

## CHARGING METHOD, APPARATUS, AND DEVICE FOR FAST CHARGER, AND COMPUTER-READABLE STORAGE MEDIUM

### TECHNICAL FIELD

5           The present invention relates to the field of charging, and in particular to a charging method, apparatus, and device for a fast charger, and a computer-readable storage medium.

### BACKGROUND

10           In the prior art, some chargers used for charging electronic devices charge the electronic devices by converting an alternating current into a direct current. For example, there are 66-watt fast chargers available in the market, which can quickly supplement an energy storage unit of an electronic device to an appropriate state of charge in a short time. However, the fast charging device will inevitably cause overheating problems for the electronic device, and the overheating of the electronic device may lead to aging problems of electronic components  
15           arranged in the electronic device, thus affecting the service life of the electronic device.

          In view of this, the present application is hereby filed.

### SUMMARY

20           The present invention discloses a charging method, apparatus, and device for a fast charger, and a computer-readable storage medium, aiming at solving the problem that existing fast chargers reduce the service life of electronic devices.

          A first embodiment of the present invention provides a charging method for a fast charger, including:

25           receiving basic parameters from an electronic device in real time in response to detection of connection to the electronic device, wherein the basic parameters include a number of batteries provided in the electronic device; and

          outputting a control signal to a voltage conversion circuit according to the basic parameters to enable the voltage conversion circuit to dynamically regulate a value of voltage output to the electronic device, wherein the value of voltage enables each of the batteries to be

charged at a rated voltage.

Optionally, the basic parameters further include a battery temperature value and a state of charge.

Optionally, the step of outputting a control signal to a voltage conversion circuit according to the basic parameters to enable the voltage conversion circuit to dynamically regulate a value of voltage output to the electronic device specifically includes:

controlling the voltage conversion circuit to output a first power to the electronic device for charging in response to detecting that the battery temperature value is lower than a preset value and the state of charge is lower than a preset value; and

controlling the voltage conversion circuit to output a second power to the electronic device for charging in response to detecting that the battery temperature value is higher than the preset value and the state of charge is higher than the preset value, wherein the first power is greater than the second power.

Optionally, the method further includes:

controlling the voltage conversion circuit to output a third power to the electronic device for charging, in response to detecting that the battery temperature value is lower than the preset value and the state of charge is higher than the preset value, or in response to detecting that the battery temperature value is higher than the preset value and the state of charge is lower than the preset value.

A second embodiment of the present invention provides a charging apparatus for a fast charger, including:

a basic parameter receiving unit configured to receive basic parameters from an electronic device in real time in response to detection of connection to the electronic device, wherein the basic parameters include a number of batteries provided in the electronic device; and

a power regulation unit configured to output a control signal to a voltage conversion circuit according to the basic parameters to enable the voltage conversion circuit to dynamically regulate a value of voltage output to the electronic device, wherein the value of voltage enables each of the batteries to be charged at a rated voltage.

Optionally, the basic parameters further include a battery temperature value and a state of charge.

Optionally, the power regulation unit is specifically configured to:

control the voltage conversion circuit to output a first power to the electronic device for charging in response to detecting that the battery temperature value is lower than a preset value and the state of charge is lower than a preset value; and

5 control the voltage conversion circuit to output a second power to the electronic device for charging in response to detecting that the battery temperature value is higher than the preset value and the state of charge is higher than the preset value, wherein the first power is greater than the second power.

Optionally, the power regulation unit is further configured to:

10 control the voltage conversion circuit to output a third power to the electronic device for charging, in response to detecting that the battery temperature value is lower than the preset value and the state of charge is higher than the preset value, or in response to detecting that the battery temperature value is higher than the preset value and the state of charge is lower than the preset value.

15 A third embodiment of the present invention provides a charging device for a fast charger, including a memory and a processor, wherein a computer program is stored in the memory, and the computer program is executable by the processor to implement the charging method for a fast charger described above.

20 A fourth embodiment of the present invention provides a computer-readable storage medium storing a computer program which is executable by a processor of a device in which the computer-readable storage medium is located to implement the charging method for a fast charger described above.

