology.

In order to achieve above objectives, the present disclosure provides a method for charging wirelessly, including:

transmitting, by a device for charging wirelessly, encoded authentication information to a terminal, in which, the authentication information includes a first identification code;

receiving, by the device for charging wirelessly, feedback information transmitted by the terminal, in which, the feedback information includes a second identification code, and the second identification code is obtained by the terminal from decoding the authentication information received;

authenticating, by the device for charging wirelessly, the second identification code according to the first identification code; and

beginning, by the device for charging wirelessly, to charge the terminal if the authentication is successful.

Alternatively, transmitting, by a device for charging wirelessly, encoded authentication information to a terminal, includes:

encoding, by the device for charging wirelessly, the authentication information;

amplifying, by the device for charging wirelessly, the encoded authentication information;

carrying out, by the device for charging wirelessly, an impedance matching processing to the amplified and encoded authentication information; and

transmitting, by the device for charging wirelessly, the encoded, amplified and impedance matched authentication information to the terminal.

Alternatively, the feedback information has been encoded.

Alternatively, before authenticating, by the device for charging wirelessly, the second identification code according to the first identification code, the method further includes:

decoding, by the device for charging wirelessly, the feedback information received so as to

obtain the second identification code.

Alternatively, an encoding mode includes: an infrared encoding mode; correspondingly, a decoding mode includes: an infrared decoding mode.

Alternatively, before transmitting, by a device for charging wirelessly, encoded authentication
5 information to a terminal, the method further includes:

confirming, by the device for charging wirelessly, the terminal within a charging range of the device for charging wirelessly through a preset induction mode; in which the preset induction mode includes at least one of a magnetic induction mode, an infrared induction mode, and an electric field induction mode.

10 The present disclosure provides another method for charging wirelessly, including:

receiving, by a terminal, encoded authentication information transmitted by a device for charging wirelessly, in which, the authentication information includes a first identification code;

decoding, by the terminal, the authentication information received to obtain a second identification code;

15 transmitting, by the terminal, feedback information including the second identification code to the device for charging wirelessly;

receiving, by the terminal, an authentication result of authenticating the second identification code according to the first identification code from the device for charging wirelessly; and

beginning, by the terminal, to accept to be charged by the wireless charging device, if the
20 authentication is successful.

Alternatively, transmitting, by the terminal, feedback information including the second identification code to the device for charging wirelessly, includes:

encoding, by the terminal, the feedback information;

amplifying, by the terminal, the encoded feedback information;

25 carrying out, by the terminal, an impedance matching processing to the amplified and encoded feedback information; and

transmitting, by the terminal, the encoded, amplified and impedance matched feedback information to the device for charging wirelessly.

Alternatively, an encoding mode includes: an infrared encoding mode; correspondingly, a
30 decoding mode includes: an infrared decoding mode.

The present disclosure provides a device for charging wirelessly, including:

a transmitting unit, configured to transmit encoded authentication information to a terminal, in which, the authentication information includes a first identification code;

a receiving unit, configured to receive feedback information transmitted by the terminal, in which, the feedback information includes a second identification code, the second identification code is obtained by the terminal from decoding the authentication information received;

an authentication unit, configured to authenticate the second identification code according to the first identification code; and

a charging unit, configured to begin to charge the terminal if the authentication is successful.

Alternatively, the device further includes:

an encoding unit, configured to encode the authentication information;

an amplifying unit, configured to amplify the encoded authentication information; and

an impedance matching unit, configured to carry out an impedance matching processing to the amplified and encoded authentication information; in which

the transmitting unit is configured to transmit the encoded, amplified and impedance matched authentication information to the terminal.

Alternatively, the feedback information has been encoded; correspondingly, the device further includes a decoding unit configured to decode the feedback information received so as to obtain the second identification code.

Alternatively, an encoding mode includes: an infrared encoding mode; correspondingly, a decoding mode includes: an infrared decoding mode.

Alternatively, the device further includes:

an induction unit, configured to confirm the terminal within a charging range of the device for charging wirelessly through a preset induction mode; in which the preset induction mode includes at least one of a magnetic induction, an infrared induction, and an electric field induction.

The present disclosure provides a terminal, including:

a receiving unit, configured to receive encoded authentication information transmitted by a device for charging wirelessly, in which, the authentication information includes a first identification code;

a decoding unit, configured to decode the authentication information received to obtain a second identification code;

a transmitting unit, configured to transmit feedback information including the second

identification code to the device for charging wirelessly, in which

the receiving unit is further configured to receive an authentication result of authenticating the second identification code according to the first identification code from the device for charging wirelessly; and

5 a charging unit, configured to accept to be charged by the device for charging wirelessly if the authentication is successful.

Alternatively, the terminal further includes:

an encoding unit, configured to encode the feedback information;

an amplifying unit, configured to amplify the encoded feedback information; and

10 an impedance matching unit, configured to carry out an impedance matching processing to the amplified and encoded feedback information; in which

the transmitting unit is configured to transmit the encoded, amplified and impedance matched feedback information to the device for charging wirelessly.

Alternatively, an encoding mode includes: an infrared encoding mode; correspondingly, a
15 decoding mode includes: an infrared decoding mode.

The present disclosure provides an apparatus for charging wirelessly, including:

a housing, a processor, a storage, a circuit board and a power supply circuit, in which, the circuit board is arranged inside a space enclosed by the housing, the processor and the storage is arranged on the circuit board; the power supply circuit is configured to supply power for each
20 circuit or component of the apparatus; the storage is configured to store executable program codes; the processor is configured to run a program corresponding to the executable program codes by reading the executable program codes stored in the storage, so as to perform the above methods.

The present disclosure provides a terminal, including:

a housing, a processor, a storage, a circuit board and a power supply circuit, in which, the
25 circuit board is arranged inside a space enclosed by the shell, the processor and the storage is arranged on the circuit board; the power supply circuit is configured to supply power for each circuit or component of the terminal; the storage is configured to store executable program codes; the processor is configured to run a program corresponding to the executable program codes by reading the executable program codes stored in the storage, so as to perform the other above
30 methods.

The present disclosure provides a computer readable storage medium having instructions

stored in it, and when a processor of a device for charging wirelessly preforms the instructions, the device for charging wirelessly performs the above methods.

