Title: PLUG WITH INSERTED ADAPTER

Abstract: Disclosed is a plug with an inserted adapter including a cylindrical housing body, a fixing plate on which plug insertion pins are fixed, the fixing plate being disposed in the housing body, and an electronic circuit for converting alternating electric power transmitted from the plug insertion pins inserted in the housing body into direct electric power.
PLUG WITH INSERTED ADAPTER

Technical Field

The present invention relates to a plug with an inserted adapter and a portable charging equipment using such a plug, and more particularly, to a plug having a rectifier, a circuit such as a switched mode power supply (SMPS), and a plug housing on which protruded walls and heat-discharging slots are formed, thereby providing convenience in use and improvement in heat-discharge efficiency thereto, and to charging equipment for charging a charging part using such a plug.

Background Art

A plug has been developed that is integrated with an adapter and minimized in size so as to be portable. However, the minimization has been limited due to the size of electronic devices disposed in the plug. Therefore, an SMPS type circuit has been employed to remarkably reduce the size of the plug. When the SMPS-type circuit is employed, a large amount of heat is generated. Therefore, it is imperative to discharge the heat generated by the circuit out of the plug. However, an appropriate structure for discharging the heat has not yet been developed.

Disclosure of the Invention

Accordingly, the present invention is directed to a plug with an inserted adapter and a charging equipment
using such a plug that substantially obviate one or more problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a plug with an inserted adapter that has an appropriate structure for discharging heat generated by an internal electric device to the outside.

Another objective of the present invention is to provide charging equipment for charging electric power to portable devices such as a mobile phone by use of electric power output from such a plug.

Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, there is provided a plug with an inserted adapter, comprising a cylindrical housing body; a fixing plate on which plug insertion pins are fixed, the fixing plate being disposed in the housing body; and an electronic circuit for converting alternating electric power transmitted from the plug insertion pins inserted in the housing body into direct electric power.
Preferably, the housing body comprises a grasping portion provided with a heat discharge slot for discharging heat to an outside.

The grasping portion comprises sidewalls extending downward from a rear-top portion of the housing body by a predetermined length, and protruded walls perpendicularly extending from rear ends of the sidewalls.

Preferably, the heat discharge slot is formed on the sidewalls.

In addition, the electronic circuit is formed on a board provided with through holes, and small diameter projections are formed on rear ends of the insertion pins, the small diameter projections being fixedly inserted into the through holes.

Preferably, the housing body comprises two halves that are welded in a state where the fixing plate fixing the board is disposed in the housing.

It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

Brief Description of the Drawings

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the
invention. In the drawings:

FIG. 1 is a perspective view illustrating a plug according to an embodiment of the present invention;

FIG. 2 is an exploded perspective view illustrating a plug depicted in FIG. 1; and

FIG. 3 is a perspective view illustrating charging equipment where a plug according to the present invention is employed.

10 **Best Mode for Carrying Out the Invention**

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts. It is intended that the following description covers the modifications and variations of this invention. Therefore, it will be apparent to those skilled in the art that various modifications and variations can be made in the present invention. In addition, in the description of the present invention, when it is determined that related art or a well-known constitution may inferior the feature of the present invention, the description thereof will be omitted herein.

25 FIGs. 1 and 2 are respectively perspective and exploded perspective views illustrating a plug according to an embodiment of the present invention.

As shown in the drawings, two terminal insertion pins 20 and 20' are fixedly inserted in socket holes formed
through a front wall of a housing 10. A wire withdraw part 11 is formed on a lower-rear end of the housing 10 to withdraw the wire to the outside thereof.

The housing 10 comprises a cylindrical body 12 and a grasping portion 13 formed on a rear end of the body 12. The grasping portion 13 allows a user to easily insert or pull out the plug into or from a socket, while being provided with heat discharge slots for discharging internal heat out of the plug. The grasping portion 13 comprises sidewalls 14 and 14′ extending downward from a rear-top portion of the body 12 by a predetermined length, and protruded walls 15 and 15′ perpendicularly extending from rear ends of the sidewalls 14 and 14′, respectively.

In addition, the heat discharge slots are formed on the sidewalls 14 and 14′. The shape of the slots is not limited herein, but they are preferably formed in a longitudinal or lateral direction of the sidewalls 14 and 14′.

In addition, as shown in FIG. 2, a fixing plate 21 for fixing the insertion pins 20 and 20′ is installed on a front end of the housing 10, and guide rods 22 and 22′ are formed on upper and lower ends of the fixing plates. The guide rods 22 and 22′ are designed to be guided by a guide portion of the socket.

The fixing plate 21 is provided at a rear surface with a plurality of projections 23 each having a predetermined length to support a printed circuit board (PCB) 30. The fixing plate 21 may be further provided at the rear surface with a plurality of fixing projections 24.
penetrating the PCB 30. In addition, rear end portions of the insertion pins 20 and 20' are fixed on the fixing plate. The insertion pins 20 and 20' are provided at the respective rear ends with projections fixedly inserted in the PCB to prevent the PCB from moving, each of the projections having a diameter smaller than that of the insertion pin 20. Circuit parts having a relatively short length are disposed in a space defined between the PCB 30 and the fixing plate 21, and circuit devices having a relatively large volume are disposed in a space defined by the PCB 30 and the housing body 10.

