AUDIO SIGNAL ADAPTER AND RECEIVER DEVICE AND AUDIO SIGNAL TRANSMISSION SYSTEM

FIELD

The present invention generally relates to an electronic technical field, and more particularly relates to an audio signal receiving device, an audio signal adapter device and a system for transmitting an audio signal.

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 loudspeaker interface (such as a headphone interface) of the mobile communication device for receiving an audio signal output from the mobile communication device.

Furthermore, with the popularization of a USB interface, a large number of electronic equipments are provided with the USB interface. Thus, how to transmit the audio signal between the mobile communication device and the electronic equipment via the loudspeaker interface of the mobile communication device and the USB interface of the electronic equipment is a problem which needs to be solved currently.

An adapter cable for connecting the loudspeaker interface and the USB interface (for example, the adapter cable for connecting a 3.5mm headphone interface and the USB interface) in the prior art can only be connected with a USB master equipment (for example, a personal computer) and a loudspeaker interface equipment (for example, the mobile communication device), such that the loudspeaker interface equipment (for example, the mobile communication device) can communicate with the USB master equipment normally. However, the existing electronic equipments provided with the USB interface are generally USB slave equipments, which cannot communicate with the mobile communication device using the adapter cable for connecting the loudspeaker interface and the USB interface in the prior art.

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 be connected with a loudspeaker interface equipment and a USB slave equipment, and a audio signal receiving device corresponding to the loudspeaker interface equipment, and a system for transmitting an audio signal comprising the audio signal adapter device and the audio signal receiving device, which can realize an audio signal transmission between the loudspeaker interface equipment and the USB slave equipment (the audio signal receiving device).

To solve the above problem, the present disclosure provides a system for transmitting an audio signal. The system is configured to receive the audio signal output from an audio signal sending device and send a signal thereto, and the system comprises an audio signal adapter device and an audio signal receiving device.

The audio signal adapter device comprises an audio interface and a adapter end interface.

The audio interface is connected with the audio signal sending device and has a first ground pin and at least one audio pin.

The adapter end interface is connected with the audio signal receiving device and has a first audio signal pin and a first reference signal pin.

The at least one audio pin of the audio interface is connected with the first audio signal pin of the adapter end interface, and the first ground pin of the audio interface is connected with the first reference signal pin of the adapter end interface.

The audio signal receiving device comprises an audio receiving module and a receiving end interface.

The receiving end interface has a second audio signal pin and a second reference signal pin, the second audio signal pin of the receiving end interface is connected with the first audio signal pin of the adapter end interface, and the second reference signal pin of the receiving end interface is connected with the first reference signal pin of the adapter end interface.

The audio receiving module is connected with the second audio signal pin and the second reference signal pin of the receiving end interface respectively, and configured to receive the audio signal via the second audio signal pin and the second reference signal pin.

Furthermore, each of the adapter end interface and the receiving end interface is a USB interface.

The first audio signal pin is one of a D+ pin and a D- pin of the adapter end interface, and the first reference signal pin is the other one of the D+ pin and the D- pin of the adapter end interface.

WHAT IS CLAIMED IS:

1. A system for transmitting an audio signal, configured to receive the audio signal output from an audio signal sending device and send a signal thereto, and comprising an audio signal adapter device and an audio signal receiving device, wherein

the audio signal adapter device comprises an audio interface and a adapter end interface;

the audio interface is connected with the audio signal sending device and has a first ground pin and at least one audio pin;

the adapter end interface is connected with the audio signal receiving device and has a first audio signal pin and a first reference signal pin;

the at least one audio pin of the audio interface is connected with the first audio signal pin of the adapter end interface, and the first ground pin of the audio interface is connected with the first reference signal pin of the adapter end interface;

the audio signal receiving device comprises an audio receiving module and a receiving end interface;

the receiving end interface has a second audio signal pin and a second reference signal pin, the second audio signal pin of the receiving end interface is connected with the first audio signal pin of the adapter end interface, and the second reference signal pin of the receiving end interface is connected with the first reference signal pin of the adapter end interface; and

the audio receiving module is connected with the second audio signal pin and the second reference signal pin of the receiving end interface respectively, and configured to receive the audio signal via the second audio signal pin and the second reference signal pin.

