AUDIO SIGNAL RECEIVING AND TRANSFERRING DEVICE

FIELD

The present invention generally relates to an electronic technique field, and more particularly relates to an audio signal receiving device and an audio signal adapter device.

BACKGROUND

With the development of an audio signal coding/decoding technology, more and more electronic devices transmitting data via an audio interface are produced. For example, the electronic device can be connected with a mobile communication device via a low-resistance voice coil type of loudspeaker interface (such as a headphone interface) of the mobile communication device (such as a mobile phone) for receiving an audio signal output from the mobile communication device.

As an output power of the low-resistance voice coil type of loudspeaker interface is usually very low, except the electronic device (such as a headphone) with low power consumption, the electronic device receiving the audio signal via the low-resistance voice coil type of loudspeaker interface generally needs to use an external power source or an internal battery for normal working, which increases a cost of the electronic device and enlarges a volume of the electronic device.

SUMMARY

The present disclosure provides an audio signal adapter device with a high output power, and an audio signal receiving device connected with the audio signal adapter device.

A new audio signal adapter device is proposed. The audio signal adapter device comprises: an input interface, a USB output interface, a boosting unit, a rectifying unit and a filtering unit, in which the input interface has a first audio signal input pin configured to receive an audio signal sent by an audio signal sending device connected with the input interface and to output the audio signal to an input end of the boosting unit; the boosting unit is configured to boost the audio signal input from the input end of the boosting unit, and to output a boosted audio signal to an input end of the rectifying unit via an output end of the boosting unit; the rectifying unit is configured to rectify the boosted audio signal input from the input end of the rectifying unit to obtain a level, and to output the level to an input end of the filtering unit via an output end of the rectifying unit; and

Furthermore, the output end and the positive terminal of the comparator are connected via a resistor R7, and the output end of the comparator is connected with a pull-up resistor R8.

Furthermore, the first direct current bias unit comprises: a resistor R3 and a resistor R4; one terminal of the resistor R3 is connected with a first power supply, and the other terminal of the resistor R3 is connected with the resistor R4; one terminal of the resistor R4 is connected with the resistor R3 and the output end of the first direct current bias unit, and the other terminal of the resistor R4 is grounded; the second direct current bias unit comprises: a resistor R5 and a resistor R6; one terminal of the resistor R5 is connected with a second power supply, and the other terminal of the resistor R5 is connected with the resistor R6; one terminal of the resistor R6 is connected with the resistor R5 and the output end of the second direct current bias unit, and the other terminal of the resistor R6 is grounded; and an output voltage of the first power supply connected with the first direct current bias unit is equal to an output voltage of the second power supply connected with the second direct current bias unit, a resistance of the resistor R3 is equal to a resistance of the resistor R5, and a resistance of the resistor R4 is equal to a resistance of the resistor R6.

In conclusion, the embodiments of the present disclosure realize feeding function via an audio signal with a relatively low hardware cost. The audio signal receiving device, used in combination with the audio signal adapter device (e.g., an audio cable or an audio adapter) of the present disclosure, can obtain power while receiving the audio signal and sending a signal to an audio signal sending device, which reduces a cost of the audio signal receiving device and decreases a volume of the audio signal receiving device.

Furthermore, the audio signal adapter device of the present disclosure further comprising the USB output interface may be connected with the audio signal receiving device having a USB interface, so that the audio signal receiving device may be powered via the VBUS pin of the USB interface. In addition, one of the D+ pin and the D- pin is used as the audio signal input pin, and the other of the D+ pin and the D- pin is used as the audio signal output pin, so that a both-way communication between the audio signal sending device and the audio signal receiving device is realized.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic diagram of an audio signal adapter device according to a first

Fig. 11 is a schematic diagram of an audio signal adapter device according to a ninth embodiment of the present disclosure. As shown in Fig. 11, the differences between the audio signal adapter devices in the ninth embodiment and in the fourth embodiment are as follows.

