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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

LS CABLE EXHIBIT 2008
Apple v. LS Cable
IPR2025-01141

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DETAILED ACTION

1.0 SUMMARY

This Office action is in response to Patent Owner's amendment/request for reconsideration filed on 11/29/2021 response to the non-final rejection mailed on 9/29/2021.

Claims 1-24 of United States Patent Number US 8,013,568 (hereinafter "the '568 patent"), issued September 6, 2011 to Park et al., are subject to reexamination wherein it has been determined in the 96/000,355 reexamination, regarding the Order mailed 04/21/2021 granting *ex parte* reexamination, that a substantial new question of patentability was raised in the request for *ex parte* reexamination, filed on 03/12/2021 (hereafter "the Request").

Interview Summary dated November 08, 2021 (previously not mailed) is attached with this office action.

1.1 Priority

As noted on its front page, the '568 patent claims priority from:

KR 10-2005-0069871 filed July 29, 2005

KR 10-2006-0038960 filed April 28, 2006

1.2 Status of Claims

Claims 1-35 and 37-75 are currently pending.

Claim 36 is cancelled by Patent Owner.

Claims 1-4, 7-10, 13, 15-18, 21, 23, 25, 30, 40-41, and 48 are amended.

New claims 49-75 are added.

Claims 1-35 and 37-75 are rejected.

2.0 REFERENCES CITED IN REQUEST

The examiner has considered a substantial new question of patentability has been raised by at least the following prior art reference submitted by Third Party Requester:

1. Korean Patent No. KR950005819B1 to Hong Chung-Sik, English Language Translation ("Chung-Sik")

3.0 ISSUES RAISED IN THE REQUEST

Issue 1: Primary reference: Chung-Sik (KR950005819B1)

Requester states that the teaching of Chung-Sik references raises a substantial new question of patentability with respect to claims 1-24 of the '568 Patent (Request pages, 4-26).

4.0 REJECTIONS PROPOSED IN THE REQUEST

The following rejection is proposed in the request:

1) Claims 1-24 of the '568 Patent are obvious under 35 U.S.C. § 103(a) over Chung-Sik taken alone (request pages 4-26).

5.0 RESPONSE TO ARGUMENTS

5.1 Claim Interpretation Under 35 U.S.C. §112(6th ¶)

In response to Patent Owner's arguments and amendment to the claims, the Examiner withdraws interpretation terms under 35 U.S.C. §112(6th ¶) of the claim "constant voltage/constant current supplier," and "microprocessor," as these are terms known in the art and do convey a particular structure. (Remarks pages 25-29).

However the following terms "overvoltage monitoring unit" (claims 1, 4, 10, 21, 26, 31, 41, 49, 52, 55, 58, 60, 62, 63, 65, 66, 68, 69, 72, 75), "wireless transmitting unit" (claims 3, 9, 49, 51, 55, 57, 62, 65, 66, 68, 71), "charging pause detecting unit" (claims 4, 10, 52, 58, 63, 72), "charging power adjustment unit" (claim 13, 17, 19, 21, 74), and "wireless receiving unit" (claim 15, 74), are subject to interpretation under 35 U.S.C. §112(6th ¶) as per the analysis given below.

5.2 Claim Rejection Under 35 U.S.C. §112

In response to Patent Owner's arguments and amendment to the claims, the Examiner withdraws the previous rejection of claims 1, 4, 7, 13, 21, and 23 under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first and second paragraphs. (Remarks pages 29-30). However claims 1, 21, and 65 and claims 4, 10, 52, 58, 63 are rejected under 35 U.S.C. 112 2nd paragraph'; and Claims 55 and 60 are rejected under 35 U.S.C. 112 1st paragraph (see claim rejections below).

5.3 Claim Rejections under 35 U.S.C. 102 and 35 U.S.C. 103

In response to the rejection of claim(s) 1-15, and 19-48, under pre-AIA 35 U.S.C. 102(b) as being anticipated by Chung-Sik (KR 950005819Bl), Patent Owner has amended independent claims 1, 7, 13, 21, and 23 by adding (underlined), "overvoltage monitoring unit that includes a microprocessor" and "wherein the monitoring result includes a wireless feedback control signal to induce the change of intensity of the magnetic field based on relative positions of the contact-less chargeable battery and the external contact-less charging device".

Patent Owner argued that Chung-Sik at best describes a system where signals transmitted from the portable device 18 to the base 12 will only occur "when the two devices are coupled to

each other" in a fixed arrangement at which the core 78 of the portable device 18 is positioned on a surface of the core 76 of the transmitter 28 of the base unit 12 (Chung-Sik, page 8-4, lines 20-25. Patent Owner further argued that Chung-Sik does not teach or suggest making any change to the intensity of the magnetic field based on relative positions of the base 12 and the contactless charging unit 18 because in Chung-Sik the relative positions of the base 12 and the contactless charging unit 18 are fixed whenever the battery 32 is being charged. (Remarks, page 35).

Patent Owner's arguments have been fully considered by the Examiner but are moot in view of the new grounds of rejection set forth in this office action. The added limitation argued by the Patent Owner is disclosed in a prior art (Shigefumi Matsuki JP H0145230 Y2)(See claim rejections below).

Regarding new claims 55-59, and 60-64, Patent Owner argued that Chung-Sik fails to teach or suggest a microprocessor that transmits a first charging power adjustment request signal for adjusting a power applied to the primary coil from a first level to a second level and a second charging power adjustment request signal for adjusting the power applied to the primary coil from the second level to a third level. (Remarks, pages 37-39). Claims 55-64 has been rejected under 35 USC 1st paragraph for lack of support in the specification for the claimed "first level", "second-level" and "third-level") (See claim rejection below). These claims have been rejected in this office action as best understood by the Examiner.

Regarding new independent claims 65 and 66, Patent Owner argued that the claim recites similar features as independent claim 7 and should be allowable for the same as reasons as claim 7 particularly for reciting "wherein the change of intensity of the magnetic field is based on relative positions of the contact-less charging circuit module and the external contact-less charging device.

Patent Owner's arguments have been fully considered by the Examiner but are moot in view of the new grounds of rejection set forth in this office action. The added limitation argued by the Patent Owner is disclosed in a prior art (Shigefumi Matsuki JP H0145230 Y2)(See claim rejections below).

Regarding independent claim 69, Patent Owner argued that Chung-Sik fails to disclose "wherein the monitoring result is a charging power adjustment request signal". (Remarks, page 43-45). Specifically, Patent Owner argued that the Chung-Sik' s VDL signal and Chung-Sik' s charge completion alarm signal are at best signals for stopping or preventing the transmission of power from the base 12 altogether and does not correspond to the claimed "charging power adjustment request signal". (Remarks, page 46). The Examiner disagrees, for the reasons set forth in the rejection of the claim. Moreover Chung-Sik clearly explains, "Thus, when a battery in a portable device is discharged to a voltage equal to or less than a predetermined level, it becomes necessary to charge the battery for smooth communication" (See Chung-Sik, page 8-1, under DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS).

Regarding new claims 74 and 75, Patent Owner argued new claim 74 and 75 recites similar features to amended claims 13 and 1 respectively. Therefore, new claims 74 and 75 are also allowable for at least the same reasons stated above in connection with amended claims 13 and . 1 respectively. Particularly, Patent Owner argued Chung-Sik and Kaite does not teach or suggest making any change/adjustment to the high frequency AC current/ intensity of the magnetic field on the basis of relative positions of the contact-less chargeable battery and the contact-less charging device base.

Patent Owner's arguments have been fully considered by the Examiner but are moot in view of the new grounds of rejection set forth in this office action. The added limitation argued

by the Patent Owner is disclosed in a prior art (Shigefumi Matsuki JP H0145230 Y2)(See claim rejections below).

6.0 CLAIM INTERPRETATION UNDER 35 U.S.C. §112(6th ¶)

The MPEP explains when a limitation invokes 35 U.S.C. 112(f) and how to interpret such limitations. See MPEP 2181-2183; *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015) (en banc). As noted in MPEP 2181, a three prong test is used to determine whether a limitation invokes 112(f):

(A) the claim limitation uses the term "means" or "step" or a term used as a substitute for "means" that is a generic placeholder (also called a nonce term or a non-structural term having no specific structural meaning) for performing the claimed function

(B) the term "means" or "step" or the generic placeholder is modified by functional language, typically, but not always linked by the transition word "for" (e.g., "means for") or another linking word or phrase, such as "configured to" or "so that"

(C) the term "means" or "step" or the generic placeholder is not modified by sufficient structure, material, or acts for performing the claimed function.

The following analysis is provided to clarify the record of claim interpretation.

(1) "overvoltage monitoring unit" (claims 1, 4, 7, 9, 10, 21, 26, 31, 41, 49, 52, 55, 58, 60, 62, 63, 65, 66, 68, 69, 71, 72, 75)

This term does not use means, but it provides no structure therefore it can be deemed a generic placeholder that substitutes for means. It is modified by functional language for,

"monitoring voltages at both ends of the constant voltage/constant current supplier and transmitting a monitoring result to the external contact-less charging device by means of wireless communication so as to induce a change of intensity of the magnetic field", recited in claim 1, and includes a microprocessor. There is no further structure of the term. The three-prong test is met and 112(f) is invoked. Corresponding structure of the overvoltage monitoring unit as described in the specification of the '568 patent includes a wireless transmitting unit 320 for wirelessly propagating the monitoring result through an antenna 330; first and second voltage

detectors (350, 360) for respectively detecting voltages at front and rear ends of the constant voltage/constant current supplier; a voltage comparator 380 for comparing first and second voltages detected by the first and second voltage detectors (350, 360) and outputs a voltage comparison result; a microprocessor 310 for outputting a monitoring result according to the voltage comparison result to the wireless transmitting unit 320; and charging pause detection unit 390 receiving the high frequency AC current output from the high frequency AC current inducing unit to detect a time point when the induction of high frequency AC current ends, and then outputting the end time point to the micro-processor 310 (col. 4, lines 28-45) (Fig. 5).

