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Apparatus, method, and computer-readable storage medium for transmitting and receiving power wirelessly for personal mobility having replaceable module

Abstract

An embodiment apparatus for wirelessly transmitting and receiving power for a personal mobility device having a replaceable module includes a power transmitter; a processor and a non-transitory computer-readable storage medium having recorded thereon one or more programs executable by the processor, wherein the one or more programs include instructions for implementing an identification unit configured to identify an upper module coupled to a base frame, and a power setting unit configured to set a maximum power to be wirelessly transmitted to the identified upper module, wherein the maximum power is set depending on the upper module, wherein the power transmitter is configured to wirelessly transmit power to the identified upper module within the set maximum power.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS

(1) This application claims the benefit of Korean Patent Application No. 10-2023-0020283, filed on Feb. 15, 2023, which application is hereby incorporated herein by reference.

TECHNICAL FIELD

(2) The present disclosure relates to an apparatus, a method, and a computer-readable storage medium for wirelessly transmitting and receiving power for a personal mobility device having a replaceable module.

BACKGROUND

- (3) Recently, personal mobility device products capable of coupling various upper modules to one base frame have been researched. For example, an upper module of a stroller, an upper module of an electric car for children, an upper module of a wagon for children, and the like may be coupled to the base frame. In general, loads of respective upper modules may be different from each other.
- (4) For example, in the case of an upper module of an electric car for children, a load such as a brake light, a horn, or a daytime running light may be used. In the case of a stroller or a wagon for children, a load such as a mobile phone charging module or a stationary fan may be used.
- (5) In general, power used for a load used in an upper module is supplied from a battery within a base module via a power cable. Therefore, it is not easy to attach or detach the upper module to or from the base frame due to a power cable.
- (6) In addition, power is supplied without considering the load used in the upper module, and thus a travel distance per charge of a personal mobility device may be shortened.

SUMMARY

- (7) An embodiment of the present disclosure provides an apparatus, method, and computer-readable storage medium for wirelessly transmitting and receiving power for a personal mobility device having a replaceable module capable of allowing an upper module to be easily attached to or detached from a base frame due to a power cable not being required.
- (8) Another embodiment of the present disclosure provides an apparatus, method, and computer-readable storage medium for wirelessly transmitting and receiving power for a personal mobility device having a replaceable module capable of optimizing a travel distance per charge of the personal mobility device, and resolving an issue associated with a travel distance of the personal mobility device being shortened when a user is riding on a trailer fastened to a base frame.
- (9) According to an embodiment of the present disclosure, there is provided an apparatus for wirelessly transmitting and receiving power for a personal mobility device having a replaceable module, the apparatus including a power transmitter, a processor and a storage medium recording one or more programs configured to be executable by the processor. The one or more programs include instructions for implementing an identification unit configured to identify an upper module coupled to a base frame and a power setting unit configured to set a maximum power to be wirelessly transmitted to the identified upper module, wherein the power transmitter is configured to wirelessly transmit power to the identified upper module within the set maximum power. The maximum power may be set depending on the upper module.
- (10) According to another embodiment of the present disclosure, there is provided a method for wirelessly transmitting and receiving power for a personal mobility device having a replaceable module, the method including a first operation of identifying, by an identification unit, an upper module coupled to a base frame, a second operation of setting, by a power setting unit, a maximum power to be wirelessly transmitted to the identified upper module, and a third operation of wirelessly transmitting, by a power transmitter, power to the identified upper module within the set maximum power. The maximum power may be set depending on the upper module.
- (11) According to another embodiment of the present disclosure, there is provided a computer-readable storage medium recording a program for executing the method on a computer.
- (12) According to an example embodiment of the present disclosure, power may be wirelessly transmitted to an upper module coupled to a base frame, such that the upper module may also use the power of the base frame without any manipulation. A power cable may not be required, such that the upper module may be easily attached to or detached from the base frame.
- (13) In addition, according to an example embodiment of the present disclosure, a maximum power transmitted to the upper module may be set depending on the upper module, thereby optimizing a travel distance per charge of a personal mobility device.
- (14) In addition, according to an example embodiment of the present disclosure, when a user is riding on a trailer fastened to the base frame, a maximum power to be transmitted to the upper

module may be subtracted and transmitted, thereby resolving the issue associated with a travel distance of the personal mobility device being shortened.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) The above and other aspects, features, and advantages of embodiments of the present disclosure will be more clearly understood from the following detailed description, taken in conjunction with the accompanying drawings, in which:

(2) FIG. 1 is a diagram illustrating an apparatus for wirelessly transmitting and receiving power for a personal mobility device having a replaceable module according to an example embodiment of the present disclosure;

(3) FIG. 2 is an exemplary diagram illustrating a personal mobility device having a replaceable module including a base frame and an upper module attachable to and detachable from the base frame according to an example embodiment of the present disclosure;

(4) FIG. 3 is a flowchart illustrating a method for wirelessly transmitting and receiving power for a personal mobility device having a replaceable module according to an example embodiment of the present disclosure; and

(5) FIG. 4 is a block diagram illustrating a computer device capable of implementing, in whole or in part, a device for transmitting/receiving wireless power for a personal mobility device having a replaceable module according to an example embodiment of the present disclosure.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

(6) Hereinafter, example embodiments of the present disclosure are described with reference to the accompanying drawings. The present disclosure may, however, be exemplified in many different forms and should not be construed as being limited to the specific example embodiments set forth herein. The shapes and sizes of the elements in the drawings may be exaggerated for clarity of description, and the elements denoted by the same reference numerals in the drawings may be the same elements.

(7) FIG. 1 is a diagram illustrating an apparatus for wirelessly transmitting and receiving power for a personal mobility device having a replaceable module according to an example embodiment of the present disclosure. FIG. 2 is an exemplary diagram illustrating a personal mobility device having a replaceable module including a base frame and an upper module attachable to and detachable from the base frame according to an example embodiment of the present disclosure.

(8) In embodiments of the present disclosure, a personal mobility device **200** having a replaceable module may refer to a means of transportation powered by electricity. As illustrated in FIG. 2, the personal mobility device **200** may include a base frame **210** and an upper module **220** attachable to or detachable from the base frame **210**. In some example embodiments, the personal mobility device **200** may further include a trailer **230** that may be fastened to the base frame **210**.

(9) The base frame **210** described above may move via a driving wheel **211** and may have an upper portion to which an upper module **220** may be coupled. The base frame **210** may include a wireless power transmission apparatus **110** (to be described below) for wirelessly transmitting power stored in a battery. In addition, a transmission resonance coil **114c** of the wireless power transmission apparatus **110** may be provided on an upper surface of the base frame **210**.

(10) In addition, the upper module **220** may be coupled to an upper portion of the base frame **210** and may include a wireless power reception apparatus **120** (to be described below) for receiving power wirelessly transmitted from the wireless power transmission apparatus **110** described above. In addition, a reception resonance coil **124a** of the wireless power reception apparatus **120** may be provided on a lower surface of the upper module **220**.

(11) The upper module **220** may be, for example, an upper frame of an electric car for children, as

illustrated in FIG. 2. In addition, it may be obvious to those skilled in the art that various upper modules such as an upper frame of a stroller, an upper frame of a wagon for children, and the like may be used, when the upper modules are attachable to or detachable from the base frame **210**.

(12) A space **221** in which a user of a preset age or younger rides or cargo is loaded may be formed in an upper portion of the upper module **220** described above.

(13) In a state in which the upper module **220** is coupled to the base frame **210**, the transmission resonance coil **114c** and the reception resonance coil **124a** may be spaced apart from each other by a predetermined interval. In addition, in a state in which the upper module **220** is coupled to the base frame **210**, a central portion of the transmission resonance coil **114c** and a central portion of the reception resonance coil **124a** may be aligned with each other in an upward direction. Here, being aligned with each other means that the central portion of the transmission resonance coil **114c** and the central portion of the reception resonance coil **124a** are present on a straight line VL in the upward direction. Such a structure may maximize power transmission efficiency.