The present disclosure provides another computer readable storage medium having instructions stored in it, and when a processor of a terminal preforms the instructions, the terminal
5 performs the other above methods.

The above technical solutions provided by the present disclosure, through adopting the mode of encoding/decoding to authenticate the identification code, is capable of achieving information transmission correctly in the near field communication of the device for charging wirelessly, of solving the problem that the terminal is not charged correctly because Carrier Modulation is easily
10 affected by circuit technology and electromagnetic environment, so as to be disturbed easily, and BLE technology is easy to generate false connection.

Other features and advantages of the present disclosure will be described in detail in subsequent specific embodiments.

15 BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are provided to facilitate further understanding of the present disclosure, constitute a part of the specification, and are used to interpret the present disclosure together with the following specific embodiments, but do not constitute a limitation to the present disclosure. In the accompanying drawings:

20 Fig. 1 is flow chart one of a method for charging wirelessly according to an embodiment of the present disclosure;

Fig. 2 is flow chart two of a method for charging wirelessly according to an embodiment of the present disclosure;

25 Fig. 3 is a flow chart of another method for charging wirelessly according to an embodiment of the present disclosure;

Fig. 4 is a flow chart of an embodiment provided by the present disclosure;

Fig. 5 is block diagram one of a device for charging wirelessly according to an embodiment of the present disclosure;

30 Fig. 6 is block diagram two of a device for charging wirelessly according to an embodiment of the present disclosure;

Fig. 7 is block diagram one of a terminal according to an embodiment of the present

disclosure; and

Fig. 8 is block diagram two of a terminal according to an embodiment of the present disclosure.

5 DETAILED DESCRIPTION

Reference will be made in detail to embodiments of the present disclosure. The embodiments described herein are explanatory, illustrative, and used to generally understand the present disclosure. The embodiments shall not be construed to limit the present disclosure.

What needs to be illustrated is: the terms “first”, “second”, etc. in Description, Claims and
10 Description of the Drawings are used to distinguish similar objects, are not used to describe a particular order. In addition, the wireless charging of the present disclosure is near field tight coupling or loose coupling wireless charging.

A method for charging wirelessly provided by an embodiment of the present disclosure, based on a side of a device for charging wirelessly, includes followings as shown in Fig. 1.

15 102, a device for charging wirelessly transmits encoded authentication information to a terminal, in which, the authentication information includes a first identification code.

In some embodiments, the first identification code can be a string of numbers generated randomly by the device for charging wirelessly. The device for charging wirelessly generates and stores the first identification code.

20 104, the device for charging wirelessly receives feedback information transmitted by the terminal, in which, the feedback information includes a second identification code obtained by the terminal from decoding the authentication information received.

In some embodiments, after receiving the authentication information transmitted by the device for charging wirelessly, the terminal decodes the authentication information received so as
25 to obtain the second identification code, then the second identification code is fed back to the device for charging wirelessly in the feedback information.

What needs to be illustrated is: if the terminal adopts the decoding mode corresponding to the encoding mode adopted by the device for charging wirelessly, the second identification code obtained by decoding the authentication information correctly is the same as the first identification
30 code, and if the terminal decodes incorrectly, the second identification code may be different from the first identification code.

106, the device for charging wirelessly authenticates the second identification code according to the first identification code.

In some embodiments, the device for charging wirelessly can carry out comparing and matching the second identification code and the first identification code. What needs to be illustrated is that a possible mode of matching to authenticate is judge whether the first identification code is the same as the second identification code, but the present disclosure is not limited to this, there is another possible mode, for example, adding the two corresponding bits of the first identification code and the second identification code together, then judging whether the sum is the predetermined results, etc.

108, if the authentication success, the device for charging wirelessly begins to charge the terminal.

In some embodiments, when both sides of the device for charging wirelessly and the terminal interact through the authentication information and the feedback information, after the completion of the authentication process, the device for charging wirelessly begins to start a power transfer module for transmitting energy to terminal.

Furtherly, 102 can specifically include:

102a, the device for charging wirelessly encodes the authentication information.

In some embodiments, the device for charging wirelessly encodes the authentication information by a predetermined encoding mode.

102b, the device for charging wirelessly amplifies the encoded authentication information.

In some embodiments, normally, the signals generated by the device for charging wirelessly are weak and need to be amplified by an amplification circuit.

102c, the device for charging wirelessly carries out an impedance matching processing to the amplified and encoded authentication information.

In some embodiments, normally, the amplified signals after 102b also need to be matched with transmitter by an impedance matching circuit before to be transmitted.

102d, the device for charging wirelessly transmits the encoded, amplified and impedance matched authentication information to the terminal.

In order to guarantee high reliable communication quality of wireless charging, the encoding self-checking function can be added in 102a. If the self-checking is not successful, then 102a is repeated. If the self-checking is successful, the signals are transmitted to a closed loop signal

amplifier to perform 102b. Then it is checked whether the amplified signal is distorted. If the signal is not distorted, 102c is performed; if the signal is distorted, the closed loop signal amplifier regulates the bandwidth thereof according to a feedback, and then jumps back to perform checking whether the amplified signal is distorted again. The signal transmitting is completed by an impedance matching network after performing 102c, then 102d is performed.

Furtherly, the feedback information in 104 has been encoded.

As shown in Fig. 2, before 106, the method further includes followings.

105, the device for charging wirelessly decodes the feedback information received so as to obtain the second identification code.

Furtherly, an encoding mode includes an infrared encoding mode; correspondingly, a decoding mode includes an infrared decoding mode.

What needs to be illustrated is that the above infrared encoding and decoding mode are only a possible example; the present disclosure is not limited to this.

Furtherly, as shown in Fig. 2, before 102, the method further includes followings.

101, the device for charging wirelessly confirms the terminal within a charging range of the device for charging wirelessly through a preset induction mode; the preset induction mode includes one or more of a magnetic induction mode, an infrared induction mode, and an electric field induction mode.