(2) "wireless transmitting unit" (claim 3)

This term does not use means, but it provides no structure therefore it can be deemed a generic placeholder that substitutes for means. It is modified by functional language for,

"wirelessly propagating the monitoring result through an antenna." There is no further structure of the term. The three-prong test is met and 112(f) is invoked. Corresponding structure of the wireless transmitting unit is any generic wireless transmitter such as a radio transmitter that transmits through an antenna.

(3) "charging pause detecting unit" (Claim 4, 10, 52, 58, 63, 72)

This term does not use means, but it provides no structure therefore it can be deemed a generic placeholder that substitutes for means. It is modified by functional language in that it,

"receives the high frequency AC current output from the high frequency AC current inducing unit to detect a time point when the induction of high frequency AC current ends, and then outputs the end time point to the microprocessor," recited in claim 4. There is no further structure of the term. The three-prong test is met and 112(f) is invoked. Corresponding structure

of the charging pause detecting unit as described in the specification of the '568 patent is the box labelled 390 in Fig. 6 (col. 9, lines 7-15). The specification does not disclose any further structure of the box labelled 390 in Fig. 6. For examination purpose the term is interpreted as a device that measures time such as a clock.

(4) "charging power adjustment unit" (Claim 13, 17, 19, 21, 74)

This term does not use means, but it provides no structure therefore it can be deemed a generic placeholder that substitutes for means. It is modified by functional language.

"for receiving the monitoring result from the contact-less chargeable battery by means of wireless communication and controlling the high frequency power driving unit to adjust a power of the high frequency AC current applied to the magnetic field generating unit so that the charging power transmitted to the contact-less chargeable battery is adjusted" recited in claim 13. Thus the charging power adjustment unit adjusts the charging power transmitted to the contact-less chargeable battery by controlling the high frequency power driving unit. There is no further structure of the term. Corresponding structure of the charging power adjustment unit as described in the specification of the '568 patent includes a wireless receiving unit 230 for wirelessly receiving the monitoring result through an antenna; and a microprocessor 240 for receiving the monitoring result from the wireless receiving unit 230 and controlling the high frequency power driving unit to adjust a power of the high frequency AC current applied to the magnetic field generating unit (col. 4, lines 46-52, 64-67) (Fig. 3). Thus the structure of charging power adjustment unit includes a wireless receiver and a microprocessor.

(5) "wireless receiving unit" (Claims 15, 74)

This term does not use means, but it provides no structure therefore it can be deemed a generic placeholder that substitutes for means. It is modified by functional language,

"for wirelessly receiving the monitoring result through an antenna," recited in claim 15. There is no further structure of the term other than the box labelled 230 in Fig. 3. Although the specification of the '568 patent describes frequency band of 10 to 15 MHz is used for wireless transmission, and the wireless receiving unit 230 is configured using a photo couple, the present invention is not limited to such frequency band of the carrier and such elements for configuring the wireless receiving unit 230 (col., 6, lines 37-45). In view of the above description, the corresponding structure of the term is a generic wireless receiver such as a radio receiver.

7.0 CLAIM REJECTIONS - 35 USC § 112

7.1 Rejection 35 U.S.C. 112(a): Second Paragraph

The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 21, and 65 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor (or for applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention.

It is not clear as to what component of the claimed "overvoltage monitoring unit" recited in claims 1, 21, and 65, is monitoring the voltages at both ends of the constant voltage/constant current supplier.

Claim limitation "charging pause detecting unit," recited in claims 4, 10, 52, 58, 63, and 72 invokes 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. However, the written description fails to disclose the corresponding structure, material, or acts for performing the entire claimed function and to clearly link the structure, material, or acts to the function. Therefore, the claims 4, 10, 52, 58, 63, and 72 are indefinite and is rejected under 35 U.S.C. 112(b) or pre-AIA 35 U.S.C. 112, second paragraph.

Applicant may:

(a) Amend the claim so that the claim limitation will no longer be interpreted as a limitation under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph;

(b) Amend the written description of the specification such that it expressly recites what structure, material, or acts perform the entire claimed function, without introducing any new matter (35 U.S.C. 132(a)); or

(c) Amend the written description of the specification such that it clearly links the structure, material, or acts disclosed therein to the function recited in the claim, without introducing any new matter (35 U.S.C. 132(a)).

If applicant is of the opinion that the written description of the specification already implicitly or inherently discloses the corresponding structure, material, or acts and clearly links them to the function so that one of ordinary skill in the art would recognize what structure, material, or acts perform the claimed function, applicant should clarify the record by either:

(a) Amending the written description of the specification such that it expressly recites the corresponding structure, material, or acts for performing the claimed function and clearly links or associates the structure, material, or acts to the claimed function, without introducing any new matter (35 U.S.C. 132(a)); or

(b) Stating on the record what the corresponding structure, material, or acts, which are implicitly or inherently set forth in the written description of the specification, perform the claimed function. For more information, see 37 CFR 1.75(d) and MPEP §§ 608.01(o) and 2181.

7.2 Rejection 35 U.S.C. 112(a): First Paragraph (cl. 55, 60)

The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 55 and 60, are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for applications subject to pre-AIA 35 U.S.C. 112, the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 55 and 60 recites, "adjusting a power applied to the primary coil from a first level to a second level", and "adjusting the power applied to the primary coil from the second level to a third level" which are not described in the specification. Specifically, the first, second, and third level fail to comply with the written description requirement.

The Examiner has reviewed the sections (column 11, lines 13-45) cited by the Patent Owner for providing support for new claims 55 and 60, but the cited section fails to describe the claimed first, second, and third level recited in the claims.

8.0 CLAIM REJECTIONS - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8.1 Chung-Sik/Kaite, Matsuki (cl. 1-15, 19-54, 56, 61, 65-68, 73-75)

Claim(s) 19-54, 56, 61, 65-68, and 73-75 are rejected under 35 U.S.C. 103(a) as being obvious over Chung-Sik (KR 950005819Bl) and Matsuki (JP H0145230 Y2) or in the alternative as being obvious over Chung-Sik (KR 950005819Bl), Kaite et al. (US 6,016,046) and Matsuki (JP H0145230 Y2).

1. A contact-less chargeable battery including a charging circuit for charging an electric energy to a battery cell, the contact-less chargeable battery comprising:

Chung-Sik discloses system for charging a battery 32 in a portable device by inductively coupling a voltage from a charger 12 (base unit) to a portable device 18. Inductively coupling a voltage from a charger to a portable device 18 is considered the same as contact-less chargeable battery (page 8-2, lines 6-7) (Fig. 1).

> The present invention relates to a charge system of a radio-telephone. More specifically, the present invention relates to a contactless charge system of a radio-telephone for charging a battery in a portable device without contact between a charger of a radio-telephone and a voltage terminal of the portable device.

a high frequency AC current inducing unit to which a high frequency AC current is induced by means of a magnetic field generated from the external contact-less charging device;

Chung-Sik disclosed high frequency AC current inducing unit 38 (CONTACTLESS CHARGING UNIT) to which a high frequency AC current (10 KHZ) is induced by means of a magnetic field generated from an external contact-less charging device (induced voltage generating unit) (page 8-2, lines 17-18, and page 8-4, lines 47-51).

a rectifier for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current;

Chung-Sik discloses rectifier 80 for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current (page 8-2, lines 17-19) (Fig. 2).

a constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode; and

Chung-Sik discloses constant voltage/current supplier for receiving DC current from the rectifier 80 and supplying a charging power to the battery cell 32 in a constant voltage/constant current charge mode (Fig. 2). (See "constant voltage unit", page 8-3, lines 24-27). Chung-Sik further discloses rectifier 80 supplies DC current at a constant voltage V1 (reference voltage) (See "voltage V1 is constant", page 8-5 line 5). Since voltage V1 is constant it is supplying a charging power to the battery cell in a constant voltage/constant current mode.

Additionally, Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).

charge. Therefore, the charging control section 123 is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit 122, and a switching device to stop charging when the rechargeable batteries 111 reach full charge under control of the computation circuit 124. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the to modify the constant voltage supplier disclosed by Chung-Sik by adding the constant current constant voltage circuit disclosed by Kaite et al. to stabilize output from the rectifying circuit.