In the ninth embodiment, the audio signal output pin is the D- pin, and the signal input pin is the D+ pin. That is, in this embodiment, the audio signal output pin (i.e., the D- pin) is connected with two audio signal input pins of the loudspeaker interface directly or via the signal amplifying unit, and configured to output the audio signal to the USB device connected with the audio signal output pin; and the signal input pin (i.e., the D+ pin) is connected with the microphone pin (i.e., the MIC pin) of the loudspeaker interface, and configured to send the signal to the audio signal sending device connected with the loudspeaker interface.

The audio signal receiving device in the ninth embodiment is identical with that in the sixth embodiment.

TENTH EMBODIMENT

Fig. 12 is a schematic diagram of an audio signal adapter device according to a tenth embodiment of the present disclosure. As shown in Fig. 12, the differences between the audio signal adapter devices in the tenth embodiment and in the fifth embodiment are as follows.

In the tenth embodiment, the audio signal output pin is the D- pin, and the signal input pin is the D+ pin. That is, in this embodiment, the audio signal output pin (i.e., the D- pin) is connected with one audio signal input pin (e.g., right-channel pin) of the loudspeaker interface directly or via the signal amplifying unit, and configured to output the audio signal to the USB device connected with the audio signal output pin; and the signal input pin (i.e., the D+ pin) is connected with the microphone pin (i.e., the MIC pin) of the loudspeaker interface, and configured to send the signal to the audio signal sending device connected with the loudspeaker interface.

The audio signal receiving device in the tenth embodiment is identical with that in the sixth embodiment.

The embodiments of the present disclosure realize feeding function via an audio signal with a relatively low hardware cost. The audio signal receiving device, used in combination with the audio signal adapter device of the present disclosure, can obtain power while receiving the audio signal and sending a signal to an audio signal sending device, which reduces a cost of the audio signal receiving device and decreases a volume of the audio signal receiving device.

Furthermore, the audio signal adapter device of the present disclosure further comprising the USB output interface may be connected with the audio signal receiving device having a USB interface, so that the audio signal receiving device may be powered via the VBUS pin of the USB interface. In addition, one of the D+ pin and the D- pin is used as the audio signal input pin, and the other of the D+ pin and the D- pin is used as the audio signal output pin, so that a both-way communication between the audio signal sending device and the audio signal receiving device is realized.

Certainly, according to a basic principle of the present disclosure, the loudspeaker interface in above embodiments may be replaced by other types of input interfaces having an audio signal input pin, a MIC pin and a ground pin.

Furthermore, the above input interface may be mounted on the audio signal sending device.

The above input interface may comprise a plurality of plugs, such as an audio signal plug comprising the audio signal input pin and a MIC plug comprising the MIC pin.

Those skilled in the art shall understand that all or parts of the steps in the above exemplifying method of the present disclosure may be achieved by commanding the related hardware with programs. The programs may be stored in a computer readable storage medium, and the programs comprise one or a combination of the steps in the method embodiments of the present disclosure when run on a computer.

In addition, each function cell of the embodiments of the present disclosure may be integrated in a processing module, or these cells may be separate physical existence, or two or more cells are integrated in a processing module. The integrated module may be realized in a form of hardware or in a form of software function modules. When the integrated module is realized in a form of software function module and is sold or used as a standalone product, the integrated module may be stored in a computer readable storage medium.

The storage medium mentioned above may be read-only memories, magnetic disks or CD, etc.

Although explanatory embodiments have been shown and described, it would be appreciated by those skilled in the art that the above embodiments cannot be construed to limit the present invention, and changes, alternatives, and modifications can be made in the embodiments without departing from spirit, principles and scope of the present invention.

WHAT IS CLAIMED IS:

1. An audio signal adapter device, comprising: an input interface, a USB output interface, a boosting unit, a rectifying unit and a filtering unit, wherein

the input interface has a first audio signal input pin configured to receive an audio signal sent by an audio signal sending device connected with the input interface and to output the audio signal to an input end of the boosting unit;

the boosting unit is configured to boost the audio signal input from the input end of the boosting unit, and to output a boosted audio signal to an input end of the rectifying unit via an output end of the boosting unit;

the rectifying unit is configured to rectify the boosted audio signal input from the input end of the rectifying unit to obtain a level, and to output the level to an input end of the filtering unit via an output end of the rectifying unit; and

the filtering unit is configured to filter the level input from the input end of the filtering unit to obtain a direct current level, and to output the direct current level to a VBUS pin of the USB output interface via an output end of the filtering unit.

