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Remarks:
Amended claims in accordance with Rule 137(2)
EPC.

(54) **Wireless terminal and wireless network interface card**

(57) A wireless terminal and a wireless network interface card are disclosed. The wireless terminal includes a terminal shell (110) and a signal processing circuit board (120), where the terminal shell is made of an electrically conductive material with a cavity slot (111) cut on its surface; and the terminal shell is connected to the

signal processing circuit board and acts as a slot antenna for the signal processing circuit board to receive or transmit signals. The shell structure of a terminal product realizes functions of an antenna. Thus, the space above the board and the cost of mechanical parts are saved, and the terminal shell plays a double role.

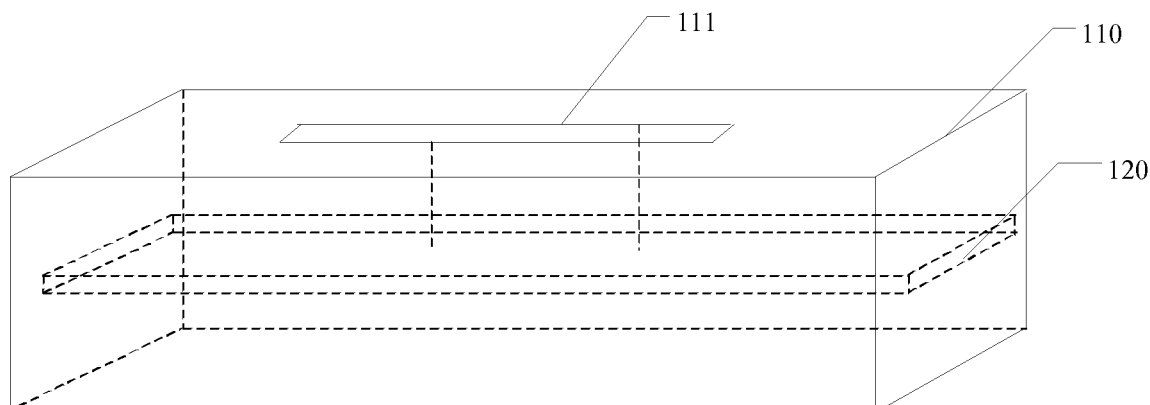


FIG. 1

Description

Field of the Invention

[0001] The present invention relates to wireless communications technologies, and in particular, to a wireless terminal and a wireless network interface card.

Background of the Invention

[0002] With the continuous development of wireless communications, wireless terminals are more and more popular. To implement more functions in a smaller space, the layout of components in the limited area of a Printed Circuit Board (PCB) is more and more difficult so that the space for a built-in antenna of a wireless terminal is smaller and smaller.

[0003] At present, built-in antennas widely adopted by wireless terminals include unipolar antennas, Inverted F Antennas (IFAs) and Planar Inverted F Antennas (PI-FAs), which require reservation of a certain clear space on the PCB exclusively for the antennas.

[0004] During the research and practice of the conventional art, the inventor finds the above antenna solutions result in a great waste of limited space resources due to the reservation of an effective clear antenna space. However, to reduce the space used by an antenna for the purpose of space saving, the communication quality and the transmission distance of antenna signals will be seriously impacted.

Summary of the Invention

[0005] Embodiments of the invention intend to provide a wireless terminal and a wireless network interface card that can effectively save the space used by an antenna and improve the quality of signal transmission.

[0006] A wireless terminal includes a terminal shell and a signal processing circuit board, where: the terminal shell is made of an electrically conductive material with a cavity slot cut on its surface; and the terminal shell is connected to the signal processing circuit board and acts as a slot antenna for the signal processing circuit board to receive or transmit signals.

[0007] A wireless network interface card includes a network interface card shell and a signal processing circuit board, where:

the network interface card shell is made of an electrically conductive material with a cavity slot cut on its surface; and the network interface card shell is connected to the signal processing circuit board and acts as a slot antenna for the signal processing circuit board to receive or transmit signals.