(14) In addition, the trailer **230** may be further coupled to the base frame **210** described above. The user may ride on an upper portion of the trailer **230** described above and may include a weight measurement sensor **231** for measuring a weight of the user. The weight of the user measured by the weight measurement sensor **231** may be transmitted to the wireless power transmission apparatus **110** in a wired or wireless manner.

(15) Referring back to FIG. 1, a wireless power transmission/reception apparatus **100** for a personal mobility device having a replaceable module according to an example embodiment may include the wireless power transmission apparatus **110** and the wireless power reception apparatus **120**. For ease, FIG. 1 illustrates loads **211**, **212**, and **222** connected to the wireless power transmission/reception apparatus **100** in addition to the wireless power transmission/reception apparatus **100**.

(16) The wireless power transmission apparatus **110** may include a switch **111**, a storage unit, i.e., a memory, **112**, a battery **113**, a power transmitter **114**, a controller **115**, and a communication unit **116**. The base frame **210** may include a driving wheel **211** and a driving motor **212**.

(17) Specifically, the switch **111** may be, for example, a switch such as an ignition key. An ON signal of the switch **111** described above may be transmitted to the controller **115** to be described below.

(18) The storage unit **112** may be a module for storing various programs for implementing functions performed by the controller **115** described above. In addition, a maximum power for each upper module may be pre-stored in the storage unit **112**, as indicated in Table 1 below.

(19) As indicated in Table 1 below, the above-described maximum power may be different for each upper module, and the maximum power for each upper module may be proportional to a total power of a load used in a corresponding upper module (for example, the number of supportable applications). Therefore, the more loads that are used in the upper module, that is, the more brake lights, mobile phone charging modules, horns, and stationary fans that are attached, the higher a wireless power transmission level, and thus the maximum power may increase.

(20) TABLE-US-00001

TABLE 1 WIRELESS POWER THE TRANS-	MAX-	NUMBER OF
UPPER MISSION	IMUM	SUPPORTABLE
MODULE	LEVEL	POWER
APPLICATIONS		
NOTES	UPPER LEVEL 1	10 W
1	ADJUST	MODULE 1
MAXIMUM	UPPER LEVEL 2	35 W
3	3	50 W
5	5	70 W
7	7	120 W
10	10	150 W

(21) When an upper module coupled to the base frame **210** is identified, the controller **115** may refer to the storage unit **112** to set a maximum power of the identified upper module. For example, when the identified upper module is Upper Module **3**, a maximum power of 50 W may be set as the maximum power, and power may be wirelessly transmitted to the upper module within the set maximum power.

(22) The battery **113** may provide power to the driving motor **212** and the power transmitter **114**.

(23) The power transmitter **114** may wirelessly transmit, to the identified upper module, power stored in the battery **113** within the set maximum power.

(24) The power transmitter **114** may include a DC-AC converter **114a** converting a DC voltage stored in the battery **113** into an AC voltage and the transmission resonance coil **114c** wirelessly transmitting power by the converted AC voltage using a preset wireless power transmission method. In some example embodiments, the power transmitter **114** may further include a matching network **114b** for impedance matching. The above-described wireless power transmission method may include, for example, a magnetic induction method or a magnetic resonance method.

(25) The controller **115** may include an identification unit **115a** and a power setting unit **115b**.

(26) Specifically, when identification information is transmitted from the communication unit **116** to be described below, the identification unit **115a** may identify the upper module coupled to the base frame **210** with reference to the storage unit **112**. The above-described identification information may be information for distinguishing upper modules from each other, and may be, for example, in the form of Upper Module 1, Upper Module 2, Upper Module 3, Upper Module 4, and Upper Module 5 indicated in Table 1 above. However, it should be noted that, when the upper modules are distinguishable from each other, the form of the identification information is not limited to the above-described form.

(27) The power setting unit **115b** may set a maximum power to be wirelessly transmitted to the identified upper module with reference to the storage unit **112**. Thereafter, the power transmitter **114** may wirelessly transmit, to the identified upper module, the power stored in the battery **113** within the set maximum power.