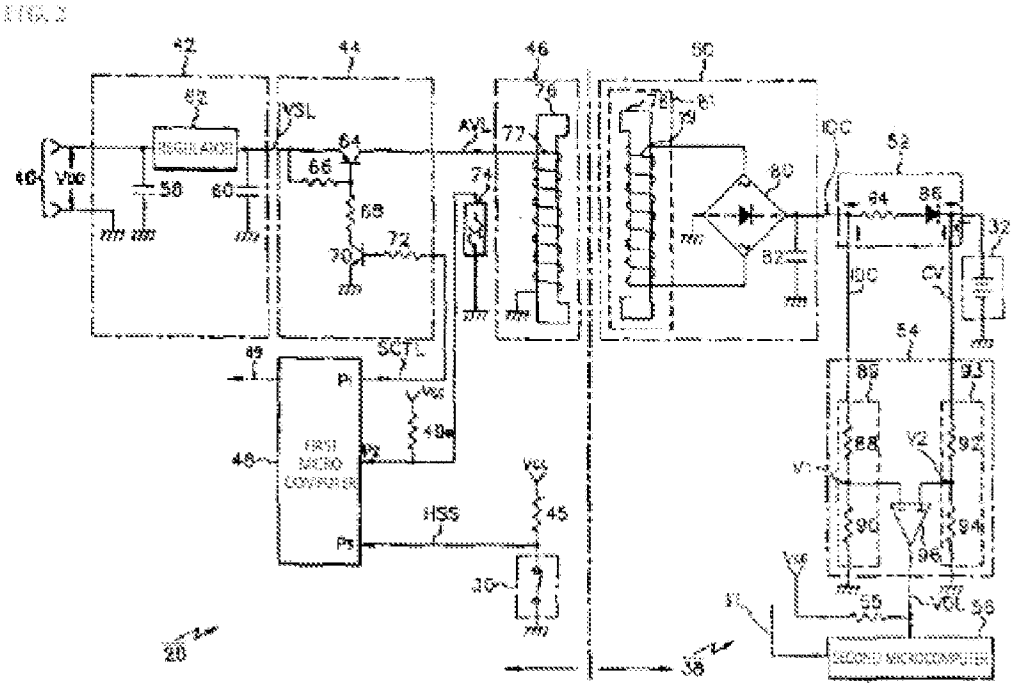
an overvoltage monitoring unit <u>that includes a microprocessor</u> for monitoring voltages at both ends of the constant voltage/constant current supplier and transmitting a monitoring result to the external contact-less charging device by means of wireless communication so as to induce a change of intensity of the magnetic field,

Chung-Sik also discloses contactless charge system for detecting a voltage of a rechargeable battery 32 including charge pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1) and specifically disclosed over voltage monitoring unit 54 and microprocessor 56 for monitoring voltages (V1, V2) at both ends of the constant voltage/current supplier 52 and microprocessor 56 scans the output VDL of the comparator 96 and searches for whether or not the charge voltage of battery 32 is normal. Microprocessor 56 transmits a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through line 37 so as to induce a change of intensity of the magnetic field of the induced voltage generating unit 46 (Fig. 1, 2) (page 8-2, lines 31-34, 40-55; page 8-3, lines 36-40; page 8-5, lines 35-43) (Fig. 2).

<u>wherein the monitoring result includes a wireless feedback control signal to induce the change of intensity of the magnetic field based on relative positions of the contact-less chargeable battery and the external contact-less charging device.</u>

Chung-Sik discloses transmitting a monitoring result of the state of charge of the battery from microprocessor 56 through line 37 wirelessly which is received by the microprocessor 48 to decide whether or not to supply current for further charging of the battery 32. Thus Chung-Sik discloses wherein the monitoring result (output VDL of the comparator 96) includes a wireless feedback control signal (wireless signal 37 transmitted by microprocessor 56 to microprocessor 48 for controlling the supply of current to induce the change of intensity of the magnetic field) (Chung-Sik, English Translation, page 8-5, Fig. 2 and Fig. 3B).

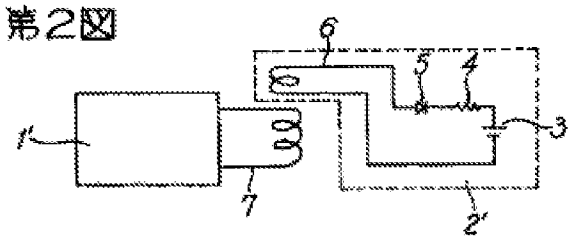
While Chung-Sik discloses to induce the change of intensity of the magnetic field based on battery voltage monitoring, it did not specifically disclose to induce the change of intensity of the magnetic field based on relative positions of the contact-less chargeable battery and the external contact-less charging device.



Chung-Sik. Fig. 2

In analogous art, Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging wherein charging current can be adjusted based on the distance of output coil 7 of charging equipment 1 and input coil 6 of battery 2'(See Figs. 2-4, and Matsuki, Machine Translation copied below)(Example Fig. 2, coped below).

input coil 6 in the upper surface of charging equipment 1'. Charging current can be adjusted by [which control a high frequency output or changes the distance of output coil 7 of charging equipment 1', and input coil 6 of storage battery 2'] grazing, and can change the charge time of storage battery 2'. As mentioned



Matsuki. Fig. 2

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by adding wireless feedback control signal to induce the change of intensity of the magnetic field based on relative positions of the contact-less chargeable battery and the external contact-less charging device disclosed by Matsuki for charging a battery.

2. The contact-less chargeable battery according to claim 1,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 1 as set forth above.

wherein the high frequency AC current inducing unit is a coil to which a magnetic flux of the magnetic field generated from the external contact-less charging device is linked.

Chung-Sik discloses wherein the high frequency AC current inducing unit is a coil 79 to which a magnetic flux of the magnetic field generated from the external (coil 77) contact-less charging device is linked. (Fig. 2).

3. The contact-less chargeable battery according to claim 1,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 1 as set forth above.

wherein the overvoltage monitoring unit includes: a wireless transmitting unit for wirelessly propagating the monitoring result through an antenna; first and second voltage detectors for respectively detecting first and second voltages at front and rear ends of the constant voltage/constant current supplier; and

Chung-Sik discloses over voltage monitoring unit 54 for monitoring first and second voltages (V1, V2) at front and rear ends of the constant voltage/current supplier 52 and transmitting a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through an antenna so as to induce a change of intensity of the magnetic field (page 8-2, paragraphs 7-8) of the induced voltage generating unit 46 (Fig. 2) (page 8-3, lines 31-34; page 8-5, lines 31-34) (Fig. 2).

a voltage comparator for comparing the first and second voltages detected by the first and second voltage detectors and outputting a voltage comparison result; and

Chung-Sik discloses voltage comparator 96 for comparing first and second voltages (V1, V2) detected by the first and second voltage detectors and outputs a voltage comparison result (charge state VDL) (Fig. 2, page 8-4, 8-5).

wherein the microprocessor outputs the monitoring result according to the voltage comparison result to the wireless transmitting unit.

Chung-Sik further disclosed microprocessor 56 outputs the monitoring result according to the voltage comparison result to the wireless transmitting unit (RADIO UNIT 34) (Chung-Sik, Fig. 2, and English Translation, pages 8-4, 8-5).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

4. The contact-less chargeable battery according to claim 3,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 3 as set forth above.

wherein the magnetic field generated by the external contact-less charging device is generated intermittently,

Chung-Sik discloses magnetic field generated by the external contact-less charging device is generated intermittently (switches on/off transistor 64, 70) (Fig. 2, page 8-4).

wherein the overvoltage monitoring unit further includes a charging pause detecting unit that receives the high frequency AC current output from the high frequency AC current inducing unit to detect a time point when the induction of high frequency AC current ends, and then outputs the end time point to the microprocessor, and

Chung-Sik also discloses contactless charge system for detecting a voltage of a rechargeable battery 32 including charge pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1) and specifically disclosed over voltage monitoring unit 54 and microprocessor 56 for monitoring voltages (V1, V2) at both ends of the constant voltage/current supplier 52 and microprocessor 56 scans the output VDL of the comparator 96 and searches for whether or not the charge voltage of battery 32 is normal. Microprocessor 56 transmits a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through line 37 so as to induce a change of intensity of the magnetic field of the induced voltage generating unit 46 (Fig. 1, 2) (page 8-2, lines 31-34, 40-55; page 8-3, lines 36-40; page 8-5, lines 35-43) (Fig. 2).

Chung-Sik discloses a control signal (SCTL) output from the output port Pl of FIRST MICRO COMPUTER 48 is applied to a base of the transistor 70 through a resistor 72 and switches "on/off' the transistor 70 around ten thousand times per second. In this case, a potential of a collector terminal of the transistor 70 is switched between "low" and "high" depending on a period of the control signal (SCT) and the signal is applied to a base of the transistor 64." (Chung-Sik, English Translation, page 8-4 and Fig. 2).

Regarding charge pause detection unit and detecting a time point when the induction of high frequency AC current ends, and then outputting the end time point to the microprocessor, Chung-Sik discloses that the charging of battery continues until the detection voltage V2 in the overvoltage detection unit 54 becomes higher than V1 and the output signal VDL of comparator 96 is transitioned to logic "high" from logic "low" and is input to second microcomputer 56 to produce charging completion alarm (Fig. 2, page 8-5, lines 31-43). The transition to logic "high" from logic "low" is considered a time point when the induction of high frequency AC current ends, and then outputting the end time point (charge completion) to the microprocessor. The microcomputer 56 is broadly considered the same as charging pause detecting unit that produces charging completion alarm when the voltage of battery is determined to be normal and completely charged. Thus the microprocessor 56 determines the ON/OFF period of charging the battery.

Additionally, Chung-Sik specifically disclosed a "time point" when the charge operation may be automatically stopped by communication between contact less charging unit 38 and power transmitter 28 (Chung-Sik, English Translation, page 8-5, lines 44-46 and Fig. 1).

> Thus, in the present invention according to the above embodiments, a battery begins to be charged from a time point when the portable device 18 operated at an operating voltage of the battery is installed on the base unit 12, and the charge operation may be automatically stopped either by communication between devices or overheating of the devices.