2. The audio signal adapter device according to claim 1, wherein

the USB output interface has a D+ pin;

the D+ pin is used as an audio signal output pin, connected with the first audio signal input pin, and configured to output the audio signal.

3. The audio signal adapter device according to claim 1, wherein

the USB output interface has a D+ pin;

the D+ pin is used as an audio signal output pin, connected with the output end of the boosting unit, and configured to output the audio signal.

4. The audio signal adapter device according to any of claims 1-3, wherein

the input interface further has a MIC pin, connected with a D- pin of the USB output interface; and

the D- pin is configured to receive a signal and to output the signal via the MIC pin.

5. The audio signal adapter device according to claim 1, wherein

the USB output interface has a D- pin;

the D- pin is used as an audio signal output pin, connected with the first audio signal input pin,

and configured to output the audio signal.

6. The audio signal adapter device according to claim 1, wherein

the USB output interface has a D- pin;

the D- pin is used as an audio signal output pin, connected with the output end of the boosting unit, and configured to output the audio signal.

7. The audio signal adapter device according to any of claims 1, 5 and 6, wherein

the input interface further has a MIC pin, connected with a D+ pin of the USB output interface; and

the D+ pin is configured to receive a signal and to output the signal via the MIC pin.

8. The audio signal adapter device according to claim 1, wherein

the boosting unit is a boosting transformer, comprising a primary coil and a secondary coil;

one pin of the primary coil is used as the input end of the boosting unit and connected with the first audio signal input pin, and the other pin of the primary coil is grounded; and

at least one output pin of the secondary coil is used as the output end of the boosting unit and connected with the input end of the rectifying unit, and a tap of the secondary coil is grounded.

9. The audio signal adapter device according to claim 8, wherein

the rectifying unit comprises at least one diode, an anode of the at least one diode is connected with the input end of the rectifying unit, and a cathode of the at least one diode is connected with the output end of the rectifying unit.

10. The audio signal adapter device according to claim 9, wherein

the secondary coil of the boosting transformer has two output pins;

the input end of the rectifying unit has two input pins;

the two output pins of the secondary coil are connected with the two input pins of the rectifying unit respectively; and

the rectifying unit comprises two diodes, and anodes of the two diodes are connected with the two input pins of the rectifying unit respectively.

11. The audio signal adapter device according to claim 1, wherein

the filtering unit comprises a capacitor;

one terminal of the capacitor is connected with the input or output end of the filtering unit; and

the input end of the filtering unit is connected with the output end of the filtering unit.

12. The audio signal adapter device according to claim 2, further comprising a signal amplifying unit, wherein the D+ pin is connected with the first audio signal input pin via the signal amplifying unit.

13. The audio signal adapter device according to claim 3, further comprising a signal amplifying unit, wherein the D+ pin is connected with the output end of the boosting unit via the signal amplifying unit.

14. The audio signal adapter device according to claim 5, further comprising a signal amplifying unit, wherein the D- pin is connected with the first audio signal input pin via the signal amplifying unit.

15. The audio signal adapter device according to claim 6, further comprising a signal amplifying unit, wherein the D- pin is connected with the output end of the boosting unit via the signal amplifying unit.

16. The audio signal adapter device according to any of claims 1, 2, 5, 8, 12 and 14, wherein the first audio signal input pin comprises a left-channel pin and a right-channel pin.

17. The audio signal adapter device according to claim 1, wherein

the boosting unit is a boosting transformer, comprising a primary coil and a secondary coil;

one pin of the primary coil is used as the input end of the boosting unit and connected with the first audio signal input pin, and the other pin of the primary coil is grounded; and

one output pin of the secondary coil is used as the output end of the boosting unit and connected with the input end of the rectifying unit, and the other output pin of the secondary coil is grounded.

