AUDIO SIGNAL ADAPTER DEVICE

FIELD

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

BACKGROUND

With the development of an audio signal coding/decoding technology, more and more electronic equipments transmitting data via an audio interface are produced. For example, the electronic equipment may be connected with a mobile communication device (such as a mobile phone) via a headphone plug of the mobile communication device for receiving an audio signal output from the mobile communication device.

As an output power of the headphone plug is usually very low, except the electronic equipment (such as a headphone) with low power consumption, the electronic equipment receiving the audio signal via the headphone plug generally needs to use an external power source or an internal battery for normal working, which increases a cost of the electronic equipment and enlarges a size of the electronic equipment.

SUMMARY

The technical problem to be solved by the present disclosure is to overcome the defects of the prior art, and to provide an audio signal adapter device which can output a relatively high power.

To solve the above problem, the present disclosure provides an audio signal adapter device, comprising an input interface, an output interface, a boosting unit, a rectifying unit and a filtering unit.

The input interface comprises at least one audio pin configured to receive an audio signal output from an audio signal sending device. The at least one audio pin of the input interface outputs the audio signal to an input end of the boosting unit.

The boosting unit is configured to boost a voltage of the audio signal, and to output a boosted audio signal to an input end of the rectifying unit via an output end thereof.

The rectifying unit is configured to rectify the boosted audio signal to obtain a rectified level,

terminal of the comparator is connected with the D+ pin of the USB plug, a negative terminal of the comparator is connected with the D- pin of the USB plug, a ground pin of the comparator is grounded, a power pin of the comparator is connected with a power supply, and an output pin of the comparator is configured to output a square wave corresponding to the input audio signal.

According to the basic principle of the present disclosure, many alternatives and modifications may be made to the above embodiments as follows.

As shown in Fig. 2, in other embodiments of the present disclosure, it is also possible to use the D- pin of the USB output interface as the audio signal pin, and to use the D+ pin of the USB output interface as the reference signal pin.

As shown in Fig. 3, in other embodiments of the present disclosure, it is also possible to connect only one audio pin (for example, the left-channel pin) of the headphone plug with the primary coil of the boosting transformer, and to connect the other audio pin (for example, the right-channel pin) of the headphone plug with only the D+ pin of the USB plug.

Certainly, when the electronic equipment only needs to receive the audio data of one channel, it is also possible for the audio signal adapter device shown in Fig. 3 not to use the right-channel pin.

SECOND EMBODIMENT

Fig. 4 is a schematic diagram of an audio signal adapter device according to a second embodiment of the present disclosure. As shown in Fig. 4, the differences between the second embodiment and the first embodiment are as follows.

In this embodiment, only one output pin of the secondary coil of the boosting transformer is connected with the input pin of the rectifier, thus the rectifier only has to comprise one input pin and one diode.

Apparently, compared with the first embodiment, a half of electric energy of the secondary coil of the boosting transformer will be lost if using the audio signal adapter device in the second embodiment. However, a circuit structure of the audio signal adapter is simplified, thus a hardware cost is reduced.

In this embodiment, the other output pin of the secondary coil of the boosting transformer is grounded, and the boosting transformer does not comprise a tag.

The above embodiments of the present disclosure realize a feeding function via the audio signal with a low hardware cost. When the electronic equipment is used together with the audio signal adapter device (such as an audio cable) according to the present disclosure, it can obtain electric energy while receiving the audio signal, thus reducing a cost of the electronic equipment and decreasing a size of the electronic equipment.

Furthermore, since the audio signal adapter device according to the present disclosure comprises the USB plug, it can be inserted into the USB socket of the electronic equipment (the audio signal receiving device), and then the electronic equipment can obtain power via the VBUS pin and can use one of the D+ pin and the D- pin as the audio signal pin (the pin corresponding to a left-channel audio signal, a right-channel audio signal, a mono audio signal or a hybrid channel audio signal) and use the other one of the D+ pin and the D- pin as the ground pin (or referred to as the reference signal pin) so as to receive the audio signal output from the headphone jack of the audio signal sending device.

Certainly, according to the basic principle of the present disclosure, the headphone plug in the above embodiments may be replaced with other types of input interfaces having an audio pin (a left-channel pin, a right-channel pin and a mono pin) and a ground pin (a reference signal pin).

Furthermore, as shown in Fig. 6, the USB plug in the above embodiments may be replaced with other types of output interfaces having a power pin, an audio signal pin, a reference signal pin and a ground pin.

Furthermore, the output interface of the above embodiments may comprise two output interfaces, which are a power output interface (may comprise a power pin and a ground pin) and an audio signal output interface (may comprise an audio signal pin and a reference signal pin).

Furthermore, the above input interface may be fixed connected with the audio signal sending device.

Furthermore, the above output interface may be fixed connected with the electronic equipment (the audio signal receiving device).

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

Furthermore, as shown in Fig. 5, the audio signal pin of the output interface may be connected with the output pin of the boosting transformer for outputting the audio signal.

reference signal pin is the other one of the D+ pin and the D- pin of the USB output interface.

10. The audio signal adapter device according to claim 2 or 6, wherein

the first pin of the primary coil is connected with the at least one audio pin via a resistor.

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

the input interface comprises two audio pins: a left-channel pin and a right-channel pin.

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

one of the left-channel pin and the right-channel pin is configured to output the audio signal to the input end of the boosting unit, and the other one of the left-channel pin and the right-channel pin is configured to be connected with the audio signal pin of the output interface.