[0008] In the embodiments of the invention, the terminal shell is made of an electrically conductive material

with a cavity slot cut on its surface; the terminal shell is connected to the signal processing circuit board and acts as a slot antenna for the signal processing circuit board to receive or transmit signals. The shell structure of a terminal product realizes functions of an antenna. Thus, the space above the board and the cost of mechanical parts are saved, and the terminal shell plays a double role.

Brief Description of the Drawings

[0009]

FIG. 1 is a structural view of a wireless terminal according to a first embodiment of the present invention;

FIG. 2 is a structural view of a wireless terminal according to a second embodiment of the present invention; and

FIG. 3 is a structural view of a wireless network interface card according to a third embodiment of the present invention.

Detailed Description of the Embodiments

[0010] Embodiments of the present invention provide a wireless terminal and a wireless network interface card. The embodiments will be described in detail.

[0011] A wireless terminal is provided in a first embodiment of the present invention. As shown in FIG. 1, the wireless terminal includes a terminal shell 110 and a signal processing circuit board 120. In FIG. 1, the thickness of the terminal shell 110 and how the signal processing circuit board 120 is fixed with the terminal shell 110 are ignored. The fixing may be in such conventional modes such as screwing, clipping or conglutination.

[0012] The terminal shell 110 is made of an electrically conductive material with a cavity slot 111 cut on its surface. The terminal shell 110 is connected to the signal processing circuit board 120 and acts as a slot antenna for the signal processing circuit board 120 to receive or transmit signals.

[0013] The wireless terminal in the embodiments of the present invention may be a wireless communications terminal device such as a handset, a wireless router, a Bluetooth headphone, a Bluetooth adapter or a wireless network interface card.

[0014] In the first embodiment of the invention, the terminal shell is made of an electrically conductive material with a cavity slot cut on its surface; the terminal shell is connected to the signal processing circuit board and acts as a slot antenna for the signal processing circuit board to receive or transmit signals. The function of an antenna is realized by the indispensable shell of a terminal product with a slot antenna on the shell. Thus the space above the board and the cost of mechanical parts are saved, and the terminal shell plays a double role.

[0015] A wireless terminal is provided in a second em-

bodiment of the present invention. As shown in FIG. 2, the wireless terminal includes a terminal shell 210 and a signal processing circuit board 220. In FIG. 2, the thickness of the terminal shell 210 and how the signal processing circuit board 220 is fixed with the terminal shell 210 are ignored. The fixing may be in such conventional modes such as screwing, clipping or conglutination.

[0016] The terminal shell 210 is made of an electrically conductive material with a cavity slot 211 cut on its surface; the electrically conductive material is a metal material or a non-conductive material coated with a conductive medium. In this embodiment, the terminal shell is improved to make the terminal shell act as a slot antenna. In the embodiments of the present invention, the material of the terminal shell need meet the requirement for acting as a slot antenna. It is understandable that all materials that enable the terminal shell to act as a slot antenna, including copper, aluminum, alloy, plastic shell interlined with a copper foil, and a plastic shell coated with a metal material, all fall in the protection scope of the present invention.

[0017] The terminal shell 210 is connected to the signaling processing circuit board 220 and acts as a slot antenna for the signal processing circuit board 220 to transmit or receive signals.

[0018] In the embodiment of the invention, the terminal shell 210 is connected to the signal processing circuit board 220 at the feeding point and the ground point of the signal processing circuit board 220. It is understandable that the connection is not limited to this mode and all conventional connection modes that enable the terminal shell to act as a slot antenna of the signal processing circuit board are all within the scope of protection of the present invention.

[0019] In the embodiment of the invention, the cavity slot 211 is 2 mm wide. It is understandable that, in view of the regular size of a wireless terminal and basic requirements for acting as a slot antenna, a width of about 2 mm is preferable, and that the practical slot width may be adjusted according to the radio performance, size and appearance requirements of the terminal.

[0020] In the embodiment of the invention, the cavity slot 211 may be of a line shape, an arc shape or an S shape. In FIG. 2, an S-shape slot is adopted in view of the required slot length for a slot antenna. In the case of a limited terminal size, an arc shape or S shape is more effective in space utilization and applicable to terminals with irregular appearances.