To the extent that Chung-Sik may not specifically disclose charging pause detecting unit it would have been obvious to modify the overvoltage monitoring unit disclosed by Chung-Sik by adding a charging pause detecting unit including a clock because Chung-Sik specifically disclosed battery begins to be charged from a "time point" and the charge operation may be automatically stopped by communication between devices.

wherein the monitoring result is transmitted to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced after the end time point is input.

Chung-Sik discloses wherein the monitoring result is transmitted to the external contact-less charging device 12 by means of wireless communication by RADIO UNIT 34. (Chung-Sik, page 8-5, lines 35-43, Fig. 1, 2). High frequency AC current is not induced after the end time point is input (charge completion, step 122) (Fig. 3B).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

To the extent that Chung-Sik may not specifically disclose transmitting a monitoring result to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced it would have been obvious for charging the battery when a voltage of the battery is determined to be less than normal (Fig. 2).

At the time the invention was made it would have been obvious to modify the overvoltage monitoring unit disclosed by Chung-Sik to transmit the monitoring result while a high frequency AC current is not applied to the magnetic field generating unit for starting charging of the battery when voltage of the battery is determined to be less than normal.

5. The contact-less chargeable battery according to claim 1, wherein the monitoring result is a charging power adjustment request signal.

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 1 as set forth above.

Chung-Sik discloses outputting a monitoring result by charge state signal (VDL) which is input to second microcomputer 56 to provide charging power adjustment request signal for controlling the portable device 18 (battery) (Fig. 2, page 8-3).

6. The contact-less chargeable battery according to claim 1, wherein the monitoring result is a difference of voltages at both ends of the constant voltage/constant current supplier, voltage values of both ends, or a code indicating that the voltages at both ends are in an overvoltage state.

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 1 as set forth above.

Chung-Sik discloses battery voltage detector circuit 54 that includes first and second voltage splitters 89 and 93 for comparing a voltage V1 of an input terminal of the charging unit 52 with a voltage V2 of an output terminal and clocking the result, and a comparator 96 for comparing outputs of the first and second voltage splitters 89 and 93 (V1, V2) and outputting a charge state signal (VDL) to second microcomputer 56 based on the difference of voltage (V1-V2) at both ends of the constant voltage/constant current supplier. The second microcomputer 56 searches for whether or not a charge voltage of the battery 32 is normal in an operation (120 of FIG. 3B) based on the result of the difference of voltage (V1-V2). Additionally, Chung-Sik discloses outputting code (NO) indicating (overvoltage state) if charge voltage is not normal (see (120 of FIG. 3B) (Fig. 2, page 8-4, lines 40-42).

7. A contact-less charging circuit module electrically connected to a battery cell and used for charging an electric energy to the battery cell in a contact-less method, the contact-less charging circuit module comprising:

Chung-Sik disclosed contact-less charging circuit module electrically connected to a battery cell 32 of portable device 18 and used for charging an electric energy to the battery cell 32 in a contact-less method (Fig. 1, page 8-1).

> The present invention relates to a charge system of a radio-telephone. More specifically, the present invention relates to a contactless charge system of a radio-telephone for charging a battery in a portable device without contact between a charger of a radio-telephone and a voltage terminal of the portable device.

a high frequency AC current inducing unit to which a high frequency AC current is induced by means of a magnetic field generated from the external contact-less charging device;

Chung-Sik disclosed high frequency AC current inducing unit 38 (CONTACTLESS CHARGING UNIT) to which a high frequency AC current is induced by means of a magnetic field generated from an external contact-less charging device (induced voltage generating unit) (page 8-2, lines 17-18).

a rectifier for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current;

Chung-Sik discloses rectifier 80 for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current (page 8-2, lines 17-19).(Fig. 2).

a constant voltage/constant current supplier receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode; and

Chung-Sik discloses constant voltage/current supplier 42 for receiving DC current from the rectifier 80 and supplying a charging power to the battery cell 32 in a constant voltage/constant current charge mode (Fig. 2). (See "constant voltage unit", page 8-3, lines 28-33). Chung-Sik further discloses rectifier 80 supplies DC current at a constant voltage V1 (reference voltage). (See "voltage V1 is constant", page 8-5 line 5).

Additionally, Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).

charge. Therefore, the charging control section 123 is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit 122, and a switching device to stop charging when the rechargeable batteries 111 reach full charge under control of the computation circuit 124. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the to modify the constant voltage supplier disclosed by Chung-Sik by adding the constant current constant voltage circuit disclosed by Kaite et al. to stabilize output from a rectifying circuit.

an overvoltage monitoring unit that includes a microprocessor monitoring voltages at both ends of the constant voltage/constant current supplier and transmitting a monitoring result to the external contact-less charging device by means of wireless communication so as to induce a change of intensity of the magnetic field,

Chung-Sik also discloses contactless charge system for detecting a voltage of a rechargeable battery 32 including charge pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1) and specifically disclosed over voltage monitoring unit 54 and microprocessor 56 for monitoring voltages (V1, V2) at both ends of the constant voltage/current supplier 52 and microprocessor 56 scans the output VDL of the comparator 96 and searches for whether or not the charge voltage of battery 32 is normal. Microprocessor 56 transmits a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through line 37 so as to induce a change of intensity of the magnetic field of the induced voltage generating unit 46 (Fig. 1, 2) (page 8-2, lines 31-34, 40-55; page 8-3, lines 36-40; page 8-5, lines 35-43) (Fig. 2).

wherein the change of intensity of the magnetic field is based on relative positions of the contact-less charging circuit module and the external contact-less charging device.

While Chung-Sik discloses to induce the change of intensity of the magnetic field based on battery voltage monitoring it did not specifically disclose to induce the change of intensity of the magnetic field based on relative positions of the contact-less chargeable battery and the external contact-less charging device.

Inventor Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging device wherein charging current can be adjusted based on the distance of output coil 7 of charging equipment 1 and input coil 6 of battery 2' ("storage battery") (Matsuki, Figs. 2-4 and English Translation: "Detailed explanation of the device" "Charging current can be adjusted by [which control a high frequency output or changes the distance of output coil 7 of charging equipment 1', and input coil 6 of storage battery 2']").

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by adding wireless feedback control signal to induce the change of intensity of the magnetic field based on relative positions of the contact-less chargeable battery and the external contact-less charging device disclosed by Matsuki for charging a battery.

8. The contact-less charging circuit module according to claim 7, wherein the high frequency AC current inducing unit is a coil to which a magnetic flux of the magnetic field generated from the external contact-less charging device is linked.

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 7 as set forth above.

Chung-Sik discloses wherein the high frequency AC current inducing unit is a coil 79 to which a magnetic flux of a magnetic field generated from the external (coil 77) contact-less charging device is linked. (Fig. 2).

9. The contact-less charging circuit module according to claim 7,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 7 as set forth above.

wherein the overvoltage monitoring unit includes:

a wireless transmitting unit for wirelessly propagating the monitoring result through an antenna;

Chung-Sik disclosed wireless transmitting unit (RADIO UNIT 34) for wirelessly propagating the monitoring result through an antenna (Fig. 1, and Fig. 2, page 8-5).

In this case, the data input to the line 49 is input as data that is wirelessly transmitted from the portable device 18 when the battery 32 is completely charged. If analysis of input data in operation 110 indicates the portable device is abnormal (i.e. charge is incomplete), the first microcomputer 48 jumps to the aforementioned step 106 to continuously generate a charge voltage, and when the portable device is normal, the first microcomputer 48 jumps to operation 112 to stop charging.

When a charge level of the battery 32 is increased through the aforementioned operation, the charge level detection voltage V2 of a second voltage splitter 93 increases, and when the detection voltage V2 becomes higher than the reference voltage V1, the output VDL of the comparator 96 is transitioned to logic "high" from logic "low" and is input to the second microcomputer 56.

Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

first and second voltage detectors for respectively detecting voltages at front and rear ends of the constant voltage/constant current supplier;

Chung-Sik also discloses first and second voltage detectors (V1, V2) for respectively detecting first and second voltage (V1, V2) at front and rear ends of the constant voltage/constant current supplier 52 (Fig. 2).

a voltage comparator for comparing the first and second voltages detected by the first and second voltage detectors and outputting a voltage comparison result; and

Chung-Sik discloses voltage comparator 96 for comparing first and second voltages (V1, V2) detected by the first and second voltage detectors and outputting a voltage comparison result (charge state VDL) (Fig. 2, page 8-4).

wherein the microprocessor outputs the monitoring result according to the voltage comparison result to the wireless transmitting unit.

Chung-Sik discloses second microprocessor 56 outputs the monitoring result (charge state VDL) according to the voltage comparison result through line 37 to the wireless transmitting unit (RADIO UNIT 34). (Chung-Sik, Fig. 1, 2, and English Translation, pages 8-4, 8-5).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

10. The contact-less charging circuit module according to claim 9,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging circuit module according to claim 9 as set forth above.

wherein the magnetic field generated by the external contact-less charging device is generated intermittently,

Chung-Sik discloses magnetic field generated by the contact-less charging device is generated intermittently (switches on/off transistor 70) (Fig. 2, page 8-4).

wherein the overvoltage monitoring unit further includes a charging pause detecting unit receiving the high frequency AC current output from the high frequency AC current inducing unit to detect a time point when the induction of high frequency AC current ends, and then outputting the end time point to the microprocessor, and

Chung-Sik also discloses contactless charge system for detecting a voltage of a rechargeable battery 32 including charging pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1).