(28) In addition, according to an example embodiment of the present disclosure, the power setting unit **115b** may determine whether the user is riding on the trailer **230**. As a result of the determination, when the user is riding on the trailer **230**, the power setting unit **115b** may adjust the set maximum power.

(29) Specifically, the power setting unit **115b** may determine, based on at least one of a weight measured by the weight measurement sensor **231** and an output of the driving motor **212**, whether the user is riding on the trailer **230**. Accordingly, when the weight measured by the weight measurement sensor **231** is a preset weight, for example, 40 kg or more, it may be determined that the user is riding on the trailer **230**. Alternatively, when the output of the driving motor **212** is a preset output, for example, 50 W or more, it may be determined that the user is riding on the trailer **230**. Alternatively, when the weight measured by the weight measurement sensor **231** is 40 kg or more and the output of the driving motor **212** is 50 W or more, it may be determined that the user is riding on the trailer **230**.

(30) Thereafter, when it is determined that the user is riding on the trailer **230**, the power setting unit **115b** may subtract a power having a preset magnitude from the maximum power set above. The power having a preset magnitude may be, for example, 5 W, but the above-described specific numerical value may be changed depending on the needs of those skilled in the art.

(31) According to another example embodiment of the present disclosure, when it is determined that a user is riding on the trailer **230**, the power setting unit **115b** may subtract power associated with the weight of the user from the maximum power. For example, 5 W may be subtracted from the maximum power when the weight of the user is 40 kg, and 10 W may be subtracted from the maximum power when the weight of the user is 50 kg.

(32) Thus, according to an example embodiment of the present disclosure, when the user is riding on the trailer **230** fastened to the base frame **210**, the maximum power to be transmitted to the upper module **220** may be subtracted and transmitted, thereby resolving the issue associated with a travel distance of the personal mobility device **200** being shortened.

(33) When the switch **111** is turned on, the communication unit **116** may transmit an identification information request to the wireless power reception apparatus **120** and may receive identification information from the wireless power reception apparatus **120**. The received identification

information may be transmitted to the above-described identification unit **115a**, and the identification unit **115a** may identify, based on the identification information, the upper module **220** coupled to the base frame **210**.

(34) The above-described communication unit **116** may transmit and receive the identification information from and to the wireless power reception apparatus **120** to be described below using an in-band or out-of-band communication method.

(35) The wireless power reception apparatus **120** may include a power receiver **124**, a controller **125**, and a communication unit **126**. The load **222** illustrated in FIG. **1** may be included in the upper module **220**. The load **222** may include, for example, various things necessary for the upper module **220**, such as a mobile phone charging module, a horn, and a stationary fan in addition to a brake light, as illustrated in FIG. **2**.

(36) The power receiver **124** may include the reception resonance coil **124a** magnetically coupled to the transmission resonance coil **114c** to wirelessly receive power by an AC voltage, a rectification unit **124c** rectifying the power wirelessly received by the reception resonance coil **124a** into a DC voltage, and a DC-DC converter **124d** converting the DC voltage rectified by the rectification unit **124c** into a DC voltage having a magnitude required by the load **222**. In some example embodiments, the power receiver **124** may also include a matching network **124b** for impedance matching.

(37) The controller **125** may receive the identification information request via the communication unit **126** and may transmit the identification information of the upper module to the wireless power transmission apparatus **110**.

(38) When the identification information request is received from the wireless power transmission apparatus **110**, the communication unit **126** may transmit the identification information request to the controller **125** and may transmit the identification information to the wireless power transmission apparatus **110** under the control of the controller **125**.

(39) As described above, according to an example embodiment of the present disclosure, power may be wirelessly transmitted to an upper module coupled to a base frame, such that the upper module may also use the power of the base frame without any manipulation. A power cable may not be required, such that the upper module may be easily attached to or detached from the base frame.

(40) In addition, according to an example embodiment of the present disclosure, a maximum power transmitted to the upper module may be set depending on the upper module, thereby optimizing a travel distance per charge of a personal mobility device.