[0021] Considering the basic features of a slot antenna, the suitable slot length is about one fourth of the wavelength corresponding to the central frequency where the signal processing circuit board works. The specific length may be slightly adjusted during product design for a better technical result.

[0022] A wireless network interface card is provided in a third embodiment of the present invention. As shown in FIG. 3, the wireless network interface card includes a network interface card shell 310 and a signal processing

circuit board 320. In FIG. 3, the thickness of the network interface card shell 310 and how the signal processing circuit board 320 is fixed with the network interface card shell 310 are ignored. The fixing may be in such conventional modes as screwing, clipping or conglutination.

[0023] The network interface card shell 311 is made of an electrically conductive material with a cavity slot 310 cut on its surface. The network interface card shell 310 is connected to the signal processing circuit board 320 and acts as a slot antenna for the signal processing circuit board 320 to receive or transmit signals.

[0024] In the embodiment of the invention, the cavity slot 311 is 2 mm wide. It is understandable that, in view of the regular size of a wireless network interface card and basic requirements for acting as a slot antenna, a width of about 2 mm is preferable, and that the practical slot width may be adjusted according to the size and appearance requirements of the wireless network interface card.

[0025] In the embodiment of the invention, the cavity slot 311 may be of a line shape, an arc shape or an S shape in view of the required slot length for acting as a slot antenna. However, in the case of a limited size of a wireless network interface card, an arc shape or S shape is more effective in space utilization and applicable to wireless network interface cards with irregular appearances.

[0026] Considering the basic features of a slot antenna, the suitable slot length is about one fourth of the wavelength corresponding to the central frequency where the signal processing circuit board works. The specific length may be slightly adjusted during product design for a better technical result.

[0027] In practice, antennas of 3G wireless network interface cards in service normally work at five frequency bands (824 MHz to 894 MHz, 880 MHz to 960 MHz, 1710 MHz to 1880 MHz, 1850 MHz to 1990 MHz, and 1920 MHz to 2170MHz). The bands are wide and the required effective antenna length is about 85 mm. A slot on a network interface card shell is easily capable of realizing such an effective length in most cases. To save costs, the usual practice may be as follows: coating a network interface card shell with metal, opening a slot on the metal surface, connecting one longer edge of the slot to the feeding point of the signal processing circuit board through a curved spring and connecting the other longer edge of the slot to the ground point of the signal processing circuit board.

[0028] The slot may be of a rectangle shape, the length of which depends on its working frequency (usually the initial length is one fourth of the wavelength corresponding to the central frequency of a working band) and the width of which is usually limited to about 2 mm. If a wireless network interface card is short, the slot is not limited to the shape shown in figures below. There may be bents and arcs so as to meet the requirement that the slot length is one fourth of the wavelength corresponding to the central frequency of the working band.

[0029] In the embodiments of the invention, function of a slot antenna is realized through adding a slot cut on the surface of the indispensable shell of a terminal product. In the foregoing embodiments, the description is based on one slot. It is understandable that more than one cavity slot may be cut on the shell according to the requirements for the slot antenna. The slot may be short-circuited at both ends, or short-circuited at one end and open-circuited at the other end, or open-circuited at both ends. The length of a slot and positions of the feeding point and the ground point may be determined according to practical needs.

[0030] The above embodiments of the present invention provide detailed introduction to the wireless terminal and the wireless network interface card. Although the present invention has been described through exemplary embodiments, the invention is not limited to such embodiments. It is apparent that those skilled in the art can make various modifications and variations to the invention without departing from the scope of the invention. The invention is intended to cover the modifications and variations provided that they fall in the protection scope defined by the claims or their equivalents.

Claims

1. A wireless terminal, comprising a terminal shell and a signal processing circuit board, wherein:

the terminal shell is made of an electrically conductive material with a cavity slot cut on the surface of the terminal shell; and

the terminal shell is connected to the signal processing circuit board and acts as a slot antenna for the signal processing circuit board to receive or transmit signals.