Chung-Sik discloses a control signal (SCTL) output from the output port Pl of FIRST MICRO COMPUTER 48 is applied to a base of the transistor 70 through a resistor 72 and switches "on/off' the transistor 70 around ten thousand times per second. In this case, a potential of a collector terminal of the transistor 70 is switched between "low" and "high" depending on a period of the control signal (SCTL) and the signal is applied to a base of the transistor 64."

(Chung-Sik, page 8-4, Fig. 2). Chung-Sik discloses charge pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1)

Regarding detecting a time point when the induction of high frequency AC current ends, and then outputting the end time point to the microprocessor, Chung-Sik discloses that the charging of battery continues until the detection voltage V2 becomes higher than V1 and the output signal VDL of comparator 96 is transitioned to logic "high" from logic "low" and is input to second microcomputer 56 to produce charging completion alarm (Fig. 2, page 8-5, lines 31-43). The transition to logic "high" from logic "low" is considered a time point when the induction of high frequency AC current ends, and then outputting the end time point (charge completion) to the microprocessor 56. The microcomputer 56 is broadly considered the same as charging pause detecting unit that produces charging completion alarm when the voltage of battery is determined to be normal and completely charged.

Additionally, Chung-Sik specifically disclosed a "time point" when the charge operation may be automatically stopped by communication between contact less charging unit 38 and power transmitter 28 (Chung-Sik, English Translation, page 8-5, lines 44-46 and Fig. 1).

> Thus, in the present invention according to the above embodiments, a battery begins to be charged from a time point when the portable device 18 operated at an operating voltage of the battery is installed on the base unit 12, and the charge operation may be automatically stopped either by communication between devices or overheating of the devices.

To the extent that Chung-Sik may not specifically disclose a charging pause detecting unit it would have been obvious to modify the overvoltage monitoring unit disclosed by Chung-Sik by adding a charging pause detecting unit because Chung-Sik specifically disclosed battery begins to be charged from a "time point" and the charge operation may be automatically stopped by communication between devices.

wherein the monitoring result is transmitted to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced after the end time point is input.

Chung-Sik discloses wherein the monitoring result (VDL) output to second microprocessor 56 is transmitted to the external contact-less charging device by means of wireless communication by an antenna connected to radio unit 34. (Fig. 2, page 8-5).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

To the extent that Chung-Sik may not specifically disclose transmitting a monitoring result to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced it would have been obvious for charging the battery when a voltage of the battery is determined to be less than normal (Fig. 2).

At the time the invention was made it would have been obvious to modify the overvoltage monitoring unit disclosed by Chung-Sik to transmit the monitoring result while a high frequency AC current is not applied to the magnetic field generating unit for starting charging of the battery when voltage of the battery is determined to be less than normal.

11. The contact-less charging circuit module according to claim 7,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 7 as set forth above.

wherein the monitoring result is a charging power adjustment request signal.

Chung-Sik discloses outputting a charge state signal (VDL) which is input to second microcomputer 56 for controlling the portable device 18 (battery) (Fig. 2, page 8-3).

Chung-Sik discloses battery voltage detector circuit 54 that includes first and second voltage splitters 89 and 93 for comparing a voltage V1 of an input terminal of the charging unit 52 with a voltage V2 of an output terminal and clocking the result, and a comparator 96 for comparing outputs of the first and second voltage splitters 89 and 93 (V1, V2) and outputting a charge state signal (VDL) to second microcomputer 56 based on the difference of voltage (V1-V2) at both ends of the constant voltage/constant current supplier. The second microcomputer 56 searches for whether or not a charge voltage of the battery 32 is normal in an operation (120 of FIG. 3B) based on the result of the difference of voltage (V1-V2). Additionally, Chung-Sik discloses outputting code (NO) indicating (overvoltage state) if charge voltage is not normal (see 120 of FIG. 3B) (Fig. 2, page 8-4, lines 40-42).

12. The contact-less charging circuit module according to claim 7,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 7 as set forth above.

wherein the monitoring result is a difference of voltages at front and rear ends of the constant voltage/constant current supplier, voltage values of the front and rear ends, or a code indicating that the voltages at both ends are in an overvoltage state.

Chung-Sik discloses battery voltage detector circuit 54 that includes first and second voltage splitters 89 and 93 for comparing a voltage V1 of an input terminal of the charging unit 52 with a voltage V2 of an output terminal and clocking the result, and a comparator 96 for comparing outputs of the first and second voltage splitters 89 and 93 (V1, V2) and outputting a charge state signal (VDL) to second microcomputer 56 based on the difference of voltage (V1-V2) at both ends of the constant voltage/constant current supplier. The second microcomputer 56 searches for whether or not a charge voltage of the battery 32 is normal in an operation (120 of FIG. 3B) based on the result of the difference of voltage (V1-V2). Additionally, Chung-Sik discloses outputting code (NO) indicating (overvoltage state) if charge voltage is not normal (see (120 of FIG. 3B) (Fig. 2, page 8-4, lines 40-42).

13. A contact-less charging device for transmitting a charging power by means of electromagnetic induction phenomenon to a contact-less chargeable battery that has a constant-voltage/constant current supplier to be capable of being charged in a constant voltage/constant current mode and,

Chung-Sik discloses contact-less charging device for transmitting a charging power by means of electromagnetic induction phenomenon to a contact-less chargeable battery 32 that has a constant-voltage/constant current supplier to be capable of being charged in a constant voltage/constant current mode (page 8-2, lines 6-7) (Fig. 1).

The present invention relates to a charge system of a radio-telephone. More specifically, the present invention relates to a contactless charge system of a radio-telephone for charging a battery in a portable device without contact between a charger of a radio-telephone and a voltage terminal of the portable device.

Chung-Sik discloses constant voltage/current supplier 52 for receiving DC current from the rectifier 80 and supplying a charging power to the battery cell 32 in a constant

voltage/constant current charge mode (Fig. 2). (See "constant voltage unit", page 8-3, lines 24-27). Chung-Sik further discloses rectifier 80 supplies DC current at a constant voltage V1 (reference voltage). (See "voltage V1 is constant", page 8-5 line 5).

Additionally, Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).

charge. Therefore, the charging control section **123** is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit **122**, and a switching device to stop charging when the rechargeable batteries **111** reach full charge under control of the computation circuit **124**. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the to modify the constant voltage supplier disclosed by Chung-Sik by adding the constant current constant voltage circuit disclosed by Kaite et al. to stabilize output from the rectifying circuit.

wirelessly transmits a monitoring result for voltages at both ends of the constant voltage/constant current supplier, the contact-less charging device comprising:

Chung-Sik discloses wirelessly transmitting (RADIO 34) (Fig. 1) a monitoring result for voltages at both ends of the constant voltage/constant current supplier (Chung-Sik, English Translation, pages 8-5, Fig. 2).

Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

a magnetic field generating unit for receiving an AC current and forming a magnetic field in an outer space;

Chung-Sik discloses magnetic field generating unit 46 (induced voltage generating unit) for receiving an AC current and forming a magnetic field in an outer space (space around coil

77). (Chung-Sik, English Translation, page 8-4 lines 47-51; and Fig. 2).

10 KHZ is generated from a collector of the transistor 64. The AC voltage of 10 KHZ generated from the collector of the transistor 64 is applied to the coil 77 wound in the induced voltage generating unit 46 through the alternating current line (AVL). When current of an AC voltage that alternates with a period of 10 KHZ flows in the coil 77, an electromagnetic field is generated around the coil 77, and a portion of a magnetic line of force is linked with the coil 79 wound around the core 78 in the induced voltage detecting unit 81.

a high frequency power driving unit for applying a high frequency AC current to the magnetic field generating unit; and

Chung-Sik discloses a high frequency power driving unit (transistor 64) for applying a high frequency AC current to the magnetic field generating unit 46 (Fig. 2, page 8-4).

control signal (SCTL), and the signal is applied to a base of the transistor 64. Thus, when the control signal (SCTL) having a period of about 10 KHZ is output from the output port P1 of the first microcomputer 48, AC power having a period of about 10 KHZ is generated from a collector of the transistor 64. The AC voltage of 10 KHZ generated from the collector of the transistor 64 is applied to the coil 77 wound in the induced voltage generating unit 46 through the alternating current line (AVL). When current of an AC voltage that alternates with a period of 10 KHZ flows in the coil 77, an electromagnetic field is generated around the coil 77, and a portion of a magnetic line of force is linked with the coil 79 wound around the core 78 in the induced voltage detecting unit 81.

a charging power adjusting unit for receiving the monitoring result from the contact-less chargeable battery by means of wireless communication and controlling the high frequency power driving unit to adjust a power of the high frequency AC current applied to the magnetic field generating unit so that the charging power transmitted to the contact-less chargeable battery is adjusted,

Chung-Sik disclosed charging power adjusting unit including first microcomputer 48 receiving the monitoring result from the contact-less chargeable battery by means of wireless communication (RADIO UNIT 26 connected to antenna) (Fig. 1) and controlling a pulse generator which generates a pulse sequence with a predetermined period (Chung-Sik, English Translation, page 8-6, lines 22-25) and high frequency power driving unit 44 including transistor 64 to adjust a power of the high frequency AC current applied to the magnetic field generating

unit 46 so that the charging power transmitted to the contact-less chargeable battery 32 is adjusted. (Figs. 1, 2 & 3A, page 8-5).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

wherein the adjustment to the power of the high frequency AC current applied to the magnetic field generating unit is based on relative positions of the contact-less chargeable battery and the contact-less charging device.