(41) In addition, according to an example embodiment of the present disclosure, when a user is riding on a trailer fastened to the base frame, a maximum power to be transmitted to the upper module may be subtracted and transmitted, thereby resolving the issue associated with a travel distance of the personal mobility device being shortened.

(42) FIG. **3** is a flowchart illustrating a method for wirelessly transmitting and receiving power for a personal mobility device having a replaceable module according to an example embodiment of the present disclosure.

(43) Hereinafter, a wireless power transmission/reception method (**S300**) for a personal mobility device having a replaceable module according to an example embodiment of the present disclosure will be described with reference to FIGS. **1** to **3**. However, descriptions overlapping those of FIGS. **1** and **2** are omitted for simplicity of the disclosure.

(44) Referring to FIGS. **1** to **3**, the wireless power transmission/reception method (**S300**) for a personal mobility device having a replaceable module according to an example embodiment of the present disclosure may be started by determining, by the controller **115** of the wireless power transmission apparatus **110**, whether the switch **111** included in the base frame **210** is turned on (**S301**).

(45) When the switch **111** is turned on, the controller **115** may transmit an identification

information request to the wireless power reception apparatus **120** via the communication unit **116** (S302) and may then receive identification information from the wireless power reception apparatus **120** (S303).

(46) Subsequently, the controller **115** may identify, based on the received identification information, an upper module coupled to the base frame **210** (S304).

(47) Subsequently, the controller **115** may set a maximum power to be wirelessly transmitted to the identified upper module (S305).

(48) Here, the maximum power may be set depending on the upper module, and the maximum power of the upper module may be proportional to a total power of a load used in the upper module.

(49) Subsequently, the controller **115** may determine whether the user is riding on the trailer **230** (S306). As a result of the determination in operation S306, when the user does not ride on the trailer **230**, the power transmitter **114** may wirelessly transmit, to the identified upper module, power stored in the battery **113** within the set maximum power (S308).

(50) Here, the controller **115** may determine, based on at least one of a weight measured by the weight measurement sensor **231** and an output of the driving motor **212**, whether the user is riding on the trailer **230**, as described above.

(51) As a result of the determination in operation S306, when the user is riding on the trailer **230**, the controller **115** may adjust the maximum power set above (S307).

(52) Here, when it is determined that the user is riding on the trailer **230**, the controller **115** may subtract a power having a predetermined magnitude from the maximum power set above.

(53) Alternatively, as described above, when it is determined that the user is riding on the trailer **230**, the controller **115** may subtract power associated with the weight of the user from the maximum power.

(54) Finally, the power transmitter **114** may wirelessly transmit the power stored in the battery **113** to the upper module within the set maximum power (S308).

(55) As described above, according to an example embodiment of the present disclosure, power may be wirelessly transmitted to an upper module coupled to a base frame, such that the upper module may also use the power of the base frame without any manipulation. A power cable may not be required, such that the upper module may be easily attached to or detached from the base frame.

(56) In addition, according to an example embodiment of the present disclosure, a maximum power transmitted to the upper module may be set depending on the upper module, thereby optimizing a travel distance per charge of a personal mobility device.

(57) In addition, according to an example embodiment of the present disclosure, when a user is riding on a trailer fastened to the base frame, a maximum power to be transmitted to the upper module may be subtracted and transmitted, thereby resolving the issue associated with a travel distance of the personal mobility device being shortened.

(58) FIG. 4 is a block diagram illustrating a computer device capable of implementing, in whole or in part, a device for transmitting/receiving wireless power for a personal mobility device having a replaceable module according to an example embodiment of the present disclosure and may be applied to the wireless power transmission/reception apparatus **100** illustrated in FIG. 1.

(59) As illustrated in FIG. 4, a computer device **400** may include an input interface **401**, an output interface **402**, a processor **404**, a memory **405**, and a communication interface **406**, and the input interface **401**, the output interface **402**, the processor **404**, the memory **405**, and the communication interface **406** may be interconnected via a system bus **403**.