18. The audio signal adapter device according to claim 17, wherein the rectifying unit comprises one diode, an anode of the diode is connected with the input end of the rectifying unit, and a cathode of the diode is connected with the output end of the rectifying unit.

19. The audio signal adapter device according to claim 1, wherein

the input interface further has a second audio signal input pin;

the USB output interface has an audio signal output pin;

the audio signal output pin is connected with the second audio signal input pin and configured to output the audio signal; and

the audio signal output pin is a D+ pin or a D- pin.

20. The audio signal adapter device according to claim 19, further comprising a signal

amplifying unit, wherein the audio signal output pin is connected with the second audio signal input pin via the signal amplifying unit.

21. An audio signal receiving device, comprising: a signal receiving module, a signal sending module and a USB input interface, wherein

the signal receiving module is connected with an audio signal input pin of the USB input interface and configured to receive an audio signal via the audio signal input pin;

the signal sending module is connected with a signal output pin of the USB input interface and configured to output a signal via the signal output pin; and

the audio signal input pin is one of a D+ pin and a D- pin, and the signal output pin is the other one of the D+ pin and the D- pin.

22. The audio signal receiving device according to claim 21, wherein

the signal receiving module comprises: a direct current signal isolation unit, a first direct current bias unit, a second direct current bias unit and a comparator;

an input end of the direct current signal isolation unit is connected with the audio signal input pin, an output end of the direct current signal isolation unit is connected with the second direct current bias unit, and the direct current signal isolation unit is configured to isolate a direct current level in the audio signal received via the audio signal input pin, and to output the audio signal via the output end thereof;

an input end of the second direct current bias unit is connected with the direct current signal isolation unit, an output end of the second direct current bias unit is connected with a negative terminal of the comparator, and the second direct current bias unit is configured to add a direct current bias to the audio signal input from the input end thereof, and to output an audio signal added with the direct current bias via the output end thereof;

an output end of the first direct current bias unit is connected with a positive terminal of the comparator, and the first direct current bias unit is configured to output a reference level; and

the comparator is configured to output a square wave corresponding to the audio signal via an output end thereof under an action of the reference level input from the positive terminal thereof and the audio signal added with the direct current bias input from the negative terminal thereof.

23. The audio signal receiving device according to claim 21, wherein

the signal sending module comprises a tri-state gate and a resistor R2;

one terminal of the resistor R2 is connected with the signal output pin, and the other terminal

of the resistor R2 is connected with an output end of the tri-state gate; and

the tri-state gate is configured to output a signal via an output end thereof under an action of a data signal input from an input end thereof and a control signal input from an enable end thereof.

24. The audio signal receiving device according to claim 22, wherein

the output end and the positive terminal of the comparator are connected via a resistor R7, and the output end of the comparator is connected with a pull-up resistor R8.

25. The audio signal receiving device according to claim 22, wherein

the first direct current bias unit comprises: a resistor R3 and a resistor R4;

one terminal of the resistor R3 is connected with a first power supply, and the other terminal of the resistor R3 is connected with the resistor R4;

one terminal of the resistor R4 is connected with the resistor R3 and the output end of the first direct current bias unit, and the other terminal of the resistor R4 is grounded;

the second direct current bias unit comprises: a resistor R5 and a resistor R6;

one terminal of the resistor R5 is connected with a second power supply, and the other terminal of the resistor R5 is connected with the resistor R6;

one terminal of the resistor R6 is connected with the resistor R5 and the output end of the second direct current bias unit, and the other terminal of the resistor R6 is grounded; and

an output voltage of the first power supply connected with the first direct current bias unit is equal to an output voltage of the second power supply connected with the second direct current bias unit, a resistance of the resistor R3 is equal to a resistance of the resistor R5, and a resistance of the resistor R4 is equal to a resistance of the resistor R6.

AUDIO SIGNAL RECEIVING DEVICE AND AUDIO SIGNAL ADAPTER DEVICE

FIELD

The present invention generally relates to an electronic technique field, and more particularly relates to an audio signal receiving device and an audio signal adapter device.