2. The wireless terminal according to claim 1, wherein the electrically conductive material is a metal material or a non-conductive material coated with a conductive medium.
3. The wireless terminal according to claim 2, wherein the metal material is copper or aluminum.
4. The wireless terminal according to claim 1, wherein the terminal shell is connected to a feeding point and a ground point of the signal processing circuit board.
5. The wireless terminal according to claim 1, wherein the cavity slot is 2 mm wide.
6. The wireless terminal according to claim 1, wherein the cavity slot is of a line shape, or an arc shape, or an S shape.
7. The wireless terminal according to any one of claims

1-6, wherein the cavity slot is filled with a non-conductive medium.

8. The wireless terminal according to any one of claims 1-6, wherein length of the slot is one fourth of a wavelength corresponding to a central frequency where the signal processing circuit board works.

9. A wireless network interface card, comprising a network interface card shell and a signal processing circuit board, wherein:

the network interface card shell is made of an electrically conductive material with a cavity slot cut on its surface; and the network interface card shell is connected to the signal processing circuit board and acts as a slot antenna for the signal processing circuit board to receive or transmit signals.

10. The wireless network interface card according to claim 9, wherein length of the slot is one fourth of a wavelength corresponding to a central frequency where the signal processing circuit board works.

11. The wireless network interface card according to claim 9, wherein the cavity slot is of a line shape, or an arc shape, or an S shape.

Amended claims in accordance with Rule 137(2) EPC.

1. A wireless terminal, comprising a terminal shell (110) and a signal processing circuit board (120), the terminal shell (110) is made of an electrically conductive material with a cavity slot (111) cut on the surface of the terminal shell (110); and the terminal shell (110) is connected to the signal processing circuit board (120) and acts as a slot antenna for the signal processing circuit board (120) to receive or transmit signals, wherein the terminal shell (110) is coated with metal, and the cavity slot (111) is opened on the metal surface, the feeding point of the signal processing circuit board (120) is connected to one longer edge of the slot through a curved spring and the ground point of the signal processing circuit board (120) is connected to the other longer edge of the slot.

2. The wireless terminal according to claim 1, wherein the electrically conductive material is a metal material or a non-conductive material coated with a conductive medium.

3. The wireless terminal according to claim 2, wherein the metal material is copper or aluminum.

4. The wireless terminal according to claim 1, wherein the terminal shell (110) is connected to a feeding point and a ground point of the signal processing circuit board.

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5. The wireless terminal according to claim 1, wherein the cavity slot is 2 mm wide.

6. The wireless terminal according to claim 1, wherein the cavity slot is of a line shape, or an arc shape, or an S shape.

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7. The wireless terminal according to any one of claims 1-6, wherein the cavity slot is filled with a non-conductive medium.

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8. The wireless terminal according to any one of claims 1-6, wherein length of the slot (111) is one fourth of a wavelength corresponding to a central frequency where the signal processing circuit board (120) works.

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9. A wireless network interface card, comprising a network interface card shell (310) and a signal processing circuit board (320), the network interface card shell (310) is made of an electrically conductive material with a cavity slot (311) cut on its surface; and the network interface card shell (310) is connected to the signal processing circuit board (320) and acts as a slot antenna for the signal processing circuit board to receive or transmit signals, wherein: the terminal shell (110) is coated with metal, and the cavity slot (111) is opened on the metal surface, the feeding point of the signal processing circuit board is connected to one longer edge of the slot through a curved spring and the ground point of the signal processing circuit board is connected to the other longer edge of the slot.

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10. The wireless network interface card according to claim 9, wherein length of the slot is one fourth of a wavelength corresponding to a central frequency where the signal processing circuit board (320) works.

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11. The wireless network interface card according to claim 9, wherein the cavity slot (311) is of a line shape, or an arc shape, or an S shape.