2. The system according to claim 1, wherein

each of the adapter end interface and the receiving end interface is a USB interface; and

the first audio signal pin is one of a D+ pin and a D- pin of the adapter end interface, and the first reference signal pin is the other one of the D+ pin and the D- pin of the adapter end interface;

the second audio signal pin is one of a D+ pin and a D- pin of the receiving end interface, and the second reference signal pin is the other one of the D+ pin and the D- pin of the receiving end interface.

3. The system according to claim 1 or 2, wherein

the audio interface of the audio signal adapter device further comprises a MIC pin;

the adapter end interface of the audio signal adapter device further comprises a second ground pin;

the MIC pin is connected with the second ground pin of the adapter end interface;

the audio signal receiving device further comprises a signal sending module; and

the signal sending module is connected with the second reference signal pin and configured to output a signal to the audio signal sending device via the second reference signal pin and the MIC pin by changing a voltage of the second reference signal pin.

4. The system according to claim 3, wherein the signal sending module is further connected with the second audio signal pin, and configured to change a voltage of the second audio signal pin with an amount same as a change of the voltage of the second reference signal pin.

5. The system according to claim 4, wherein the signal sending module is further connected with a third ground pin of the receiving end interface, and configured to keep a voltage of the third ground pin at a fixed preset voltage when changing the voltage of the second reference signal pin.

6. The system according to claim 1, wherein

the audio receiving module comprises a comparator;

a positive terminal of the comparator is connected with the second audio signal pin, a negative terminal of the comparator is connected with the second reference signal pin, and an output pin of the comparator is configured to output a square wave corresponding to an input audio signal; or

the positive terminal of the comparator is connected with the second reference signal pin, the negative terminal of the comparator is connected with the second audio signal pin, and the output pin of the comparator is configured to output the square wave corresponding to the input audio signal.

7. The system according to claim 1, wherein the at least one audio pin of the audio interface of the audio signal adapter device comprise a left-channel pin and a right-channel pin.

8. An audio signal adapter device, comprising an audio interface and an adapter end interface, wherein

the audio interface is connected with an audio signal sending device and has a first ground pin and at least one audio pin;

the adapter end interface is connected with the audio signal receiving device and has an audio signal pin and a reference signal pin;

the at least one audio pin of the audio interface is configured to receive an audio signal output

from the audio signal sending device and connected with the audio signal pin of the adapter end interface, and the first ground pin of the audio interface is connected with the reference signal pin of the adapter end interface; and

the audio signal pin and the reference signal pin are configured to output the audio signal to the audio signal receiving device connected therewith.

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

the adapter end interface is a USB interface; and

the audio signal pin is one of a D+ pin and a D- pin of the adapter end interface, the reference signal pin is the other one of the D+ pin and the D- pin of the adapter end interface.

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

the audio interface further comprises a MIC pin, and the adapter end interface further comprises a second ground pin; and

the MIC pin is connected with the second ground pin.

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

the at least one audio pin of the audio interface comprises a left-channel pin and a right-channel pin.

12. An audio signal receiving device, comprising an audio receiving module and a receiving end interface, wherein

the receiving end interface has an audio signal pin and a reference signal pin; and

the audio receiving module is connected with the audio signal pin and the reference signal pin of the receiving end interface, and configured to receive an audio signal via the audio signal pin and the reference signal pin.

13. The audio signal receiving device according to claim 12, wherein

the receiving end interface is a USB interface; and

the audio signal pin is one of a D+ pin and a D- pin of the receiving end interface, the reference signal pin is the other one of the D+ pin and the D- pin of the receiving end interface.

14. The audio signal receiving device according to claim 12 or 13, wherein

the audio signal receiving device further comprises a signal sending module; and

the signal sending module is connected with the reference signal pin, and configured to output a signal to an audio signal sending device via the reference signal pin by changing a voltage of the reference signal pin.

15. The audio signal receiving device according to claim 14, wherein

the signal sending module is further connected with the audio signal pin, and configured to change a voltage of the audio signal pin with an amount same as a change of the voltage of the reference signal pin.

16. The audio signal receiving device according to claim 15, wherein

the signal sending module is further connected with a ground pin of the receiving end interface, and configured to keep a voltage of the ground pin at a fixed preset voltage when changing the voltage of the reference signal pin.

17. The audio signal receiving device according to claim 12, wherein

the audio receiving module comprises a comparator, and

a positive terminal and a negative terminal of the comparator are connected with a D+ pin and a D- pin of the receiving end interface respectively, and an output pin of the comparator is configured to output a square wave corresponding to an input audio signal.