BACKGROUND

With the development of an audio signal coding/decoding technology, more and more electronic devices transmitting data via an audio interface are produced. For example, the electronic device can be connected with a mobile communication device via a low-resistance voice coil type of loudspeaker interface (such as a headphone interface) of the mobile communication device (such as a mobile phone) for receiving an audio signal output from the mobile communication device.

As an output power of the low-resistance voice coil type of loudspeaker interface is usually very low, except the electronic device (such as a headphone) with low power consumption, the electronic device receiving the audio signal via the low-resistance voice coil type of loudspeaker interface generally needs to use an external power source or an internal battery for normal working, which increases a cost of the electronic device and enlarges a volume of the electronic device.

SUMMARY

The present disclosure provides an audio signal adapter device which can realize feeding function via an audio signal, and an audio signal receiving device connected with the audio signal adapter device.

A new audio signal adapter device is proposed. The audio signal adapter device comprises: an input interface, a USB output interface, a boosting unit, a rectifying unit and a filtering unit, in which the input interface has a first audio signal input pin configured to receive an audio signal sent by an audio signal sending device connected with the input interface and to output the audio signal to an input end of the boosting unit; the boosting unit is configured to boost the audio signal input from the input end of the boosting unit, and to output a boosted audio signal to an input end of the rectifying unit via an output end of the boosting unit; the rectifying unit is configured to rectify the boosted audio signal input from the input end of the rectifying unit to obtain a level, and to output the level to an input end of the filtering unit via an output end of the rectifying unit; and

Furthermore, the output end and the positive terminal of the comparator are connected via a resistor R7, and the output end of the comparator is connected with a pull-up resistor R8.

Furthermore, the first direct current bias unit comprises: a resistor R3 and a resistor R4; one terminal of the resistor R3 is connected with a first power supply, and the other terminal of the resistor R3 is connected with the resistor R4; one terminal of the resistor R4 is connected with the resistor R3 and the output end of the first direct current bias unit, and the other terminal of the resistor R4 is grounded; the second direct current bias unit comprises: a resistor R5 and a resistor R6; one terminal of the resistor R5 is connected with a second power supply, and the other terminal of the resistor R5 is connected with the resistor R6; one terminal of the resistor R6 is connected with the resistor R5 and the output end of the second direct current bias unit, and the other terminal of the resistor R6 is grounded; and an output voltage of the first power supply connected with the first direct current bias unit is equal to an output voltage of the second power supply connected with the second direct current bias unit, a resistance of the resistor R3 is equal to a resistance of the resistor R5, and a resistance of the resistor R4 is equal to a resistance of the resistor R6.

In conclusion, the embodiments of the present disclosure realize feeding function via an audio signal with a relatively low hardware cost. The audio signal receiving device, used in combination with the audio signal adapter device (e.g., an audio cable or an audio adapter) of the present disclosure, can obtain power while receiving the audio signal and/or sending a signal to an audio signal sending device, which reduces a cost of the audio signal receiving device and decreases a volume of the audio signal receiving device.

Furthermore, the audio signal adapter device of the present disclosure further comprising the USB output interface may be connected with the audio signal receiving device having a USB interface, so that the audio signal receiving device may be powered via the VBUS pin of the USB interface. In addition, one of the D+ pin and the D- pin is used as the audio signal input pin, and the other of the D+ pin and the D- pin is used as the audio signal output pin, so that a both-way communication between the audio signal sending device and the audio signal receiving device is realized.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic diagram of an audio signal adapter device according to a first

Fig. 11 is a schematic diagram of an audio signal adapter device according to a ninth embodiment of the present disclosure. As shown in Fig. 11, the differences between the audio signal adapter devices in the ninth embodiment and in the fourth embodiment are as follows.