In some embodiments, when the terminal needs to be charged, users put the terminal on the charging platform of the device for charging wirelessly, and then the device for charging wirelessly induces the terminal in its charging range through the magnetic induction mode, and then begins to perform 102. The aforementioned magnetic induction mode, infrared induction mode, electric field induction mode have been technologies in the related art and the technical principle thereof are no more described in detail in present disclosure.

The technical solutions of the present disclosure embodiments mentioned above are capable of avoiding the wireless charging device and the terminal being disturbed or generating wrong connection in wireless charging, so as to charge the terminal correctly.

The present disclosure also provides another method for charging wirelessly, based on a side of a terminal, as shown in Fig. 3, includes followings.

202, a terminal receives encoded authentication information transmitted by a device for charging wirelessly, in which, the authentication information includes a first identification code.

204, the terminal decodes the authentication information received and obtains a second identification code.

206, the terminal transmits feedback information including the second identification code to the device for charging wirelessly.

5 208, the terminal receives an authentication result of authenticating the second identification code according to the first identification code from the device for charging wirelessly.

210, if the result is authentication success, the terminal begins to accept to be charged by the device for charging wirelessly.

Furtherly, 206 specifically includes:

10 206a, the terminal encodes the feedback information.

206b, the terminal amplifies the encoded feedback information.

206c, the terminal carries out an impedance matching processing to the amplified and encoded feedback information.

15 206d, the terminal transmits the encoded, amplified and impedance matched feedback information to the device for charging wirelessly.

Furthermore, an encoding mode includes an infrared encoding mode; correspondingly, a decoding mode includes an infrared decoding mode.

20 What needs to be illustrated, the implementation way of aforementioned technical solutions based on terminal side is similar to the implementation way of the technical solutions based on device side, thus it is no more described in detail, and technical personnel can refer to and understand that.

Overall, according to aforementioned two methods for charging wirelessly provided by embodiments of the present disclosure, the device for charging wirelessly broadcasts the authentication information to the terminal within the range of wireless charging platform, other
25 than through the Carrier Modulation mode, thereby enhancing the anti-interference ability, meanwhile can also avoid generating influence to the terminal in the far field. The authentication of the device for charging wirelessly and the terminal is completed through the verification of the two identification code contained in the authentication information and the feedback information respectively, so as to accomplish the information communication interaction between the wireless
30 charging transmitting end and receiving end, thereby solving the problem that the terminal is not charged correctly because Carrier Modulation is easy to be affected by circuit technology and

electromagnetic environment, and BLE technology is easy to generate false connection, and greatly improving the wireless charging communication efficiency and broadening the application range of wireless charging, and improving the user experience.

In order to facilitate technical personnel understanding aforementioned method for charging wirelessly, the following provides an embodiment to illustrate, as shown in Fig. 4, the embodiment including:

S01, the device for charging wirelessly is electrified.

S02, the encoding unit and decoding unit of the device for charging wirelessly are initialized.

S03, the handshake broadcast signal is transmitted by the device for charging wirelessly when the terminal is induced within the charging range by the device for charging wirelessly.

S04, the device for charging wirelessly detects whether receives the handshake acknowledgement signal transmitted by the terminal.

If the handshake acknowledgement signal transmitted by the terminal is received, then turn to S05; if the handshake acknowledgement signal transmitted by the terminal is not received, then turn back to S03.

S05, the device for charging wirelessly transmits a random identification code, in which, the random identification code is carried in the authentication information and is encoded.

S06, the terminal returns feedback information carrying random identification code.

S07, the device for charging wirelessly carries out matching and authenticating to the two identification codes.

If the matching and authenticating carried out by the device for charging wirelessly is unsuccessful, turn back to S03; if the matching and authentication is successful, and turn to S08.

S08, the authentication of the wireless charging is completed.

S09, wireless energy transmission begins.

What needs to be illustrated, in the aforementioned technical solution, the handshake broadcast signal and the handshake acknowledgement signal belong to technologies in the related art, so no more described in detail here.

Embodiments of the present disclosure provide a device 10 for charging wirelessly. As shown in Fig. 5, the device 10 for charging wirelessly includes: a transmitting unit 11, a receiving unit 12, an authentication unit 13, and a charging unit 14.

The transmitting unit 11 is configured to transmit encoded authentication information to a

terminal, in which, the authentication information includes a first identification code.

The receiving unit 12 is configured to receive feedback information transmitted by the terminal, in which, the feedback information includes a second identification code obtained by the terminal from decoding the authentication information received.

5 The authentication unit 13 is configured to authenticate the second identification code according to the first identification code.

The charging unit 14 is configured to begin to charge the terminal, if the authentication is successful.

10 Furtherly, as shown in Fig. 6, the device for charging wirelessly further includes: an encoding unit 15, an amplifying unit 16, and an impedance matching unit 17.

The encoding unit 15 is configured to encode the authentication information.

15 The amplifying unit 16 is configured to amplify the encoded authentication information. For example, the amplifying unit 16 can be a signal amplification circuit, and the signal amplification circuit can be a closed loop type signal amplification circuit. The amplification multiple is in a range of 1-100 according to different requirements of wireless charging system. The amplifying unit 16 is mainly used to amplify the small wireless charging handshake signal and the controlling signal, so as to be convenient to transmit to the terminal; meanwhile the amplifying circuit 16 can also regulate the bandwidth of the amplification signal by itself according to the different frequency of the signal transmitted.

20 The impedance matching unit 17 is configured to carry out an impedance matching processing to the amplified and encoded authentication information. For example, the impedance matching unit 17 can be an impedance matching circuit, and is configured to accomplish the impedance matching between the amplifying unit 16 and the transmitting unit 11. The impedance matching unit 17 may be a closed loop feedback type impedance matching network, and can
25 regulate characteristic impedance autonomically according to impedance feedback situation of the network.

Correspondingly, the transmitting unit 11 is configured to transmit the encoded, amplified and impedance matched authentication information to the terminal.

30 Furtherly, the feedback information has been encoded; correspondingly, as shown in Fig. 6, the device 10 further includes a decoding unit 18. The decoding unit 18 is configured to decode the feedback information received so as to obtain the second identification code.

Furthermore, an encoding mode includes: an infrared encoding mode; correspondingly, a decoding mode includes: an infrared decoding mode.

Furtherly, as shown in Fig. 6, the device 10 also includes: an induction unit 19.