While Chung-Sik discloses to adjust the power of the high frequency AC current applied to the magnetic field generating unit is based on the voltage of the contact-less chargeable battery, Chung-Sik did not specifically disclose adjusting the power of the high frequency AC current applied to the magnetic field generating unit is based on relative positions of the contact-less chargeable battery and the contact-less charging device.

Inventor Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging device wherein charging current (power of the high frequency AC current applied to the magnetic field generating unit) can be adjusted based on the distance of output coil 7 of charging equipment 1 and input coil 6 of battery 2' ("storage battery") (Matsuki, Figs. 2-4 and English Translation, "Detailed explanation of the device" "Charging current can be adjusted by [which control a high frequency output or changes the **distance** of output coil 7 of charging equipment 1', and input coil 6 of storage battery 2']").

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by adding wireless feedback control signal to induce the change of intensity of the magnetic field based on relative positions of the contact-less chargeable battery and the external contact-less charging device disclosed by Matsuki for charging a battery.

14. The contact-less charging device according to claim 13, wherein the magnetic field generating unit is a coil to both sides of which a high frequency AC current is applied.

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 13 as set forth above.

Chung-Sik discloses wherein the magnetic field generating unit is a coil (77, 78) to both sides of which a high frequency AC current is applied. (Fig. 2, page 8-3).

15. The contact-less charging device according to claim 13,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging device according to claim 13 as set forth above.

wherein the charging power adjusting unit includes:

Chung-Sik discloses charging power adjusting unit 12, 48 (base unit having a charge function) (Fig. 1) (Chung-Sik, page 8-5, paragraph 4).

a wireless receiving unit for wirelessly receiving the monitoring result through an antenna; and

Chung-Sik discloses wireless receiving unit (RADIO UNIT 26 connected to antenna) for wirelessly receiving the monitoring result through the antenna (Fig. 1).

a microprocessor for receiving the monitoring result from the wireless receiving unit and controlling the high frequency power driving unit to adjust the power of the high frequency AC current applied to the magnetic field generating unit.

Chung-Sik discloses first microprocessor 48 for receiving the monitoring result from the wireless receiving unit (radio unit 26) and controlling the high frequency power driving unit 44 including transistor 64 to adjust a power of the high frequency AC current applied to the magnetic field generating unit (induced voltage generating unit 46) (Fig. 1, 2 & 3A, pages 8-4, 8-5).

48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

19 (original). The contact-less charging device according to claim 13,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging device according to claim 13 as set forth above.

wherein the high frequency power driving unit intermittently applies a high frequency AC current to the magnetic field generating unit, and

Chung-Sik discloses a high frequency power driving unit 44 (voltage switching unit) for intermittently applying a high frequency AC current by switching on/off transistor (64, 70) to the magnetic field generating unit 46 (induce voltage generating unit) (Fig. 2, page 8-3).

wherein the charging power adjusting unit receives the monitoring result while a high frequency AC current is not applied to the magnetic field generating unit.

Chung-Sik discloses the charging power adjusting unit including microprocessor 48 receives the monitoring result by means of wireless communication (RADIO UNIT 26 connected to antenna). (Chung-Sik, page 8-5, Fig. 1, 2).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

To the extent that Chung-Sik may not specifically disclose charging power adjusting unit receives the monitoring result while a high frequency AC current is not applied to the magnetic field generating unit it would have been obvious for charging of the battery when voltage of the battery is determined to be less than normal (Fig. 2).

At the time the invention was made it would have been obvious for the charging power adjusting unit disclosed by Chung-Sik to transmit a monitoring result to the charging device by means of wireless communication while a high frequency AC current is not induced in the secondary coil for starting charging of the battery when voltage of the battery is determined to be less than normal.

20 (original). The contact-less charging device according to claim 13,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging device according to claim 13 as set forth above.

wherein the monitoring result is a difference of voltages at both ends of the constant voltage/constant current supplier, voltage values at both ends, a code indicating that the voltages at both ends are in an overvoltage state, or a charging power adjustment request signal.

Chung-Sik discloses battery voltage detector circuit 54 that includes first and second voltage splitters 89 and 93 for comparing a voltage V1 of an input terminal of the charging unit 52 with a voltage V2 of an output terminal and clocking the result, and a comparator 96 for comparing outputs of the first and second voltage splitters 89 and 93 (V1, V2) and outputting a charge state signal (VDL) to second microcomputer 56 based on the difference of voltage (V1-V2) at both ends of the constant voltage/constant current supplier. The second microcomputer 56 searches for whether or not a charge voltage of the battery 32 is normal in an operation (120 of FIG. 3B) based on the result of the difference of voltage (V1-V2). Additionally, Chung-Sik discloses outputting code (NO) indicating (overvoltage state) if charge voltage is not normal (see (120 of FIG. 3B) (Fig. 2, page 8-4, lines 40-42).

21 (amended). A battery charging set including a contact-less chargeable battery and a contact-less charging device, wherein the contact-less chargeable battery includes:

Chung-Sik discloses battery charging set including a contact-less chargeable battery and a contact-less charging device. (page 8-2, lines 6-7) (Fig. 1).

The present invention relates to a charge system of a radio-telephone. More specifically, the present invention relates to a contactless charge system of a radio-telephone for charging a battery in a portable device without contact between a charger of a radio-telephone and a voltage terminal of the portable device.

a high frequency AC current inducing unit to which a high frequency AC current is induced by means of a magnetic field intermittently generated from an external contact-less charging device;

Chung-Sik discloses high frequency AC current inducing unit to which a high frequency AC current is induced by means of a magnetic field intermittently generated from an external contact-less charging device. (Fig. 2, page 8-4).

control signal (SCTL), and the signal is applied to a base of the transistor 64. Thus, when the control signal (SCTL) having a period of about 10 KHZ is output from the output port P1 of the first microcomputer 48, AC power having a period of about 10 KHZ is generated from a collector of the transistor 64. The AC voltage of 10 KHZ generated from the collector of the transistor 64 is applied to the coil 77 wound in the induced voltage generating unit 46 through the alternating current line (AVL). When current of an AC voltage that alternates with a period of 10 KHZ flows in the coil 77, an electromagnetic field is generated around the coil 77, and a portion of a magnetic line of force is linked with the coil 79 wound around the core 78 in the induced voltage detecting unit 81.

a rectifier for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current;

Chung-Sik discloses rectifier 80 for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current (page 8-2, lines 17-19) (Fig. 2).

a constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to a battery cell in a constant voltage/constant current mode; and

Chung-Sik discloses constant voltage/current supplier 52 for receiving DC current from the rectifier 80 and supplying a charging power to the battery cell 32 in a constant voltage/constant current charge mode (Fig. 2). (See "constant voltage unit", page 8-3, lines 24-

27). Chung-Sik further discloses rectifier 80 supplies DC current at a constant voltage V1 (reference voltage). (See "voltage V1 is constant", page 8-5 line 5).

Additionally, Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).

charge. Therefore, the charging control section **123** is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit **122**, and a switching device to stop charging when the rechargeable batteries **111** reach full charge under control of the computation circuit **124**. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the to modify the constant voltage supplier disclosed by Chung-Sik by adding the constant

current constant voltage circuit disclosed by Kaite et al. to stabilize output from a rectifying circuit.

an overvoltage monitoring unit <u>that includes a microprocessor</u> for monitoring voltages at both ends of the constant voltage/constant current supplier and transmitting a monitoring result to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced, wherein the <u>contact-less</u> charging device includes:

Chung-Sik also discloses contactless charge system for detecting a voltage of a rechargeable battery 32 including charge pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1) and specifically disclosed an over voltage monitoring unit 54 for monitoring voltages (V1, V2) broadly interpreted the same as the claimed voltage detectors (V1, V2) at both ends of the constant voltage/current supplier 52, and a comparator 96 for comparing the voltages (V1, V2), and a transmitter for transmitting a monitoring result from comparator 96 to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34), and a microprocessor (48, 56) providing signal SCTL at the output port P1 based on the monitoring result for controlling the switching ON/OFF of transistors (70, 64) for controlling AC line voltage (AVL) so as to induce a change of intensity of the magnetic field of the induced voltage generating unit 46 (Fig. 1, 2) (page 8-2, lines 31-34, 40-55; page 8-3, lines 36-40; page 8-5, lines 35-43) (Fig. 2). Chung-Sik further discloses wherein the monitoring result is transmitted to the external contact-less charging device by means of wireless communication. (Chung-Sik, pages 8-

5, Fig. 2).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

To the extent that Chung-Sik may not specifically disclose transmitting a monitoring result to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced it would have been obvious for charging the battery when a voltage of the battery is determined to be less than normal (Fig. 2).