As shown in FIG. 2, the PCB 30 on which a variety of parts are coupled is fixedly installed on the fixing plate 21, and the PCB 30 and the fixing plate 21 are fitted on the body 10 separated into two halves. The body 10 is provided at an inner wall with insertion holes on which the PCB 30 and the fixing plate 21 are fixed. The two halves of the body 10 are coupled to each other by, for example, ultrasonic-welding after the PCB 30 and the fixing plate 21 are fixedly inserted, thereby completing a product.

FIG. 3 shows charging equipment for a mobile phone, in which the plug of the present invention is employed.

The charging equipment comprises a plug 100 with an inserted adapter 100 and a charging socket 200 connected to the plug 100 through a power supply line 300. The charging socket 200 receives output from an output end of the plug 100 through the power supply line for constant voltage and current charge.

The charging socket 200 is provided with a charging
terminal coupled to a charging terminal of a portable electric device such as a mobile phone. The charging socket has a charging circuit inserted therein.

For conventional charging equipment, the charging circuit is provided on an adapter and is designed to apply a rated voltage of 4.2 volts to the mobile phone. However, even when the charging circuit provided on the adapter outputs the rated voltage of 4.2 volts, the rated voltage cannot be fully supplied due to a voltage drop occurring at the power supply line 300.

However, for the charging equipment of the present invention, since the charging circuit is installed in the charging socket 200, there is no voltage drop caused by the power supply line. As a result, the rated voltage of 4.2 volts can be fully supplied to the charging terminal of the mobile phone.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

**Industrial Applicability**

As described above, the plug of the present invention has a variety of advantages, as follows:

(1) The plug can be easily inserted in or pulled out of the socket, and it is designed to effectively discharge internal heat generated by electronic circuits out of the
plug;

(2) Since the electronic circuits can be securely fixed in the housing, the possibility of malfunction can be reduced;

(3) The plug can be employed to charge electric power to a variety of portable electric devices such as a mobile phone; and

(4) Since the adapter circuit is inserted in the plug, it does not conflict with other peripheral plugs when it is inserted into a socket.
Claims:

1. A plug with an inserted adapter, comprising:
   a cylindrical housing body;
   a fixing plate on which plug insertion pins are fixed,
   the fixing plate being disposed in the housing body; and
   an electronic circuit for converting alternating
   electric power transmitted from the plug insertion pins
   inserted in the housing body into direct electric power.

2. The plug according to claim 1, wherein the
   housing body comprises a grasping portion provided with a
   heat discharge slot for discharging heat to an outside.

3. The plug according to claim 2, wherein the
   grasping portion comprises sidewalls extending downward
   from a rear-top portion of the housing body by a
   predetermined length, and protruded walls perpendicularly
   extending from rear ends of the sidewalls.

4. The plug according to claim 2, wherein the heat
   discharge slot is formed on the sidewalls.

5. The plug according to any one of claims 1 to 4,
   wherein the electronic circuit is formed on a board
   provided with through holes, and small diameter projections
   are formed on rear ends of the insertion pins, the small
   diameter projections being fixedly inserted into the
   through holes.
6. The plug according to any one of claims 1 to 4, wherein the housing body comprises two halves that are welded in a state where the fixing plate fixing the board is disposed in the housing.
INTERNATIONAL SEARCH REPORT  

A. CLASSIFICATION OF SUBJECT MATTER  

IPC7 H01R 29/00  

According to International Patent Classification (IPC) or to both national classification and IPC  

B. FIELDS SEARCHED  

Minimum documentation searched (classification system followed by classification symbols)  

IPC7 H01R 13/46, H01R 31/06  

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  

Korean Patents and applications for inventions since 1975  

Korean Utility models and applications for Utility models since 1975  

Japanese Utility models and applications for Utility models since 1975  

Electronic database consulted during the international search (name of database and, where practicable, search terms used)  

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C. DOCUMENTS CONSIDERED TO BE RELEVANT  

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tr>
<td>Y</td>
<td>KR 20-0256159 Y1 (KIM, MYOUNG-CHUN) 13 December 2001 See the whole document</td>
<td>1-6</td>
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<tr>
<td>A</td>
<td>KR 20-0248051 Y1 (JUSIN ELECTRONICS CO., LTD) 29 October 2001 See the whole document</td>
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<td>KR 10-0308714 B1 (ANAM INSTRUMENT CO. LTD) 30 November 2001 See the whole document</td>
<td>1-6</td>
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Further documents are listed in the continuation of Box C.  

Date of the actual completion of the international search  

29 OCTOBER 2003 (29.10.2003)  

Date of mailing of the international search report  

29 OCTOBER 2003 (29.10.2003)  

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