The induction unit 19 is configured to confirm the terminal within a charging range of the device 10 through a preset induction mode; the preset induction mode includes at least one of a magnetic induction mode, an infrared induction mode, and an electric field induction mode.

The present embodiments are used to achieve all aforementioned embodiments of the methods for charging wirelessly, the working flow and working principle of each unit of present embodiments refer to the description of the embodiments of the methods for charging wirelessly mentioned above, it is no more described in detail.

The embodiments of the present disclosure also provide a terminal 20. As shown in Fig. 7, the terminal 20 includes: a receiving unit 21, a decoding unit 22, a transmitting unit 23 and a charging unit 24.

The receiving unit 21 is configured to receive encoded authentication information transmitted by the device for charging wirelessly, in which the authentication information includes a first identification code.

The decoding unit 22 is configured to decode the authentication information received and to obtain a second identification code.

The transmitting unit 23 is configured to transmit feedback information including the second identification code to the device for charging wirelessly.

The receiving unit 21 is further configured to receive an authentication result of authenticating the second identification code according to the first identification code from the device for charging wirelessly.

The charging unit 24 is configured to accept to be charged by the device for charging wirelessly, if the result is authentication success.

Furtherly, as shown in Fig. 8, the terminal 20 also includes: an encoding unit 25, an amplifying unit 26, and an impedance matching unit 27.

The encoding unit 25 is configured to encode the feedback information.

The amplifying unit 26 is configured to amplify the encoded feedback information. For example, the amplifying unit 26 can be a signal amplification circuit, and the signal amplification circuit can be the closed loop type signal amplification circuit. The amplification multiple is in a

range of 1-100 according to different requirements of wireless charging system. The amplifying unit 26 is mainly configured to amplify the small wireless charging handshake signal and the controlling signal, so as to be convenient to transmit to the terminal; meanwhile the amplifying circuit 26 can also regulate the bandwidth of the amplification signal by itself according to the
5 different frequency of the signal transmitted.

The impedance matching unit 27 is configured to carry out impedance matching processing to the amplified and encoded authentication information. For example, the impedance matching unit 27 can be an impedance matching circuit configured to accomplish the impedance matching between the amplifying unit 26 and the transmitting unit 21. The impedance matching unit is a
10 closed loop feedback type impedance matching network, and can regulate characteristic impedance autonomically according to impedance feedback situation of the network.

Correspondingly, the transmitting unit 23 is used to transmit the encoded, amplified and impedance matched feedback information to the device for charging wirelessly.

Furtherly, an encoding mode includes: an infrared encoding mode; correspondingly, a
15 decoding mode includes: an infrared decoding mode.

The present embodiments are used to achieve all aforementioned method embodiments, and the working flow and working principle of each unit of the present embodiments refer to the description of the method embodiments mentioned above, it is no more described in detail.

The embodiments of the present disclosure also provide an apparatus for charging wirelessly,
20 including: a housing, a processor, a storage, a circuit board and a power supply circuit, in which the circuit board is arranged inside a space enclosed by the housing, the processor and the storage is arranged on the circuit board; the power supply circuit is configured to supply power for each circuit or component of the apparatus; the storage is configured to store executable program codes; the processor is configured to run a program corresponding to the executable program codes by
25 reading executable program codes stored in the storage, so as to perform the method shown in Fig.1 or Fig. 2.

The embodiments of the present disclosure also provide a terminal, including: a housing, a processor, a storage, a circuit board and a power supply circuit, in which the circuit board is arranged inside a space enclosed by the housing, the processor and the storage is arranged on the
30 circuit board; the power supply circuit is configured to supply power for each circuit or component of the terminal; the storage is configured to store executable program codes; the processor is

configured to run a program corresponding to executable program codes by reading executable program codes stored in the storage, so as to perform the method shown in Fig. 3.

The embodiments of the present disclosure also provide a computer readable storage medium, having instructions stored in it, when a processor of a device for charging wirelessly preforms the instructions, the device for charging wirelessly performs the method shown in Fig. 1 and Fig. 2.

The embodiments of the present disclosure also provide a computer readable storage medium, having instructions stored in it, when a processor of a terminal preforms the instructions, the terminal performs the method shown in Fig. 3.

Overall, it can be seen from the technical solutions provided by embodiments of the present disclosure, the aforementioned technical solutions are capable of avoiding the problem that Carrier Modulation adopted in tight coupling wireless charging is easy to be disturbed by circuit technology and electromagnetic environment around. The tightly coupled wireless charging uses Carrier Modulation. When the Carrier Modulation signal is affected by circuit technology and around electromagnetic environment, the shape and depth of modulated waveform will be obviously affected, causing fail to demodulation. Meanwhile, the aforementioned technical solutions are capable of avoiding the problem that the loose coupling wireless charging BLE communication is easy to generate wrong connection. Because BLE communication distance is far and generally reaches 10~30 meters, it is very easy to generate wrong connection in short distance. Adopting aforementioned encoding and decoding solutions, because the positions of the transmitting module and the receiving module are relatively fixed, so the communication effect is stable, can greatly improve the user experience and the wireless charging technology level.

Although preferable embodiments of the present disclosure have been described in detail in above with reference to the accompanying drawings, the present disclosure is not limited to specific details in the foregoing embodiments. Various simple variations can be made within the scope of the technical idea of the present disclosure, and such simple variations all fall within the protection scope of the present disclosure.

It should be further noted that the specific technical features described in the foregoing specific embodiments can be combined in any appropriate manner as long as no conflict occurs. To avoid unnecessary repetition, various possible combination manners will not be described in the present disclosure.

In addition, various different embodiments of the present disclosure may also be combined

discretionarily. Such combinations shall also be considered as the content disclosed by the present disclosure as long as these combinations do not depart from the concept of the present disclosure.

CLAIMS

What is claimed is:

1. A method for charging wirelessly, comprising:

transmitting, by a device for charging wirelessly, encoded authentication information to a
5 terminal, wherein, the authentication information comprises a first identification code;

receiving, by the device for charging wirelessly, feedback information transmitted by the
terminal, wherein, the feedback information comprises a second identification code, and the
second identification code is obtained by the terminal from decoding the authentication
information received;

10 authenticating, by the device for charging wirelessly, the second identification code according
to the first identification code; and

beginning, by the device for charging wirelessly, to charge the terminal if the authentication is
successful.

