CLAIMS

1. An power adapter characterized in that the power adapter comprises:

a first rectifying circuit configured to rectify an input AC power to output voltage in a first pulsating waveform during a charging process; and

a second rectifying circuit configured to rectify voltage coupled from a primary side of the adapter to a secondary side of the adapter, wherein waveform of current output after being rectified by the second rectifying circuit has a same period as period of the first pulsating waveform, or an envelope of the waveform of the current output after being rectified by the second rectifying circuit has a same period as period of the first pulsating waveform.

2. The power adapter as claimed in claim 1, characterized in that the power adapter comprises:

a switch circuit, configured to modulate the voltage in the first pulsating waveform based on a control signal;

a transformer, configured to output voltage in a second pulsating waveform based on the voltage in the first pulsating waveform that is modulated; and

wherein the second rectifying circuit is configured to rectify the voltage in the second pulsating waveform to output voltage in a third pulsating waveform.

3. The power adapter as claimed in claim 2, characterized in that the power adapter comprises:

a first charging interface, connected to the second rectifying circuit and configured to apply the voltage in the third pulsating waveform to a battery of a terminal via a second charging interface of the terminal when the first charging interface connected to the second charging interface, characterized in that the second charging interface connects the battery;

a sampling circuit configured to sample voltage and/or a current output from the second rectifying circuit to obtain a voltage sampling value and/or a voltage sampling value; and

a control circuit connected to the sampling circuit and the switch circuit, the control circuit outputting the control signal to the switch circuit, and modulating a duty cycle of the control signal based on the voltage sampling value and/or the current sampling value so that the voltage in the third pulsating waveform satisfies a charging requirement.

4. The power adapter as claimed in claim 3, characterized in that the control circuit is further configured to modulate a frequency of the control signal based on the voltage sampling value and/or the current sampling value.

5. The power adapter as claimed in claim 3, characterized in that the control

circuit is connected to the first charging interface, the control circuit is further configured to communicate with the terminal through the first charging interface to acquire state information of the terminal.

6. The power adapter as claimed in claim 3, characterized in that the power adapter comprises:

a drive circuit connected between the switch circuit and the control circuit, the drive circuit configured to drive the switch circuit to turn on or turn off based on the control signal.

7. The power adapter as claimed in claim 3, characterized in that the sampling circuit comprises:

a first current sampling circuit configured to sample a current output from the second rectifying circuit to obtain the current sampling value; and

a first voltage sampling circuit configured to sample voltage output from the second rectifying circuit to obtain the voltage sampling value, the first voltage sampling circuit comprising:

a peak voltage sampling and retaining circuit configured to configured to sample and retain a peak voltage of the voltage in the third pulsating waveform;

a zero-crossing sampling circuit configured to sample zero-crossing points of the voltage in the third pulsating waveform;

a discharge circuit configured to discharge the peak voltage sampling and retaining circuit at the zero-crossing points; and

an analog/digital (AD) sampling circuit configured to sample the peak voltage in the peak voltage sampling and retaining circuit so as to obtain the voltage sampling value.

8. The power adapter as claimed in claim 7, characterized in that the power adapter comprises:

a second voltage sampling circuit configured to sample the voltage in the first pulsating waveform, the second voltage sampling circuit being connected to the control circuit, characterized in that the control circuit controls the switch circuit to turn on for a first predetermined time so as to discharge when a voltage value sampled by the second voltage sampling circuit is greater than a first predetermined voltage value.

9. The power adapter as claimed in claim 3, characterized in that the first charging interface comprises:

power lines configured to charge the battery; and

data lines configured to communicate with the terminal; the control circuit communicates with the terminal through the first charging interface to determine a charging mode, wherein the charging mode comprises a fast charging mode and a normal charging mode.