At the time the invention was made it would have been obvious to modify the overvoltage monitoring unit disclosed by Chung-Sik to transmit the monitoring result while a high frequency AC current is not applied to the magnetic field generating unit for starting charging of the battery when voltage of the battery is determined to be less than normal.

a magnetic field generating unit for receiving an AC current and forming a magnetic field in an outer space;

Chung-Sik discloses magnetic field generating unit 46 (induced voltage generating unit) for receiving an AC current and forming a magnetic field in an outer space (space around coil 77). (Fig. 2, page 8-4).

a high frequency power driving unit for intermittently applying a high frequency AC current to the magnetic field generating unit; and

Chung-Sik discloses a high frequency power driving unit 44 (voltage switching unit) for intermittently applying a high frequency AC current by switching on/off transistor 70 to the magnetic field generating unit 46 (induce voltage generating unit) (Fig. 2, page 8-3).

a charging power adjusting unit for, while a high frequency AC current is not applied to the magnetic field generating unit, receiving the monitoring result by means of wireless communication and controlling the high frequency power driving unit to adjust a power of the high frequency AC current applied to the magnetic field generating unit so that a charging power transmitted from the contact-less charging device to the contact-less chargeable battery is adjusted,

Chung-Sik discloses charging power adjusting including first microcomputer unit 48 receiving the monitoring result from the contact-less chargeable battery by wireless communication (RADIO UNIT 26 connected to antenna) and controlling the high frequency power driving unit (transistor 64) to adjust a power of the high frequency AC current applied to the magnetic field generating unit 46 so that a charging power transmitted to the battery 32 is adjusted. (Figs. 1, 2 & 3A, page 8-5).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

To the extent that Chung-Sik may not specifically disclose charging power adjusting unit 48 (first microcomputer) receives the monitoring result while a high frequency AC current is not applied to the magnetic field generating unit 46 (induced voltage generating unit) it would have

been obvious for charging of the battery when voltage of the battery is determined to be less than normal (Fig. 2).

At the time the invention was made it would have been obvious for the charging power adjusting unit disclosed by Chung-Sik to receives the monitoring result while a high frequency AC current is not applied to the magnetic field generating unit for starting charging of the battery when voltage of the battery is determined to be less than normal.

wherein the adjustment to the power of the high frequency AC current applied to the magnetic field generating unit is based on relative positions of the contact-less chargeable battery and the contact-less charging device.

While Chung-Sik discloses to adjust the power of the high frequency AC current applied to the magnetic field generating unit is based on the voltage of the contact-less chargeable battery, Chung-Sik did not specifically disclose adjusting the power of the high frequency AC current applied to the magnetic field generating unit is based on relative positions of the contact-less chargeable battery and the contact-less charging device.

Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging device wherein charging current (power of the high frequency AC current applied to the magnetic field generating unit) can be adjusted based on the distance of output coil 7 of charging equipment 1 and input coil 6 of battery 2' ("storage battery") (Matsuki, Figs. 2-4 and English Translation, "Detailed explanation of the device" "Charging current can be adjusted by [which control a high frequency output or changes the distance of output coil 7 of charging equipment 1', and input coil 6 of storage battery 2']").

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by adding wireless feedback control signal to induce the change of intensity of the magnetic field based on relative positions of the contact-less chargeable battery and the external contact-less charging device disclosed by Matsuki for charging a battery.

22 (Original). The battery charging set according to claim 21,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses battery charging set according to claim 21 as set forth above.

wherein the monitoring result is a difference of voltages at both ends of the constant voltage/constant current supplier, voltage values at both ends, a code indicating that the voltages at both ends are in an overvoltage state, or a charging power adjustment request signal.

Chung-Sik discloses battery voltage detector circuit 54 that includes first and second voltage splitters 89 and 93 for comparing a voltage V1 of an input terminal of the charging unit 52 with a voltage V2 of an output terminal and clocking the result, and a comparator 96 for comparing outputs of the first and second voltage splitters 89 and 93 (V1, V2) and outputting a charge state signal (VDL) to second microcomputer 56 based on the difference of voltage (V1-V2) at both ends of the constant voltage/constant current supplier. The second microcomputer 56 searches for whether or not a charge voltage of the battery 32 is normal in an operation (120 of FIG. 3B) based on the result of the difference of voltage (V1-V2).

Additionally, Chung-Sik discloses outputting code (NO) indicating (overvoltage state) if charge voltage is not normal (see (120 of FIG. 3B) (Fig. 2, page 8-4, lines 40-42).

23 (Amended). A method for controlling charging of a contact-less chargeable battery using a contact-less charging device by means of electromagnetic induction phenomenon, the method comprising:

Chung-Sik discloses method for controlling charging of a contact-less chargeable battery 32 in a portable device by means of electromagnetic induction phenomenon by inductively coupling a voltage from a charger 12 (base unit) to a portable device 18 comprising contactless charging unit 38 for charging chargeable battery 32 (page 8-2, lines 6-7) (Fig. 1).

The present invention relates to a charge system of a radio-telephone. More specifically, the present invention relates to a contactless charge system of a radio-telephone for charging a battery in a portable device without contact between a charger of a radio-telephone and a voltage terminal of the portable device.

(a) intermittently applying a high frequency AC current to a primary coil provided to the charging device so as to intermittently generate a magnetic field in an outer region;

Chung-Sik discloses intermittently applying a high frequency AC current to a primary coil 77 provided to the charging device by a voltage switching unit 44 by turning on/off transistor 64 so as to intermittently generate a magnetic field in an outer region around coil 77 (Fig. 2).

(b) linking a magnetic flux of the generated magnetic field to a secondary coil provided to the battery so as to intermittently output an electromagnetically-induced high frequency AC current;

Chung-Sik discloses linking a magnetic flux of the generated magnetic field of coil 77 to a secondary coil 79 provided to the battery 32 so as to intermittently output an electromagnetically-induced high frequency AC current (Fig. 2).

(c) rectifying the output high frequency AC current to be converted into a DC current;

Chung-Sik discloses rectifying the high frequency AC current output from coil 79 by rectifier 80 and converted into a DC current (Fig. 2, page 8-3).

> The induced voltage rectifying unit 50 includes a core 78 and a coil 79 wound around the core 78, and includes an induced voltage detecting unit 83 that is inductively coupled to the induced voltage generating unit 46, and a rectifier 80 for rectifying a voltage output from the coil 79 of the induced voltage detecting unit 83.

(d) applying the DC current to a battery cell through a constant voltage/constant current supplier so as to charge the battery cell in a constant voltage/constant current mode;

Chung-Sik discloses applying the DC current to a battery cell 32 through a constant voltage/constant current supplier (80, 52) (see "constant voltage V1") so as to charge the battery cell in a constant voltage/constant current mode (Fig. 2, page 8-4, lines 59-62; page 8-5, line 5).

Additionally, Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is

no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier so as to charge the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).

charge. Therefore, the charging control section **123** is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit **122**, and a switching device to stop charging when the rechargeable batteries **111** reach full charge under control of the comparison circuit **124**. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the to modify the constant voltage supplier disclosed by Chung-Sik by adding the constant current constant voltage circuit disclosed by Kaite et al. to stabilize output from a rectifying circuit.

(e) monitoring voltages at both ends of the constant voltage/constant current supplier and transmitting a monitoring result to the charging device by means of wireless

communication while a high frequency AC current is not induced in the secondary coil; and

Chung-Sik discloses contactless charge device for detecting a voltage of a rechargeable battery 32 to control the charge between the charger 12 and the portable device 18 (Chung-Sik , English Translation, page 8-2, lines 8-9)(Fig. 1) and monitoring voltages (V1, V2) at both ends of constant voltage/constant current supplier 52 and transmitting a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) so as to induce a change of intensity of the magnetic field of the induced voltage generating unit 46 (Fig. 2)(Chung-Sik , English Translation, page 8-2, lines 40-55; page 8-3, lines 36-40; page 8-5, lines 35-43) (Fig. 2).

To the extent that Chung-Sik may not specifically disclose communication while a high frequency AC current is not induced in the secondary coil it would have been obvious to do so for charging of the battery when voltage of the battery is determined to be less than normal (Fig. 2).

At the time the invention was made it would have been obvious for the charging power adjusting unit disclosed by Chung-Sik to transmit a monitoring result to the charging device by means of wireless communication while a high frequency AC current is not induced in the secondary coil for starting charging of the battery when voltage of the battery is determined to be less than normal.

(f) adjusting a power of the high frequency AC current applied to the primary coil according to the transmitted monitoring result,

Chung-Sik disclosed charging power adjusting unit 48 (first microcomputer) for receiving the monitoring result from the contact-less chargeable battery by means of wireless communication (RADIO UNIT 26 connected to antenna) and controlling the high frequency power driving unit (transistor 64) to adjust a power of the high frequency AC current applied to the magnetic field generating unit 46 so that a charging power transmitted to the battery 32 is adjusted. (Figs. 1, 2 & 3A, page 8-5).

Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

wherein the adjusting the power of the high frequency AC current applied to the primary coil is based on relative positions of the contact-less chargeable battery and the contact-less charging device.

While Chung-Sik discloses to adjust the power of the high frequency AC current applied to the magnetic field generating unit is based on the voltage of the contact-less chargeable battery, Chung-Sik did not specifically disclose adjusting the power of the high frequency AC current applied to the magnetic field generating unit is based on relative positions of the contact-less chargeable battery and the contact-less charging device.

Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging device wherein charging current (power of the high frequency AC current applied to the magnetic field generating unit) can be adjusted based on the distance of output coil 7 of charging equipment 1 and input coil 6 of battery 2' ("storage battery") (Matsuki,

Figs. 2-4 and English Translation, "Detailed explanation of the device" "Charging current can be adjusted by [which control a high frequency output or changes the distance of output coil 7 of charging equipment 1', and input coil 6 of storage battery 2']").

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by adding wireless feedback control signal to induce the change of intensity of the magnetic field based on relative positions of the contact-less chargeable battery and the external contact-less charging device disclosed by Matsuki for charging a battery.

24 (Original). The method according to claim 23, wherein the monitoring result is a difference of voltages at both ends of the constant voltage/constant current supplier, voltage values at both ends, a code indicating that the voltages at both ends are in an overvoltage state, or a charging power adjustment request signal.

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses method according to claim 23 as set forth above.