AUDIO SIGNAL RECEIVING DEVICE, AUDIO SIGNAL ADAPTER DEVICE AND SYSTEM FOR TRANSMITTING AUDIO SIGNAL

FIELD

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Furthermore, with the popularization of a USB interface, a large number of electronic equipments are provided with the USB interface. Thus, how to transmit the audio signal between the mobile communication device and the electronic equipment via the loudspeaker interface of the mobile communication device and the USB interface of the electronic equipment is a problem which needs to be solved currently.

An adapter cable for connecting the loudspeaker interface and the USB interface (for example, the adapter cable for connecting a 3.5mm headphone interface and the USB interface) in the prior art can only be connected with a USB master equipment (for example, a personal computer) and a loudspeaker interface equipment (for example, the mobile communication device), such that the loudspeaker interface equipment (for example, the mobile communication device) can communicate with the USB master equipment normally. However, the existing electronic equipments provided with the USB interface are generally USB slave equipments, which cannot communicate with the mobile communication device using the adapter cable for connecting the loudspeaker interface and the USB interface in the prior art.

SUMMARY

The present disclosure overcomes the defects of the prior art, and provides an audio signal

adapter device which can be connected with a loudspeaker interface equipment and a USB slave equipment, and a audio signal receiving device corresponding to the loudspeaker interface equipment, and a system for transmitting an audio signal comprising the audio signal adapter device and the audio signal receiving device, which can realize an audio signal transmission between the loudspeaker interface equipment and the USB slave equipment (the audio signal receiving device).

The present disclosure provides a system for transmitting an audio signal. The system is configured to receive the audio signal output from an audio signal sending device and send a signal thereto, and the system comprises an audio signal adapter device and an audio signal receiving device.

The audio signal adapter device comprises an audio interface and a adapter end interface.

The audio interface is connected with the audio signal sending device and has a first ground pin and at least one audio pin.

The adapter end interface is connected with the audio signal receiving device and has a first audio signal pin and a first reference signal pin.

The at least one audio pin of the audio interface is connected with the first audio signal pin of the adapter end interface, and the first ground pin of the audio interface is connected with the first reference signal pin of the adapter end interface.

The audio signal receiving device comprises an audio receiving module and a receiving end interface.

The receiving end interface has a second audio signal pin and a second reference signal pin, the second audio signal pin of the receiving end interface is connected with the first audio signal pin of the adapter end interface, and the second reference signal pin of the receiving end interface is connected with the first reference signal pin of the adapter end interface.

The audio receiving module is connected with the second audio signal pin and the second reference signal pin of the receiving end interface respectively, and configured to receive the audio signal via the second audio signal pin and the second reference signal pin.

Furthermore, each of the adapter end interface and the receiving end interface is a USB interface.

The first audio signal pin is one of a D+ pin and a D- pin of the adapter end interface, and the first reference signal pin is the other one of the D+ pin and the D- pin of the adapter end interface.

WHAT IS CLAIMED IS:

1. A system for transmitting an audio signal, configured to receive the audio signal output from an audio signal sending device and send a signal thereto, and comprising an audio signal adapter device and an audio signal receiving device, wherein

the audio signal adapter device comprises an audio interface and a adapter end interface;

the audio interface is connected with the audio signal sending device and has a first ground pin and at least one audio pin;

the adapter end interface is connected with the audio signal receiving device and has a first audio signal pin and a first reference signal pin;

the at least one audio pin of the audio interface is connected with the first audio signal pin of the adapter end interface, and the first ground pin of the audio interface is connected with the first reference signal pin of the adapter end interface;

the audio signal receiving device comprises an audio receiving module and a receiving end interface;

the receiving end interface has a second audio signal pin and a second reference signal pin, the second audio signal pin of the receiving end interface is connected with the first audio signal pin of the adapter end interface, and the second reference signal pin of the receiving end interface is connected with the first reference signal pin of the adapter end interface; and

the audio receiving module is connected with the second audio signal pin and the second reference signal pin of the receiving end interface respectively, and configured to receive the audio signal via the second audio signal pin and the second reference signal pin.

2. The system according to claim 1, wherein

each of the adapter end interface and the receiving end interface is a USB interface; and

the first audio signal pin is one of a D+ pin and a D- pin of the adapter end interface, and the first reference signal pin is the other one of the D+ pin and the D- pin of the adapter end interface;

the second audio signal pin is one of a D+ pin and a D- pin of the receiving end interface, and the second reference signal pin is the other one of the D+ pin and the D- pin of the receiving end interface.