10. The power adapter as claimed in claim 9, characterized in that the control circuit is further configured to obtain a charging current and/or a charging voltage corresponding to the fast charging mode based on state information of the terminal when the charging mode is determined to be the fast charging mode, and modulate the duty cycle of the control signal based on the charging current and/or the charging voltage corresponding to the fast charging mode.

11. The power adapter as claimed in claim 10, characterized in that the state information of the terminal comprises a battery temperature, wherein when the battery temperature is higher than a first predetermined threshold temperature or lower than a second predetermined threshold temperature, the fast charging mode is switched to the normal charging mode if a current charging mode is the fast charging mode, wherein the first predetermined threshold temperature is higher the second predetermined threshold temperature.

12. The power adapter as claimed in claim 11, characterized in that the control circuit is further configured to control the switch circuit to turn off when the battery temperature is higher than a high temperature protection threshold that is predetermined.

13. The power adapter as claimed in claim 7, characterized in that the control circuit is further configured to control the switch circuit to turn off when the voltage sampling value is greater than a second predetermined voltage value, or the control circuit is further configured to control the switch circuit to turn off when the current sampling value is greater than a predetermined current value.

14. The power adapter as claimed in claim 9, characterized in that when the control circuit performs a bidirectional communication with the terminal through the data lines in the first charging interface to determine that the terminal is charged by the fast charging mode,

the control circuit sends a first instruction to the terminal, the first instruction is configured to inquire of the terminal whether to enable the fast charging mode or not;

the control circuit receives a reply instruction responsive to the first instruction from the terminal, the reply instruction responsive to the first instruction is configured to indicate that the terminal agrees to enable the fast charging mode.

15. The power adapter as claimed in claim 14, characterized in that the control circuit is further configured to control the power adapter through controlling the switch circuit so as to adjust a charging current to a charging current corresponding to the fast charging mode, and before the power adapter

uses the charging current corresponding to the fast charging mode to charge the terminal,

the control circuit performs the bidirectional communication with the terminal through the data lines in the first charging interface to determine a charging voltage corresponding to the fast charging mode and control the power adapter to adjust a charging voltage to the charging voltage corresponding to the fast charging mode.

16. The power adapter as claimed in claim 15, characterized in that before the control circuit controls the power adapter to adjust the charging current to the charging current corresponding to the fast charging mode, the control circuit further performs the bidirectional communication with the terminal through the data lines in the first charging interface to determine the charging current corresponding to the fast charging mode.

17. The power adapter as claimed in claim 16, characterized in that when the control circuit performs the bidirectional communication with the terminal through the data lines in the first charging interface to determine the charging current corresponding to the fast charging mode,

the control circuit sends a second instruction to the terminal, the second instruction is configured to inquire about a maximum charging current currently

supported by the terminal;

the control circuit receives a reply instruction responsive to the second instruction sent by the terminal, the reply instruction responsive to the second instruction is configured to indicate the maximum charging current currently supported by the terminal;

the control circuit determines a charging current of the fast charging mode based on the reply instruction responsive to the third instruction.

18. The power adapter as claimed in claim 14, characterized in that during the process that the power adapter uses the fast charging mode to charge the terminal, the control circuit further performs the bidirectional communication with the terminal through the data lines in the first charging interface to continuously adjust the charging current output to the battery from the power adapter through controlling the switch circuit.

19. The power adapter as claimed in claim 12, characterized in that the control circuit is further configured to acquire a temperature of the first charging interface, and control the switch circuit to turn off when the temperature of the first charging interface is higher than a predetermined protection temperature.

20. A charging method of charging a terminal comprising a power

adapter, the charging method comprises:

rectifying an input alternating current (AC) power to output voltage in a first pulsating waveform during a charging process; and

rectifying voltage coupled from a primary side of the power adapter to a secondary side of the power adapter to generate a secondary rectifying signal, wherein a waveform of a current of the secondary rectifying signal has a same period as period of the first pulsating waveform, or an envelope of the current of the secondary rectifying signal has a same period as period of the first pulsating waveform.