25 Based on the charging method, apparatus, and device for a fast charger, and computer-readable storage medium provided by the present invention, by receiving basic parameters from an electronic device in real time in response to detection of connection to the electronic device, and outputting a control signal to a voltage conversion circuit according to the basic parameters to enable the voltage conversion circuit to dynamically regulate a value of voltage output to the electronic device, the value of voltage enables each of the batteries to be charged at a rated voltage, and the problem that existing fast chargers reduce the service  
30 life of electronic devices is solved as well.

## BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a flow chart of a charging method for a fast charger according to a first embodiment of the present invention; and

Fig. 2 is a block diagram of a charging apparatus for a fast charger according to the first embodiment of the present invention.

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## DETAILED DESCRIPTION

The technical solutions in the embodiments of the present invention are clearly and completely described in the following with reference to the drawings in the embodiments of the present invention. It is obvious that the described embodiments are only some of the  
10 embodiments of the present invention and are not all the embodiments thereof. All other embodiments obtained by those of ordinary skill in the art based on the embodiments of the present invention without inventive effort fall within the scope of the present invention.

In order to better understand the technical solutions of the present invention, the embodiments of the present invention are described in detail below with reference to the  
15 accompanying drawings.

It should be clear that the described embodiments are only some of the embodiments of the present invention instead of all the embodiments thereof. All other embodiments obtained by those of ordinary skill in the art based on the embodiments of the present invention without  
inventive effort fall within the scope of protection of the present invention.

20 Terms used in embodiments of the present invention are for the purpose of describing specific embodiments only and are not intended to limit the present invention. The singular forms “a/an” and “the” as used in the embodiments of the present invention and in the appended claims are also intended to include the plural forms, unless the context clearly dictates otherwise.

25 It should be understood that the term “and/or” used herein is merely an association relationship that describes associated objects, and represents that there may be three kinds of relationships. For example, A and/or B may represent the following three cases: only A exists, both A and B exist, or only B exists. In addition, the slash “/” used herein generally indicates that associated objects are in an “or” relationship.

30 Depending on the context, the word “if” as used herein may be interpreted as “once”, or “when”, or “in response to determining that”, or “in response to detecting that”. Similarly, depending on the context, the phrases “if it is determined that” or “if it is detected that (a

stated condition or event occurs)” can be interpreted as “when it is determined that” or “in response to determining that” or “when it is detected that” or “in response to detecting that (a stated condition or event occurs)”.

5 The reference to “first\second” in the embodiment is merely to distinguish similar objects and does not represent a specific order for the objects, and it is to be understood that “first\ second” may be interchanged in a specific order or sequence if allowed. It should be understood that the objects distinguished by “first\second” are interchangeable where appropriate, such that the embodiments described herein can be implemented in an order other than those illustrated or described herein.

10 Specific embodiments of the present invention are described in detail below with reference to the accompanying drawings.

The present invention discloses a charging method, apparatus, and device for a fast charger, and a computer-readable storage medium, aiming at solving the problem that existing fast chargers reduce the service life of electronic devices.

15 Referring to Fig. 1, a first embodiment of the present invention provides a charging method for a fast charger, which can be executed by a charging device for a fast charger (hereinafter referred to as charging device), in particular by one or more processors within the charging device, to implement at least the following steps.

20 At S101, basic parameters are received from an electronic device in real time in response to detection of connection to the electronic device, wherein the basic parameters include a number of batteries provided in the electronic device.

25 It should be noted that, in this embodiment, the charging device may include a control chip, a rectifier circuit and a voltage conversion circuit. The control chip can carry out protocol interaction with the electronic device to realize a handshake, and charging can be started only after the handshake between the charging device and the electronic device succeeds, before which the charging device can receive the basic parameters sent by the electronic device in real time.

30 In this embodiment, the rectifier circuit can be configured to convert the connected mains power into a direct current and further regulate the voltage through the voltage conversion circuit to output the regulated voltage to the electronic device.