In the ninth embodiment, the audio signal output pin is the D- pin, and the signal input pin is the D+ pin. That is, in this embodiment, the audio signal output pin (i.e., the D- pin) is connected with two audio signal input pins of the loudspeaker interface directly or via the signal amplifying unit, and configured to output the audio signal to the USB device connected with the audio signal output pin; and the signal input pin (i.e., the D+ pin) is connected with the microphone pin (i.e., the MIC pin) of the loudspeaker interface, and configured to send the signal to the audio signal sending device connected with the loudspeaker interface.

The audio signal receiving device in the ninth embodiment is identical with that in the sixth embodiment.

TENTH EMBODIMENT

Fig. 12 is a schematic diagram of an audio signal adapter device according to a tenth embodiment of the present disclosure. As shown in Fig. 12, the differences between the audio signal adapter devices in the tenth embodiment and in the fifth embodiment are as follows.

In the tenth embodiment, the audio signal output pin is the D- pin, and the signal input pin is the D+ pin. That is, in this embodiment, the audio signal output pin (i.e., the D- pin) is connected with one audio signal input pin (e.g., right-channel pin) of the loudspeaker interface directly or via the signal amplifying unit, and configured to output the audio signal to the USB device connected with the audio signal output pin; and the signal input pin (i.e., the D+ pin) is connected with the microphone pin (i.e., the MIC pin) of the loudspeaker interface, and configured to send the signal to the audio signal sending device connected with the loudspeaker interface.

The audio signal receiving device in the tenth embodiment is identical with that in the sixth embodiment.

The embodiments of the present disclosure realize feeding function via an audio signal with a relatively low hardware cost. The audio signal receiving device, used in combination with the audio signal adapter device of the present disclosure, can obtain power while receiving the audio signal and/or sending a signal to an audio signal sending device, which reduces a cost of the audio signal receiving device and decreases a volume of the audio signal receiving device.

Furthermore, the audio signal adapter device of the present disclosure further comprising the USB output interface may be connected with the audio signal receiving device having a USB interface, so that the audio signal receiving device may be powered via the VBUS pin of the USB interface. In addition, one of the D+ pin and the D- pin is used as the audio signal input pin, and the other of the D+ pin and the D- pin is used as the audio signal output pin, so that a both-way communication between the audio signal sending device and the audio signal receiving device is realized.

Certainly, according to a basic principle of the present disclosure, the loudspeaker interface in above embodiments may be replaced by other types of input interfaces having an audio signal input pin, a MIC pin and a ground pin.

Furthermore, the above input interface may be mounted on the audio signal sending device.

Furthermore, the above output interface may be mounted on the electronic device (the audio signal receiving equipment).

The above input interface may comprise a plurality of plugs, such as an audio signal plug comprising the audio signal input pin and a MIC plug comprising the MIC pin.

Those skilled in the art shall understand that all or parts of the steps in the above exemplifying method of the present disclosure may be achieved by commanding the related hardware with programs. The programs may be stored in a computer readable storage medium, and the programs comprise one or a combination of the steps in the method embodiments of the present disclosure when run on a computer.

In addition, each function cell of the embodiments of the present disclosure may be integrated in a processing module, or these cells may be separate physical existence, or two or more cells are integrated in a processing module. The integrated module may be realized in a form of hardware or in a form of software function modules. When the integrated module is realized in a form of software function module and is sold or used as a standalone product, the integrated module may be stored in a computer readable storage medium.

The storage medium mentioned above may be read-only memories, magnetic disks or CD, etc.

Although explanatory embodiments have been shown and described, it would be appreciated by those skilled in the art that the above embodiments cannot be construed to limit the present invention, and changes, alternatives, and modifications can be made in the embodiments without departing from spirit, principles and scope of the present invention.

WHAT IS CLAIMED IS:

1. An audio signal adapter device, comprising: an input interface, a USB output interface, and a signal amplifying unit, wherein

the input interface is a headphone interface, and has a first audio signal input pin configured to receive an audio signal sent by an audio signal sending device connected with the input interface and to output the audio signal to an input end of the signal amplifying unit;

the USB output interface comprises an audio signal output pin;

the signal amplifying unit is connected with the first audio signal input pin and the audio signal output pin for outputting an amplified audio signal;

the audio signal output pin is a D+ pin or D- pin of the USB output interface.