2. The method according to claim 1, wherein, transmitting, by a device for charging
15 wirelessly, encoded authentication information to a terminal, comprising:

encoding, by the device for charging wirelessly, the authentication information;

amplifying, by the device for charging wirelessly, the encoded authentication information;

carrying out, by the device for charging wirelessly, an impedance matching processing to the
amplified and encoded authentication information; and

20 transmitting, by the device for charging wirelessly, the encoded, amplified and impedance
matched authentication information to the terminal.

3. The method according to claim 1, wherein the feedback information has been encoded; and

before authenticating, by the device for charging wirelessly, the second identification code
according to the first identification code, the method further comprises:

25 decoding, by the device for charging wirelessly, the feedback information received so as to
obtain the second identification code.

4. The method according to any one of claims 1 to 3, wherein an encoding mode comprises:
an infrared encoding mode; and a decoding mode comprises: an infrared decoding mode.

5. The method according to claim 4, before transmitting, by a device for charging wirelessly,
30 encoded authentication information to a terminal, further comprising:

confirming, by the device for charging wirelessly, the terminal within a charging range of the device for charging wirelessly through a preset induction mode; wherein the preset induction mode comprises at least one of a magnetic induction mode, an infrared induction mode, and an electric field induction mode.

5 6. A method for charging wirelessly, comprising:

receiving, by a terminal, encoded authentication information transmitted by a device for charging wirelessly, wherein, the authentication information comprises a first identification code;

decoding, by the terminal, the authentication information received to obtain a second identification code;

10 transmitting, by the terminal, feedback information comprising the second identification code to the device for charging wirelessly;

receiving, by the terminal, an authentication result of authenticating the second identification code according to the first identification code from the device for charging wirelessly; and

15 beginning, by the terminal, to accept to be charged by the wireless charging device, if the authentication is successful.

7. The method according to claim 6, wherein, transmitting, by the terminal, feedback information comprising the second identification code to the device for charging wirelessly, comprises:

encoding, by the terminal, the feedback information;

20 amplifying, by the terminal, the encoded feedback information;

carrying out, by the terminal, an impedance matching processing to the amplified and encoded feedback information; and

transmitting, by the terminal, the encoded, amplified and impedance matched feedback information to the device for charging wirelessly.

25 8. The method according to claim 6 or 7, wherein an encoding mode comprising: an infrared encoding mode; a decoding mode comprising: an infrared decoding mode.

9. A device for charging wirelessly, comprising:

a transmitting unit, configured to transmit encoded authentication information to a terminal, wherein, the authentication information comprises a first identification code;

30 a receiving unit, configured to receive feedback information transmitted by the terminal, wherein, the feedback information comprises a second identification code, the second

identification code is obtained by the terminal from decoding the authentication information received;

an authentication unit, configured to authenticate the second identification code according to the first identification code; and

5 a charging unit, configured to begin to charge the terminal if the authentication is successful.

10. The device according to claim 9, further comprising:

an encoding unit, configured to encode the authentication information;

an amplifying unit, configured to amplify the encoded authentication information; and

10 an impedance matching unit, configured to carry out an impedance matching processing to the amplified and encoded authentication information; wherein

the transmitting unit is configured to transmit the encoded, amplified and impedance matched authentication information to the terminal.

11. The device according to claim 9, wherein the feedback information has been encoded; and

15 the device further comprises a decoding unit configured to decode the feedback information received so as to obtain the second identification code.

12. The device according to any one of claims 9 to 11, wherein an encoding mode comprising: an infrared encoding mode; a decoding mode comprising: an infrared decoding mode.

13. The device according to claim 12, further comprising:

20 an induction unit, configured to confirm the terminal within a charging range of the device for charging wirelessly through a preset induction mode; wherein the preset induction mode comprises at least one of a magnetic induction, an infrared induction, and an electric field induction.

14. A terminal, comprising:

25 a receiving unit, configured to receive encoded authentication information transmitted by a device for charging wirelessly, wherein, the authentication information comprises a first identification code;

a decoding unit, configured to decode the authentication information received to obtain a second identification code;

a transmitting unit, configured to transmit feedback information comprising the second identification code to the device for charging wirelessly, wherein

30 the receiving unit is further configured to receive an authentication result of authenticating the second identification code according to the first identification code from the device for charging

wirelessly; and

a charging unit, configured to accept to be charged by the device for charging wirelessly if the authentication is successful.

15. The terminal according to claim 14, further comprising:

5 an encoding unit, configured to encode the feedback information;

an amplifying unit, configured to amplify the encoded feedback information; and

an impedance matching unit, configured to carry out an impedance matching processing to the amplified and encoded feedback information; wherein

10 the transmitting unit is configured to transmit the encoded, amplified and impedance matched feedback information to the device for charging wirelessly.

16. The terminal according to claim 14 or 15, wherein an encoding mode comprising: an infrared encoding mode; a decoding mode comprising: an infrared decoding mode.

17. An apparatus for charging wirelessly, comprising:

15 a housing, a processor, a storage, a circuit board and a power supply circuit, wherein, the circuit board is arranged inside a space enclosed by the housing, the processor and the storage is arranged on the circuit board; the power supply circuit is configured to supply power for each circuit or component of the apparatus; the storage is configured to store executable program codes; the processor is configured to run a program corresponding to the executable program codes by reading the executable program codes stored in the storage, so as to perform the method according to any one of claims 1 to 5.

18. A terminal, comprising:

25 a housing, a processor, a storage, a circuit board and a power supply circuit, wherein, the circuit board is arranged inside a space enclosed by the shell, the processor and the storage is arranged on the circuit board; the power supply circuit is configured to supply power for each circuit or component of the terminal; the storage is configured to store executable program codes; the processor is configured to run a program corresponding to the executable program codes by reading the executable program codes stored in the storage, so as to perform the method according to any one of claims 6 to 8.

30 19. A computer readable storage medium, having instructions stored in it, wherein when a processor of a device for charging wirelessly preforms the instructions, the device for charging wirelessly performs the method according to any one of claims 1 to 5.