At S102, a control signal is output to the voltage conversion circuit according to the basic parameters to enable the voltage conversion circuit to dynamically regulate a value of

voltage output to the electronic device.

In this embodiment, the control chip regulates the output voltage in response to receiving the number of batteries arranged in the electronic device, so that each battery arranged in the electronic device can be charged at a rated voltage.

5 In one possible embodiment of the present invention, the basic parameters may further include a battery temperature value and a state of charge. Specifically,

the voltage conversion circuit is controlled to output a first power to the electronic device for charging in response to detecting that the battery temperature value is lower than a preset value and the state of charge is lower than a preset value; and

10 the voltage conversion circuit is controlled to output a second power to the electronic device for charging in response to detecting that the battery temperature value is higher than the preset value and the state of charge is higher than the preset value, wherein the first power is greater than the second power.

It should be noted that when the battery temperature is lower than the preset value (e.g. 15 25° C) and the state of charge is lower than the preset value (e.g., 80%), the control chip regulates the duty ratio output to the voltage conversion circuit such that the voltage conversion circuit outputs the first power to the electronic device for charging, wherein the first power may be 66W.

When the battery temperature is greater than the preset value (e.g. 25° C) and the state 20 of charge is greater than the preset value (e.g., 80%), the control chip regulates the duty ratio output to the voltage conversion circuit such that the voltage conversion circuit outputs the second power to the electronic device for charging, wherein the second power may be 33W.

In one possible embodiment of the present invention, the method may further include:

25 controlling the voltage conversion circuit to output a third power to the electronic device for charging, in response to detecting that the battery temperature value is lower than the preset value and the state of charge is higher than the preset value, or in response to detecting that the battery temperature value is higher than the preset value and the state of charge is lower than the preset value.

It should be noted that when the battery temperature is lower than the preset value (e.g. 30 25° C) and the state of charge is higher than the preset value (e.g., 80%), or when the battery temperature is higher than the preset value (e.g. 25° C) and the state of charge is lower than

the preset value (e.g., 80%), the control chip regulates the duty cycle output to the voltage conversion circuit such that the voltage conversion circuit outputs the third power to the electronic device for charging, wherein the third power may be 45W.

5 Herein, in this embodiment, through the communication between an adapter and the electronic device, the basic parameters of the electronic device itself, such as battery temperature and state of charge, can be obtained, which can effectively reduce the heat generated when the fast charging device charges the electronic device.

Referring to Fig. 2, a second embodiment of the present invention provides a charging apparatus for a fast charger, including:

10 a basic parameter receiving unit 201 configured to receive basic parameters from an electronic device in real time in response to detection of connection to the electronic device, wherein the basic parameters include a number of batteries provided in the electronic device; and

15 a power regulation unit 202 configured to output a control signal to a voltage conversion circuit according to the basic parameters to enable the voltage conversion circuit to dynamically regulate a value of voltage output to the electronic device, wherein the value of voltage enables each of the batteries to be charged at a rated voltage.

Optionally, the basic parameters include a battery temperature value and a state of charge.

20 Optionally, the step of outputting a control signal to a voltage conversion circuit according to the basic parameters to enable the voltage conversion circuit to dynamically regulate a value of voltage output to the electronic device specifically includes:

25 controlling the voltage conversion circuit to output a first power to the electronic device for charging in response to detecting that the battery temperature value is lower than a preset value and the state of charge is lower than a preset value; and

controlling the voltage conversion circuit to output a second power to the electronic device for charging in response to detecting that the battery temperature value is higher than the preset value and the state of charge is higher than the preset value, wherein the first power is greater than the second power.

30 Optionally, the method further includes:

controlling the voltage conversion circuit to output a third power to the electronic device for charging, in response to detecting that the battery temperature value is lower than the

preset value and the state of charge is higher than the preset value, or in response to detecting that the battery temperature value is higher than the preset value and the state of charge is lower than the preset value.

5 A third embodiment of the present invention provides a charging device for a fast charger, including a memory and a processor, wherein a computer program is stored in the memory, and the computer program is executable by the processor to implement the charging method for a fast charger described above.