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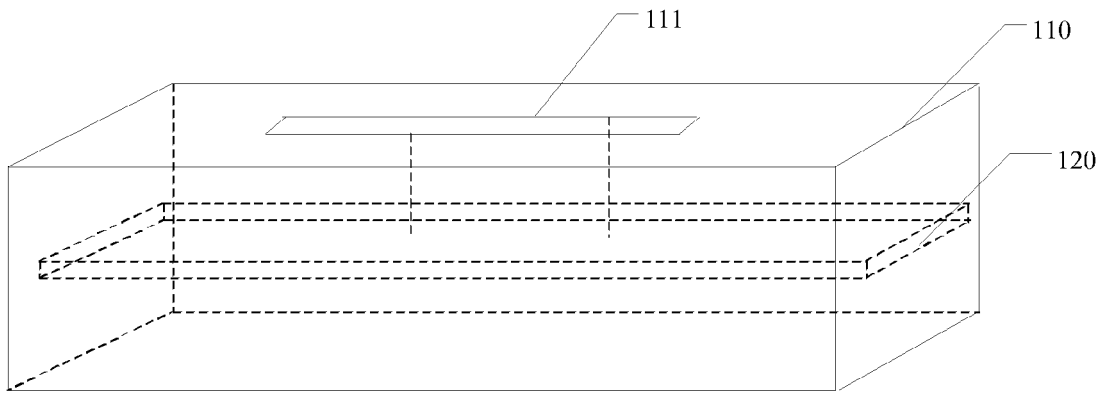


FIG. 1

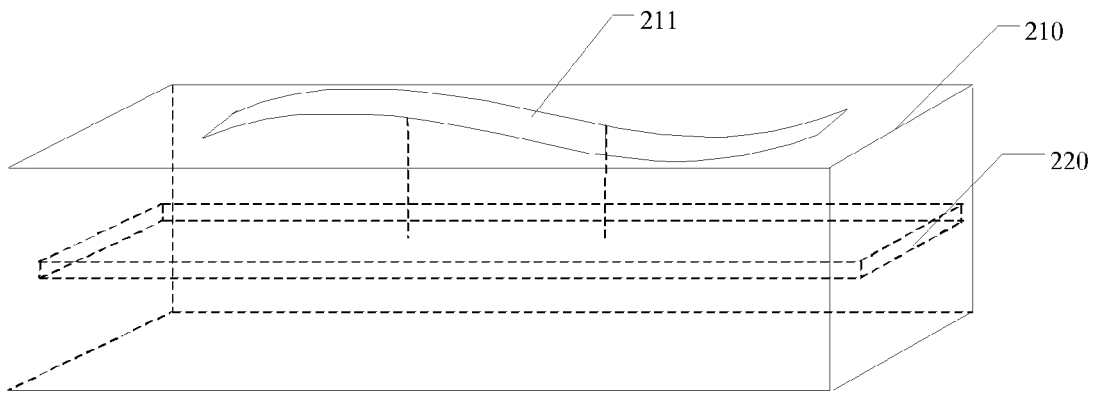


FIG. 2

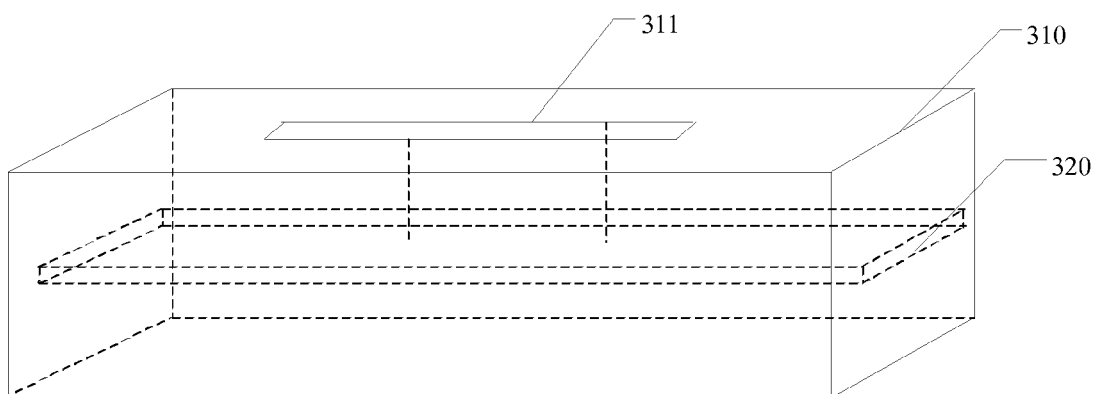


FIG. 3



EUROPEAN SEARCH REPORT

Application Number
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Place of search Munich		Date of completion of the search 19 January 2010	Examiner Kaleve, Abraham
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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