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As an output power of the headphone plug is usually very low, except the electronic equipment (such as a headphone) with low power consumption, the electronic equipment receiving the audio signal via the headphone plug generally needs to use an external power source or an internal battery for normal working, which increases a cost of the electronic equipment and enlarges a size of the electronic equipment.

SUMMARY

The present disclosure overcomes the defects of the prior art, and provides an audio signal adapter device which can realizes a feeding function via an audio signal.

The present disclosure provides an audio signal adapter device, comprising an input interface, an output interface, a boosting unit, a rectifying unit and a filtering unit.

The input interface comprises at least one audio pin configured to receive an audio signal output from an audio signal sending device. The at least one audio pin of the input interface outputs the audio signal to an input end of the boosting unit.

The boosting unit is configured to boost a voltage of the audio signal, and to output a boosted audio signal to an input end of the rectifying unit via an output end thereof.

The rectifying unit is configured to rectify the boosted audio signal to obtain a rectified level, and to output the rectified level to an input end of the filtering unit via an output end thereof.

The filtering unit is configured to filter the rectified level to obtain a direct current level,

terminal of the comparator is connected with the D+ pin of the USB plug, a negative terminal of the comparator is connected with the D- pin of the USB plug, a ground pin of the comparator is grounded, a power pin of the comparator is connected with a power supply, and an output pin of the comparator is configured to output a square wave corresponding to the input audio signal. Alternatively, the positive terminal of the comparator may be connected with the D- pin of the USB plug, and the negative terminal of the comparator may be connected with the D+ pin of the USB plug.

According to the basic principle of the present disclosure, many alternatives and modifications may be made to the above embodiments as follows.

As shown in Fig. 2, in other embodiments of the present disclosure, it is also possible to use the D- pin of the USB output interface as the audio signal pin, and to use the D+ pin of the USB output interface as the reference signal pin.

As shown in Fig. 3, in other embodiments of the present disclosure, it is also possible to connect only one audio pin (for example, the left-channel pin) of the headphone plug with the primary coil of the boosting transformer, and to connect the other audio pin (for example, the right-channel pin) of the headphone plug with only the D+ pin of the USB plug.

Certainly, when the electronic equipment only needs to receive the audio data of one channel (for example, the left channel), it is also possible for the audio signal adapter device shown in Fig. 3 not to use the right-channel pin.

SECOND EMBODIMENT

Fig. 4 is a schematic diagram of an audio signal adapter device according to a second embodiment of the present disclosure. As shown in Fig. 4, the differences between the second embodiment and the first embodiment are as follows.

In this embodiment, only one output pin of the secondary coil of the boosting transformer is connected with the input pin of the rectifier, thus the rectifier only has to comprise one input pin and one diode.

Apparently, compared with the first embodiment, a half of electric energy of the secondary coil of the boosting transformer will be lost if using the audio signal adapter device in the second embodiment. However, a circuit structure of the audio signal adapter is simplified, thus a hardware cost is reduced.

In this embodiment, the other output pin of the secondary coil of the boosting transformer is

grounded, and the boosting transformer does not comprise a tag.

The above embodiments of the present disclosure realize a feeding function via the audio signal with a low hardware cost. When the electronic equipment is used together with the audio signal adapter device (such as an audio cable) according to the present disclosure, it can obtain electric energy while receiving the audio signal, thus reducing a cost of the electronic equipment and decreasing a size of the electronic equipment.

Furthermore, since the audio signal adapter device according to the present disclosure comprises the USB plug, it can be inserted into the USB socket of the electronic equipment (the audio signal receiving device), and then the electronic equipment can obtain power via the VBUS pin and can use one of the D+ pin and the D- pin as the audio signal pin (the pin corresponding to a left-channel audio signal, a right-channel audio signal, a mono audio signal or a hybrid channel audio signal) and use the other one of the D+ pin and the D- pin as the ground pin (or referred to as the reference signal pin) so as to receive the audio signal output from the headphone jack of the audio signal sending device.

Certainly, according to the basic principle of the present disclosure, the headphone plug in the above embodiments may be replaced with other types of input interfaces having an audio pin (a left-channel pin, a right-channel pin and/or a mono pin) and a reference signal pin (a ground pin).

Furthermore, as shown in Fig. 6, the USB plug in the above embodiments may be replaced with other types of output interfaces having a power pin, an audio signal pin, a reference signal pin and a ground pin.

Furthermore, the output interface of the above embodiments may comprise two output interfaces, which are a power output interface (may comprise a power pin and a ground pin) and an audio signal output interface (may comprise an audio signal pin and a reference signal pin).

Furthermore, the above input interface may be fixed connected with the audio signal sending device.

Furthermore, the above output interface may be fixed connected with the electronic equipment (the audio signal receiving device).

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

Furthermore, as shown in Fig. 5, the audio signal pin of the output interface may be connected with the output pin of the boosting transformer for outputting the audio signal.

reference signal pin is the other one of the D+ pin and the D- pin of the USB output interface.

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

the first pin of the primary coil is connected with the at least one audio pin via a resistor.

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

the input interface comprises two audio pins: a left-channel pin and a right-channel pin.

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

one of the left-channel pin and the right-channel pin is configured to output the audio signal to the input end of the boosting unit, and the other one of the left-channel pin and the right-channel pin is configured to be connected with the audio signal pin of the output interface.

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

the input interface comprises two audio pins: a left-channel pin and a right-channel pin.