20. A computer readable storage medium, having instructions stored in it, wherein when a processor of a terminal preforms the instructions, the terminal performs the method according to any one of claims 6 to 8.

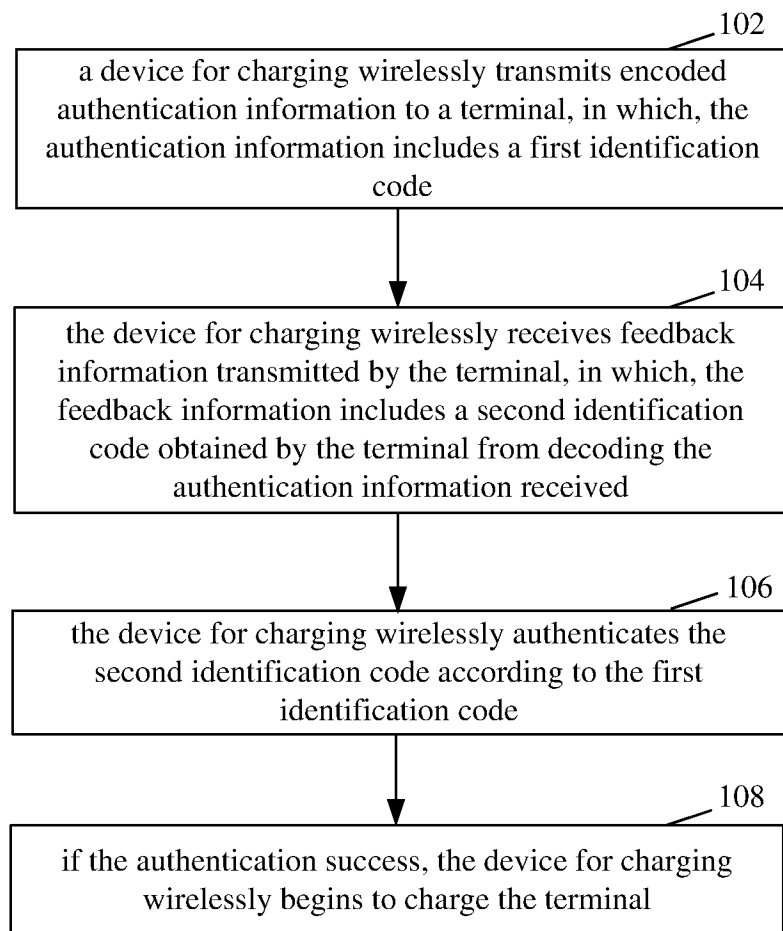


Fig. 1

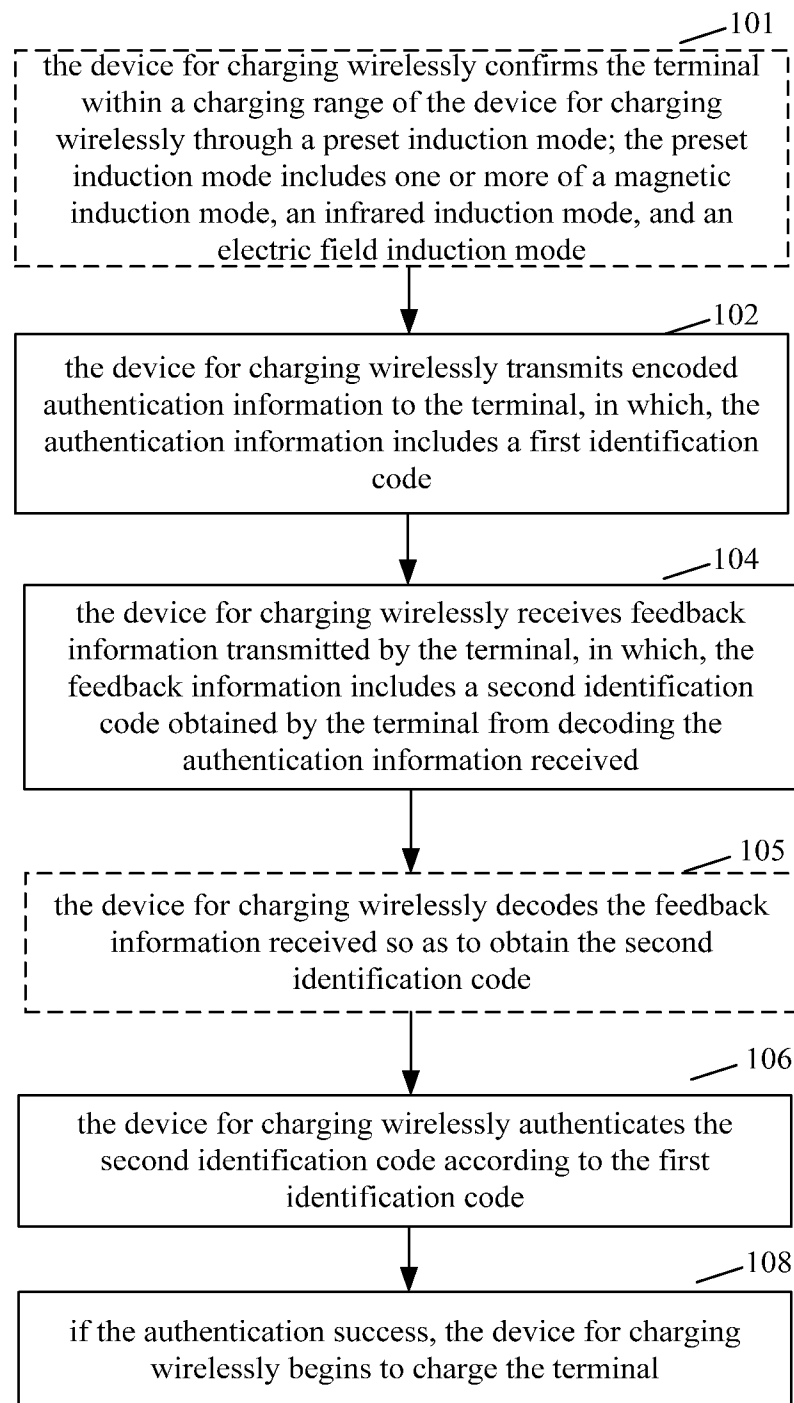


Fig. 2

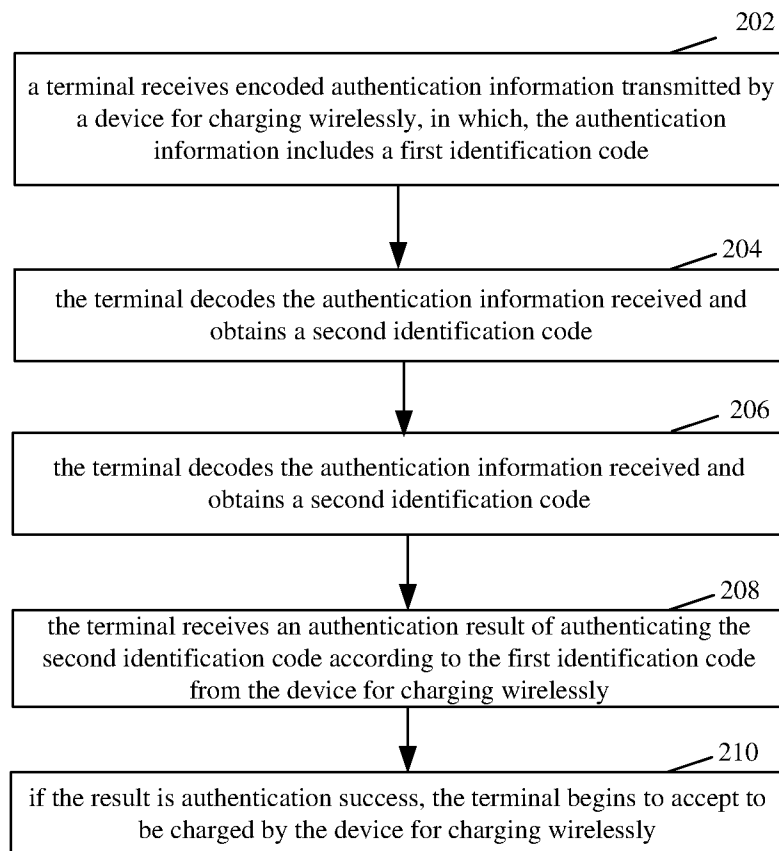


Fig. 3

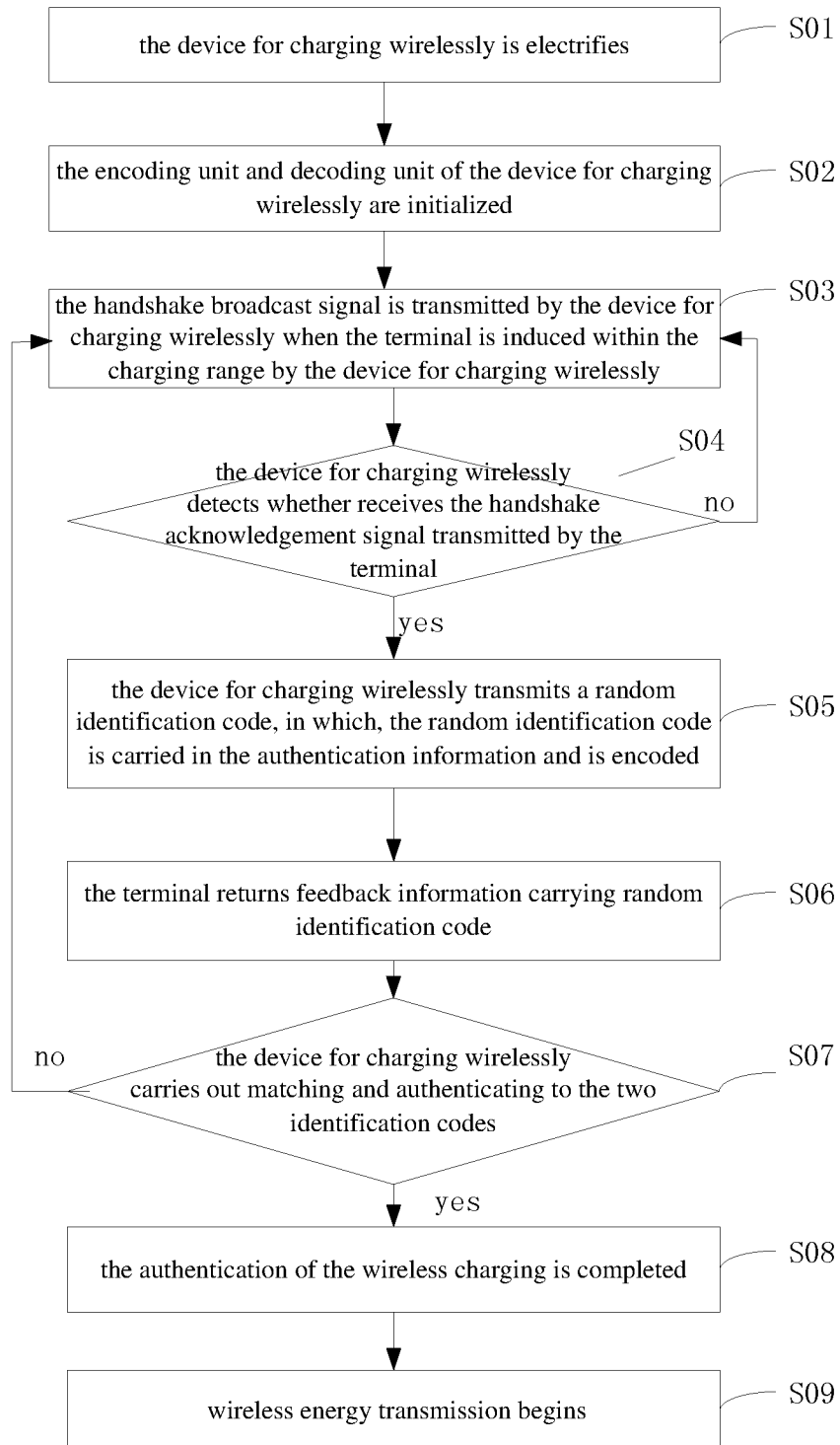


Fig. 4

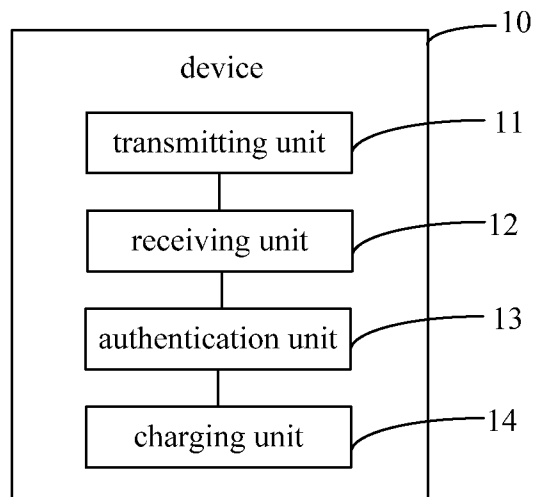


Fig. 5

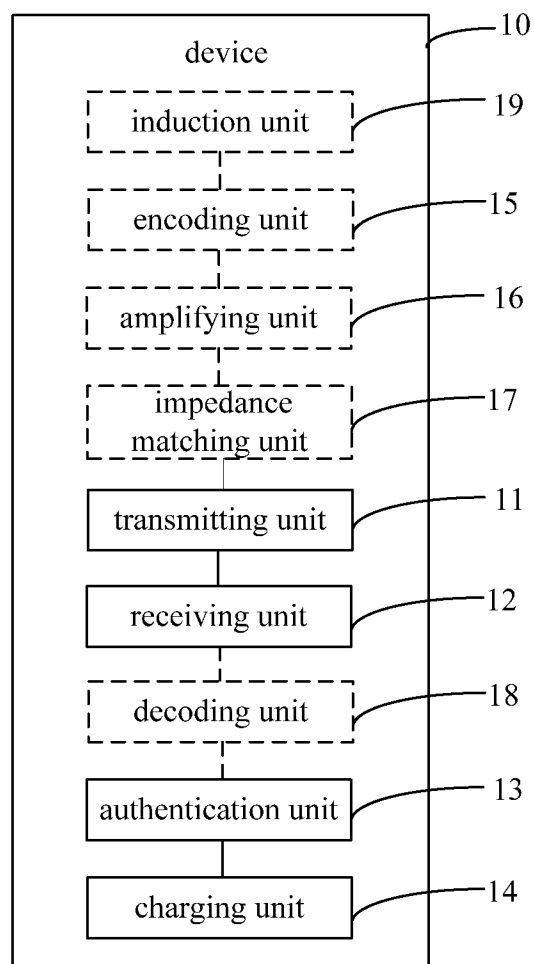


Fig. 6

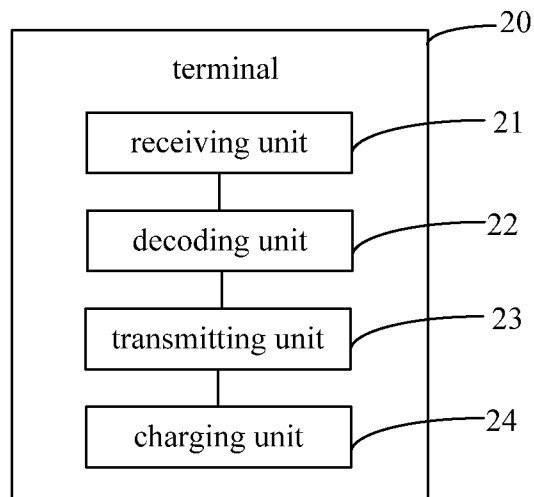


Fig. 7

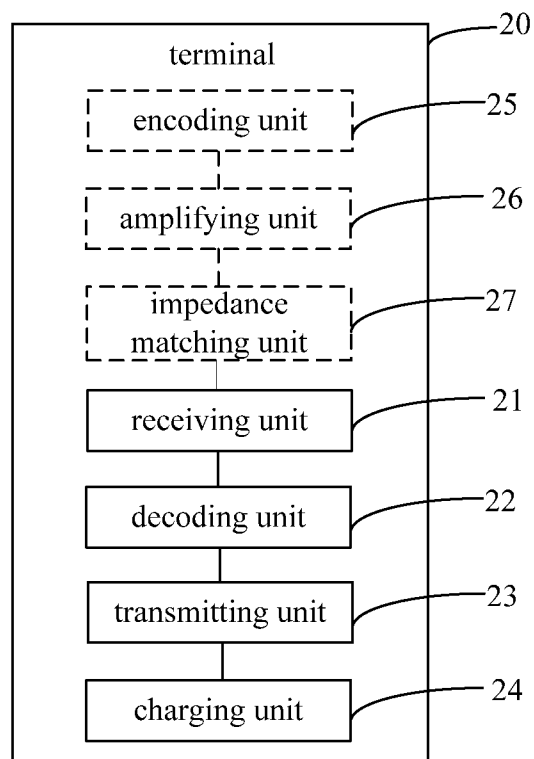


Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2016/113296

A. CLASSIFICATION OF SUBJECT MATTER

H04W 12/06(2009.01)i; H02J 7/00(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)

H04W 12/-; H02J 7/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, CNTXT, CNKI, VEN: wireless, charge, authenticate, verificate, ID, identif+, code, encode, decode

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 8421592 B1 (SPRINT COMMUNICATIONS CO LP) 16 April 2013 (2013-04-16) description, column 3, line 20 to column 4, line 22, and figure 2	1-20
A	CN 104518529 A (ZTE CORP) 15 April 2015 (2015-04-15) the whole document	1-20
A	CN 104601331 A (SHENZHEN CLOU ELECTRONICS CO LTD) 06 May 2015 (2015-05-06) the whole document	1-20

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

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“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

03 March 2017

Date of mailing of the international search report

01 April 2017

Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2016/113296

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
US	8421592	B1	16 April 2013	None			
CN	104518529	A	15 April 2015	WO	2015043247	A1	02 April 2015
CN	104601331	A	06 May 2015	None			