(60) The communication interface **406** may be connected to a network via wireless or wired communication, and thus may communicate with an external device. The wireless communication may include, for example, cellular communication using at least one of LTE, LTE advance (LTE-A), code division multiple access (CDMA), wideband CDMA (WCDMA), a universal mobile

telecommunications system (UMTS), wireless broadband (WiBro), or a global system for mobile communications (GSM). According to an example embodiment, the wireless communication may include, for example, at least one of wireless fidelity (WiFi), Bluetooth, Bluetooth low energy (BLE), Zigbee, near field communication (NFC), magnetic secure transmission, radio frequency (RF), or a body area network (BAN). According to an example embodiment, the wireless communication may include GNSS. The GNSS may be, for example, a global positioning system (GPS), a global navigation satellite system (Glonass), a Beidou navigation satellite system (hereinafter “Beidou”) or Galileo, the European global satellite-based navigation system. The wired communication may include, for example, at least one of a universal serial bus (USB), a high-definition multimedia interface (HDMI), recommended standard 232 (RS-232), power line communication, or a plain old telephone service (POTS). The network may include at least one of a telecommunications network, for example, a computer network (for example, LAN or WAN), the Internet, or a cellular network.

(61) In an example embodiment of the present disclosure, the memory **405** is used to store programs, instructions, or codes, and the processor **404** executes the programs, instructions, or codes stored in the memory **405**, controls the input interface to receive signals, and controls the output interface **402** to transmit signals. The aforementioned memory **405** may include read-only memory and random access memory and may provide instructions and data to the processor **404**. The communication interface **406** may implement the communication units **116** and **126**.

(62) In an example embodiment of the present disclosure, the processor **404** may be a central processing unit (CPU) and may be understood as being another general-purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or another programmable logic device, an individual gate or transistor logic device, an individual hardware component, or the like. A general-purpose processor may be a microprocessor, or the processor may be any processor according to the related art or the like. The processor **404** described above may perform an operation of an apparatus for wirelessly transmitting and receiving power for a personal mobility device.

(63) In an implementation process, the method of FIG. **3** may be accomplished by an integrated logic circuit of hardware in the processor **404** or an instruction in the form of software. The method disclosed with respect to example embodiments of the present disclosure may be performed and completed by a hardware processor or may be performed and completed by a combination of hardware in the processor and a software module. The software module may be disposed in a storage medium such as random access memory, flash memory, read-only memory, programmable read-only memory, or electrically erasable programmable memory, a register, or the like. The storage medium may be positioned in the memory **405**. The processor **404** may read information in the memory **405** and may implement the above-described method in combination with hardware. In order to avoid redundancy, a detailed description will be omitted herein.

(64) In the present disclosure, “. . . unit” may be implemented in various manners, for example, by a processor, program instructions executed by the processor, a software module, a microcode, a computer program product, a logic circuit, an application-specific integrated circuit, firmware, or the like, or may be implemented by hardware.

(65) While embodiments of the present disclosure have been illustrated and described above, it will be apparent to those skilled in the art that modifications and variations could be made without departing from the scope of the present disclosure as defined by the appended claims.

Claims

1. An apparatus for wirelessly transmitting and receiving power for a personal mobility device having a replaceable module, the apparatus comprising: a power transmitter; a processor; and a non-transitory computer-readable storage medium having recorded thereon one or more programs

executable by the processor, wherein the one or more programs include instructions for: identifying an upper module coupled to a base frame; and setting a maximum power to be wirelessly transmitted to the identified upper module, wherein the maximum power is set depending on the upper module, wherein the power transmitter is configured to wirelessly transmit power to the identified upper module within the set maximum power, wherein the upper module is attachable to or detachable from the base frame, wherein the base frame comprises a driving wheel, a driving motor configured to drive the driving wheel, a battery and the power transmitter configured to wirelessly transmit the power stored in the battery, and wherein the upper module comprises power receiver configured to receive the wirelessly transmitted power.