2. The audio signal adapter device according to claim 1, wherein

the input interface further has a MIC pin;

the MIC pin is connected with a D- pin of the USB output interface, when the audio signal output pin is a D+ pin of the USB output interface; and

the D- pin is configured to receive a signal and to output the signal via the MIC pin.

3. The audio signal adapter device according to claim 1, wherein

the input interface further has a MIC pin;

the MIC pin is connected with a D+ pin of the USB output interface, when the audio signal output pin is a D- pin of the USB output interface; and

the D+ pin is configured to receive a signal and to output the signal via the MIC pin.

4. The audio signal adapter device according to claim 1, further comprising: a boosting unit, a rectifying unit and a filtering unit, wherein

the boosting unit is connected with the first audio signal input pin, and configured to boost the audio signal input from the an input end of the boosting unit, and to output a boosted audio signal to an input end of the rectifying unit via an output end of the boosting unit;

the rectifying unit is configured to rectify the boosted audio signal input from the input end of the rectifying unit to obtain a level, and to output the level to an input end of the filtering unit via an output end of the rectifying unit; and

the filtering unit is configured to filter the level input from the input end of the filtering unit to obtain a direct current level, and to output the direct current level to a VBUS pin of the USB output interface via an output end of the filtering unit.

5. The audio signal adapter device according to claim 4, wherein

the boosting unit is a boosting transformer, comprising a primary coil and a secondary coil;

one pin of the primary coil is used as the input end of the boosting unit and connected with the first audio signal input pin, and the other pin of the primary coil is grounded; and

at least one output pin of the secondary coil is used as the output end of the boosting unit and connected with the input end of the rectifying unit, and a tap of the secondary coil is grounded.

6. The audio signal adapter device according to claim 4, wherein

the rectifying unit comprises at least one diode, an anode of the at least one diode is connected with the input end of the rectifying unit, and a cathode of the at least one diode is connected with the output end of the rectifying unit.

7. The audio signal adapter device according to claim 5, wherein

the rectifying unit comprises at least one diode, an anode of the at least one diode is connected with the input end of the rectifying unit, and a cathode of the at least one diode is connected with the output end of the rectifying unit.

8. The audio signal adapter device according to claim 5, wherein

the secondary coil of the boosting transformer has two output pins;

the input end of the rectifying unit has two input pins;

the two output pins of the secondary coil are connected with the two input pins of the rectifying unit respectively; and

the rectifying unit comprises two diodes, and anodes of the two diodes are connected with the two input pins of the rectifying unit respectively.

9. The audio signal adapter device according to claim 4, wherein

the filtering unit comprises a capacitor;

one terminal of the capacitor is connected with the input or output end of the filtering unit; and

the input end of the filtering unit is connected with the output end of the filtering unit.

10. The audio signal adapter device according to claim 1, wherein the first audio signal input pin comprises a left-channel pin and/or a right-channel pin.

11. The audio signal adapter device according to claim 2, wherein the first audio signal input pin comprises a left-channel pin and/or a right-channel pin.

12. The audio signal adapter device according to claim 3, wherein the first audio signal input pin comprises a left-channel pin and/or a right-channel pin.

13. The audio signal adapter device according to claim 4, wherein the first audio signal input pin comprises a left-channel pin and/or a right-channel pin.

14. The audio signal adapter device according to claim 5, wherein the first audio signal input pin comprises a left-channel pin and/or a right-channel pin.

15. The audio signal adapter device according to claim 6, wherein the first audio signal input pin comprises a left-channel pin and/or a right-channel pin.

16. The audio signal adapter device according to claim 7, wherein the first audio signal input pin comprises a left-channel pin and/or a right-channel pin.

17. The audio signal adapter device according to claim 8, wherein the first audio signal input pin comprises a left-channel pin and/or a right-channel pin.

18. The audio signal adapter device according to claim 9, wherein the first audio signal input pin comprises a left-channel pin and/or a right-channel pin.