10 A fourth embodiment of the present invention provides a computer-readable storage medium storing a computer program which is executable by a processor of a device in which the computer-readable storage medium is located to implement the charging method for a fast charger described above.

15 Based on the charging method, apparatus, and device for a fast charger, and computer-readable storage medium provided by the present invention, by receiving basic parameters from an electronic device in real time in response to detection of connection to the electronic device, and outputting a control signal to a voltage conversion circuit according to the basic parameters to enable the voltage conversion circuit to dynamically regulate a value of voltage output to the electronic device, the value of voltage enables each of the batteries to be charged at a rated voltage, and the problem that existing fast chargers reduce the service life of electronic devices is solved as well.

20 For example, the computer program described in the third and fourth embodiments of the present invention may be divided into one or more modules, which are stored in the memory and executed by the processor to implement the present invention. The one or more modules may be a series of computer program instruction segments that can enable specific functions, and the instruction segments are configured to describe the execution process of the computer program in a charging device for a fast charger, for example, the apparatus described in the  
25 second embodiment of the present invention.

30 The processor may be a central processing unit (CPU), or other general purpose processors, a digital signal processor (DSP), an application-specific integrated circuit (ASIC), a field-programmable gate array (FPGA), or other programmable logic devices, discrete gates or transistor logic devices, discrete hardware components, etc. The general-purpose processor may be a microprocessor, or the processor may be any conventional processor. The processor is a control center of the charging method for a fast charger, using various interfaces and circuits to connect various parts that are configured to implement the charging method for a

fast charger.

The memory may be configured to store the computer programs and/or modules, and the processor can implement various functions of the charging method for a fast charger by running or executing the computer programs and/or modules stored in the memory and calling  
5 the data stored in the memory. The memory may mainly include a program storage area and a data storage area, wherein the program storage area may store an operating system and application program(s) required by at least one function (such as an audio playback function and a text conversion function), etc.; and the data storage area can store data (such as audio data and text message data) created from the use of a mobile phone. In addition, the memory  
10 may be a high-speed random access memory, or a non-volatile memory, such as a hard disk, internal storage, a plug-in hard disk, a smart media card (SMC), a secure digital (SD) card, a flash card, at least one disk memory device, a flash memory device, or other volatile solid-state memory devices.

Herein, if the implemented modules are implemented in the form of functional units of  
15 software and sold or used as independent products, they can be stored in a computer-readable storage medium. Based on this understanding, all or part of the processes of the methods in the above embodiments may also be completed by related hardware with instructions of a computer program which may be stored in a computer-readable storage medium, and the computer program, when executed by a processor, can enable the implementation of the steps  
20 of the above methods. Herein, the computer program includes computer program code, which may be in the form of source code, object code, an executable file or in some intermediate forms, etc. The computer-readable medium may include: any entity or device capable of carrying computer program code, a recording medium, a USB flash drive, a removable hard disk, a magnetic disk, an optical disk, a computer memory, a read-only memory (ROM), a  
25 random access memory (RAM), an electrical carrier signal, a telecommunication signal, a software distribution medium, etc. It should be noted that the contents contained in the computer-readable medium can be appropriately added or subtracted according to the requirements of legislation and patent practice in jurisdictions. For example, in some jurisdictions, according to legislation and patent practice, the computer-readable medium does  
30 not include electrical carrier signals and telecommunication signals.

It should be noted that the apparatus embodiments described above are only for illustration. The units described as separate components may or may not be physically separated, and the components displayed as units may or may not be physical units, that is,

they may be located in one place or distributed to multiple network units. Some or all of the modules can be selected according to actual needs to achieve the purpose of the embodiment. In addition, in the figures of apparatus embodiments provided by the present invention, the connection between modules means that they are in communication with each other, which  
5 can be specifically realized as one or more communication buses or signal wires. Those of ordinary skill in the art can understand and implement it without creative effort.