2. The apparatus of claim 1, wherein the maximum power is set in proportion to a total power of a load used in the upper module.
3. The apparatus of claim 1, wherein the base frame is further couplable to a trailer having an upper portion on which a user can ride, the trailer comprising a weight measurement sensor configured to measure a weight of the user.
4. The apparatus of claim 3, wherein a power setting unit is configured to: determine whether the user is riding on the trailer; and adjust the set maximum power in response to a determination that the user is riding on the trailer.
5. The apparatus of claim 4, wherein the power setting unit is configured to determine whether the user is riding on the trailer based on the weight measured by the weight measurement sensor or an output of the driving motor.
6. The apparatus of claim 4, wherein the power setting unit is configured to subtract a power having a preset magnitude from the maximum power in response to the determination that the user is riding on the trailer.
7. The apparatus of claim 4, wherein the power setting unit is configured to subtract a power associated with the weight of the user from the maximum power in response to the determination that the user is riding on the trailer.
8. The apparatus of claim 1, wherein: the power transmitter comprises a DC-AC converter configured to convert a DC voltage stored in the battery into an AC voltage and a transmission resonance coil configured to wirelessly transmit power by the converted AC voltage using a preset wireless power transmission method; and the power receiver comprises a reception resonance coil magnetically coupled to the transmission resonance coil, the reception resonance coil configured to wirelessly receive the power by the AC voltage, a rectifier configured to rectify the power wirelessly received via the reception resonance coil into a DC voltage, and a DC-DC converter configured to convert the DC voltage rectified by the rectifier into a DC voltage having a magnitude required by a load.
9. The apparatus of claim 8, wherein the preset wireless power transmission method comprises a magnetic induction method or a magnetic resonance method.
10. The apparatus of claim 8, wherein: the transmission resonance coil is attached to an upper surface of the base frame and the reception resonance coil is attached to a lower surface of the upper module; the transmission resonance coil and the reception resonance coil are spaced apart from each other by a predetermined interval in a state in which the upper module is coupled to the base frame; and a central portion of the transmission resonance coil and a central portion of the reception resonance coil are aligned with each other in an upward direction in the state in which the upper module is coupled to the base frame.
11. The apparatus of claim 1, further comprising a communication unit configured to request identification information and receive the identification information in response to the request in response to a determination that a switch is turned on, wherein an identification unit is configured to identify the upper module coupled to the base frame based on the received identification information.
12. The apparatus of claim 1, wherein the upper module comprises an upper frame of a stroller, an

electric car for children, or a wagon for children.

13. A method for wirelessly transmitting and receiving power for a personal mobility device having a replaceable module, the method comprising: identifying an upper module coupled to a base frame; setting a maximum power to be wirelessly transmitted to the identified upper module, wherein the maximum power is set depending on the upper module; and wirelessly transmitting power to the identified upper module within the set maximum power, wherein the upper module is attachable to or detachable from the base frame, wherein the base frame comprises a driving wheel, a driving motor configured to drive the driving wheel, a battery, and a power transmitter configured to wirelessly transmit the power stored in the battery, and wherein the upper module comprises a power receiver configured to receive the power wirelessly transmitted from the power transmitter.

14. The method of claim 13, wherein the base frame is further couplable to a trailer having an upper portion on which a user can ride, the trailer comprising a weight measurement sensor configured to measure a weight of the user.

15. The method of claim 14, further comprising: determining whether the user is riding on the trailer; and adjusting the set maximum power in response to a determination that the user is riding on the trailer.

16. The method of claim 15, wherein determining whether the user is riding on the trailer is based on the weight measured by the weight measurement sensor or an output of the driving motor.

17. The method of claim 15, wherein adjusting the set maximum power comprises subtracting a power having a preset magnitude from the maximum power in response to the determination that the user is riding on the trailer.

18. A non-transitory computer-readable storage medium recording a program for executing the method of claim 13 on a computer.

19. The method of claim 13, wherein identifying the upper module comprises identifying the upper module among at least 3 upper modules.

20. The method of claim 19, wherein each of the at least 3 upper modules comprises a maximum power level selected from a power level of between 10 W and 120 W, inclusive.