3. The system according to claim 1, wherein

the audio interface of the audio signal adapter device further comprises a MIC pin;

the adapter end interface of the audio signal adapter device further comprises a second ground pin;

the MIC pin is connected with the second ground pin of the adapter end interface;

the audio signal receiving device further comprises a signal sending module; and

the signal sending module is connected with the second reference signal pin and configured to output a signal to the audio signal sending device via the second reference signal pin and the MIC pin by changing a voltage of the second reference signal pin.

4. The system according to claim 3, wherein the signal sending module is further connected with the second audio signal pin, and configured to change a voltage of the second audio signal pin with an amount same as a change of the voltage of the second reference signal pin.

5. The system according to claim 4, wherein the signal sending module is further connected with a third ground pin of the receiving end interface, and configured to keep a voltage of the third ground pin at a fixed preset voltage when changing the voltage of the second reference signal pin.

6. The system according to claim 1, wherein

the audio receiving module comprises a comparator;

a positive terminal of the comparator is connected with the second audio signal pin, a negative terminal of the comparator is connected with the second reference signal pin, and an output pin of the comparator is configured to output a square wave corresponding to an input audio signal; or

the positive terminal of the comparator is connected with the second reference signal pin, the negative terminal of the comparator is connected with the second audio signal pin, and the output pin of the comparator is configured to output the square wave corresponding to the input audio signal.

7. The system according to claim 1, wherein the at least one audio pin of the audio interface of the audio signal adapter device comprise a left-channel pin and a right-channel pin.

8. An audio signal adapter device, comprising an audio interface and an adapter end interface, wherein

the audio interface is connected with an audio signal sending device and has a first ground pin and at least one audio pin;

the adapter end interface is connected with the audio signal receiving device and has an audio signal pin and a reference signal pin;

the at least one audio pin of the audio interface is configured to receive an audio signal output

from the audio signal sending device and connected with the audio signal pin of the adapter end interface, and the first ground pin of the audio interface is connected with the reference signal pin of the adapter end interface; and

the audio signal pin and the reference signal pin are configured to output the audio signal to the audio signal receiving device connected therewith.

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

the adapter end interface is a USB interface; and

the audio signal pin is one of a D+ pin and a D- pin of the adapter end interface, the reference signal pin is the other one of the D+ pin and the D- pin of the adapter end interface.

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

the audio interface further comprises a MIC pin, and the adapter end interface further comprises a second ground pin; and

the MIC pin is connected with the second ground pin.

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

the at least one audio pin of the audio interface comprises a left-channel pin and a right-channel pin.

12. An audio signal receiving device, comprising an audio receiving module and a receiving end interface, wherein

the receiving end interface has an audio signal pin and a reference signal pin, and the audio receiving module is connected with the audio signal pin and the reference signal pin of the receiving end interface, and configured to receive an audio signal via the audio signal pin and the reference signal pin;

the audio signal receiving device further comprises a signal sending module, and the signal sending module is connected with the reference signal pin, and configured to output a signal to an audio signal sending device via the reference signal pin by changing a voltage of the reference signal pin.

13. The audio signal receiving device according to claim 12, wherein

the receiving end interface is a USB interface; and

the audio signal pin is one of a D+ pin and a D- pin of the receiving end interface, the reference signal pin is the other one of the D+ pin and the D- pin of the receiving end interface.

14. The audio signal receiving device according to claim 12, wherein

the signal sending module is further connected with the audio signal pin, and configured to change a voltage of the audio signal pin with an amount same as a change of the voltage of the reference signal pin.

15. The audio signal receiving device according to claim 14, wherein

the signal sending module is further connected with a ground pin of the receiving end interface, and configured to keep a voltage of the ground pin at a fixed preset voltage when changing the voltage of the reference signal pin.

16. The audio signal receiving device according to claim 12, wherein

the audio receiving module comprises a comparator; and

a positive terminal of the comparator is connected with a D+ pin of the receiving end interface, a negative terminal of the comparator is connected with a D- pin of the receiving end interface, and an output pin of the comparator is configured to output a square wave corresponding to an input audio signal; or the positive terminal of the comparator is connected with the D- pin of the receiving end interface, the negative terminal of the comparator is connected with the D+ pin of the receiving end interface, and the output pin of the comparator is configured to output the square wave corresponding to the input audio signal.