Only a preferred embodiment of the present invention is described above, and the scope of protection of the present invention is not limited thereto. Any changes or substitutions that can be readily conceived by those skilled in the art within the technical scope disclosed by the  
10 present invention shall fall within the scope of protection of the present invention. Therefore, the scope of protection of the present invention should be subject to the scope of protection of the claims.

## CLAIMS

1. A charging method for a fast charger, comprising:

receiving basic parameters from an electronic device in real time in response to detection of connection to the electronic device, wherein the basic parameters comprise a  
5 number of batteries provided in the electronic device; and

outputting a control signal to a voltage conversion circuit according to the basic parameters to enable the voltage conversion circuit to dynamically regulate a value of voltage output to the electronic device, wherein the value of voltage enables each of the batteries to be charged at a rated voltage.

10 2. The charging method for a fast charger of claim 1, wherein the basic parameters further comprise a battery temperature value and a state of charge.

3. The charging method for a fast charger of claim 2, wherein the step of outputting a control signal to a voltage conversion circuit according to the basic parameters to enable the voltage conversion circuit to dynamically regulate a value of voltage output to the electronic  
15 device specifically comprises:

controlling the voltage conversion circuit to output a first power to the electronic device for charging in response to detecting that the battery temperature value is lower than a preset value and the state of charge is lower than a preset value; and

20 controlling the voltage conversion circuit to output a second power to the electronic device for charging in response to detecting that the battery temperature value is higher than the preset value and the state of charge is higher than the preset value, wherein the first power is greater than the second power.

4. The charging method for a fast charger of claim 3, further comprising:

25 controlling the voltage conversion circuit to output a third power to the electronic device for charging, in response to detecting that the battery temperature value is lower than the preset value and the state of charge is higher than the preset value, or in response to detecting that the battery temperature value is higher than the preset value and the state of charge is lower than the preset value.

5. A charging apparatus for a fast charger, comprising:

a basic parameter receiving unit configured to receive basic parameters from an electronic device in real time in response to detection of connection to the electronic device, wherein the basic parameters comprise a number of batteries provided in the electronic device;

5 and

a power regulation unit configured to output a control signal to a voltage conversion circuit according to the basic parameters to enable the voltage conversion circuit to dynamically regulate a value of voltage output to the electronic device, wherein the value of voltage enables each of the batteries to be charged at a rated voltage.

10 6. The charging apparatus for a fast charger of claim 5, wherein the basic parameters further comprise a battery temperature value and a state of charge.

7. The charging apparatus for a fast charger of claim 6, wherein the power regulation unit is specifically configured to:

15 control the voltage conversion circuit to output a first power to the electronic device for charging in response to detecting that the battery temperature value is lower than a preset value and the state of charge is lower than a preset value; and

20 control the voltage conversion circuit to output a second power to the electronic device for charging in response to detecting that the battery temperature value is higher than the preset value and the state of charge is higher than the preset value, wherein the first power is greater than the second power.

8. The charging apparatus for a fast charger of claim 7, wherein the power regulation unit is further configured to:

25 control the voltage conversion circuit to output a third power to the electronic device for charging, in response to detecting that the battery temperature value is lower than the preset value and the state of charge is higher than the preset value, or in response to detecting that the battery temperature value is higher than the preset value and the state of charge is lower than the preset value.

9. A charging device for a fast charger, comprising a memory and a processor, wherein

a computer program is stored in the memory, and the computer program is executable by the processor to implement the charging method for a fast charger of any one of claims 1 to 4.

10. A computer-readable storage medium storing a computer program which is executable by a processor of a device in which the computer-readable storage medium is  
5 located to implement the charging method for a fast charger of any one of claims 1 to 4.

## ABSTRACT

The present invention provides a charging method, apparatus, and device for a fast charger, and a computer-readable storage medium. By receiving basic parameters from an electronic device in real time in response to detection of connection to the electronic device, and outputting a control signal to a voltage conversion circuit according to the basic parameters to enable the voltage conversion circuit to dynamically regulate a value of voltage output to the electronic device, the value of voltage enables each of the batteries to be charged at a rated voltage, and the problem that existing fast chargers reduce the service life of electronic devices is solved as well.