Chung-Sik discloses battery voltage detector circuit 54 includes first and second voltage splitters 89 and 93 for comparing a voltage V1 of an input terminal of the charging unit 52 with a voltage V2 of an output terminal and clocking the result, and a comparator 96 for comparing outputs of the first and second voltage splitters 89 and 93 (V1, V2) and outputting a charge state signal (VDL) to second microcomputer 56 based on the difference of voltage (V1-V2) at both ends of the constant voltage/constant current supplier. The second microcomputer 56 searches for whether or not a charge voltage of the battery 32 is normal in an operation (120 of FIG. 3B)

based on the result of the difference of voltage (V1-V2). Additionally, Chung-Sik discloses outputting code (NO) indicating (overvoltage state) if charge voltage is not normal (see (120 of FIG. 3B) (Fig. 2, page 8-4, lines 40-42).

Claim 25 (New amended): The contact-less chargeable battery according to claim 1,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 1 as set forth above.

wherein the constant voltage/constant current supplier includes circuitry and the controlled by at least one microprocessor.

Chung-Sik discloses wherein the constant voltage/constant current supplier includes circuitry controlled by at least one microprocessor (48, 56) (Fig. 2).

Claim 26 (New): The contact-less chargeable battery according to claim 1,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 1 as set forth above.

wherein the overvoltage monitoring unit controls, through wireless feedback control of the charging of the battery cell, the voltages at both ends of the constant voltage/constant current supplier by inducing the change of intensity of the magnetic field.

Chung-Sik discloses feedback is provided wirelessly to the base unit 12 by the output (VDL) of the comparator 96 in the overvoltage monitoring unit 54 for controlling the voltages at both ends of a constant voltage/constant current supplier 52 by inducing the change of intensity of the magnetic field in coil 77 by switching transistor 64 at a frequency of 10 KHZ so as to induce an AC voltage from the coil 77 to the inductively coupled coil 79 and AC voltage output

from coil 79 is rectified by the rectifier 80 so as to control the voltages at both ends of the constant voltage/constant current supplier 52 for charging the battery 32. (Chung-Sik, English Translation, page 8-4).

Claim 27 (New): The contact-less chargeable battery according to claim 1,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 1 as set forth above.

wherein the constant voltage/constant current supplier has a front end and a rear end, wherein the constant voltage/constant current supplier receives the DC current at the front end from the rectifier and supplies the charging power at the rear end to the battery cell.

Chung-Sik disclosed constant voltage/constant current supplier 52 receives the DC current at the front end from the rectifier 80 and supplies the charging power at the rear end to the battery cell 32 (The other end of the battery 32 is grounded) (Fig. 2).

Claim 28 (New): The contact-less chargeable battery according to claim 1,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 1 as set forth above.

wherein the constant voltage/constant current supplier supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage.

Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the

battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage it would have been obvious over Kaite et al. (US 6,016,046).

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage (col. 6, lines 61-65) (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the contact-less charging circuit of Chung-Sik and Matsuki by adding the constant voltage/constant current supplier disclosed by Kaite et al. to supply the charging power in a constant current mode at an initial charging stage and then supply the charging power in a constant voltage mode at a later charging stage for efficient charging of the battery.

Claim 29 (New): The contact-less chargeable battery according to claim 1,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 1 as set forth above.

wherein the constant voltage/constant current supplier charges the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level.

Chung-Sik discloses constant voltage/constant current supplier 52 charges the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level 120 (charge voltage normal?) (Fig. 3B).

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier charges the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level, it would have been obvious over Kaite et al.

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) charges the battery cell (batteries 111) (Fig. 2) in a constant voltage mode based on a charging voltage measured by the VOLTAGE MEASURING SECTION 126 of the battery cell 111 exceeding a predetermined level ("battery voltage or current are outside the specified range") (col. 6, line 64 to col. 7, line 4; col. 7, lines 45-46). Kaite et al. discloses computational circuit 124 stops charging (SWITCHING DEVICE OFF) (Fig. 3) when the rechargeable batteries 111 have reached full charge based on the charging voltage of the battery cell exceeding a predetermined level measured by voltage measuring section 126 (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the constant voltage/constant current supplier disclosed by Chung-Sik by adding computational circuit disclosed by Kaite et al to stop charging of the battery when the

rechargeable batteries have reached full charge based on the charging voltage of the battery cell exceeding a predetermined level measured by voltage measuring section.

Claim 30 (New, amended): The contact-less charging circuit module according to claim 7,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging circuit module according to claim 7 as set forth above.

wherein the constant voltage/constant current supplier includes circuitry controlled by at least one microprocessor.

Chung-Sik discloses wherein the constant voltage/constant current supplier 52 include circuitry controlled by at least one microprocessor (48, 56) (Fig. 2).

To the extent that Chung-Sik may not specifically disclose wherein the constant voltage/constant current supplier and the overvoltage monitoring unit include circuitry controlled by at least one microprocessor, it would have been obvious over Kaite et al.

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) and the overvoltage monitoring unit 126 include circuitry controlled by at least one microprocessor 120 (CONTROL CIRCUIT). Kaite et al. discloses that the control circuit 120 may be a microprocessor (col. 7, lines 28-36) (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the constant voltage/constant current supplier disclosed by Chung-Sik by adding microprocessor disclosed by Kaite et al. for controlling the battery charging switching device (Fig. 3).

Claim 31 (New): The contact-less charging circuit module according to claim 7,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 7 as set forth above.

wherein the overvoltage monitoring unit controls, through wireless feedback control of the charging of the battery cell, the voltages at both ends of the constant voltage/constant current supplier by inducing the change of intensity of the magnetic field.

Chung-Sik discloses overvoltage monitoring unit 54 controls, through wireless feedback by (RADIO UNIT 34) to control of the charging of the battery cell 32 by switching on and off transistor 64, inducing the change of intensity of the magnetic field in coil 77 of the induced voltage generating unit 46 to control the voltages at both ends of the constant voltage/constant current supplier 52. (Fig. 2).

Claim 32 (New): The contact-less charging circuit module according to claim 7,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 7 as set forth above.

wherein the constant voltage/constant current supplier has a front end and a rear end, wherein the constant voltage/constant current supplier receives the DC current at the front end from the rectifier and supplies the charging power at the rear end to the battery cell.

Chung-Sik disclosed constant voltage/constant current supplier 52 receives the DC current at the front end from the rectifier 80 and supplies the charging power at the rear end to the battery cell 32 (The other end of the battery 32 is grounded) (Fig. 2).

Additionally, Kaite et al. disclosed constant voltage/constant current supplier 123 has a front end and a rear end, wherein the constant voltage/constant current supplier 123 receives the DC current at the front end from the rectifier 122 and supplies the charging power at the rear end to the battery cell 111 (col. 6, lines 25-36) (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the contact-less charging circuit of Chung-Sik and Matsuki by adding the constant voltage/constant current supplier disclosed by Kaite et al. to supply the charging power in a constant current mode at an initial charging stage and then supply the charging power in a constant voltage mode at a later charging stage for efficient charging of the battery.

Claim 33 (New): The contact-less charging circuit module according to claim 7,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging circuit module according to claim 7 as set forth above.

wherein the constant voltage/constant current supplier supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage.

Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage it would have been obvious over Kaite et al. (US 6,016,046).

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage (col. 6, lines 61-65) (Fig. 2).

Claim 34 (New): The contact-less charging circuit module according to claim 7,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging circuit module according to claim 7 as set forth above.

wherein the constant voltage/constant current supplier charges the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level.

Chung-Sik discloses constant voltage/constant current supplier 52 charges the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level 120 (charge voltage normal?) (Fig. 3B).

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier charges the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level, it would have been obvious over Kaite et al.

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) charges the battery cell (batteries 111) (Fig. 2) in a constant voltage mode based on a charging voltage measured by the VOLTAGE MEASURING SECTION 126 of the battery cell 111 exceeding a predetermined level ("battery voltage or current are outside the specified range") (col. 6, line 64 to col. 7, line 4; col. 7, lines 45-46). Kaite et al. discloses computational circuit 124 stops charging (SWITCHING DEVICE OFF) (Fig. 3) when the rechargeable batteries 111 have reached full charge based on the charging voltage of the battery cell exceeding a predetermined level measured by voltage measuring section 126 (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the constant voltage/constant current supplier disclosed by Chung-Sik by adding computational circuit disclosed by Kaite et al to stop charging when the rechargeable batteries have reached full charge based on the charging voltage of the battery cell exceeding a predetermined level measured by voltage measuring section.

Claim 35 (New): The contact-less chargeable battery according to claim 13,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 13 as set forth above.

wherein the constant voltage/constant current supplier includes circuitry controlled by at least one microprocessor.

Chung-Sik discloses wherein the constant voltage/constant current supplier 52 and the overvoltage monitoring unit 54 include circuitry controlled by at least one microprocessor (48, 56) (Fig. 2).

To the extent that Chung-Sik may not specifically disclose wherein the constant voltage/constant current supplier and the overvoltage monitoring unit include circuitry controlled by at least one microprocessor, it would have been obvious over Kaite et al.

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) and the overvoltage monitoring unit 126 include circuitry controlled by at least one microprocessor 120 (CONTROL CIRCUIT). Kaite et al. discloses that the control circuit 120 may be a microprocessor (col. 7, lines 28-36) (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the constant voltage/constant current supplier disclosed by Chung-Sik by adding microprocessor disclosed by Kaite et al. for controlling the battery charging switching device (Fig. 3).

Claim 36 (New): (Cancelled)

Claim 37 (New): The contact-less charging device according to claim 13,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less chargeable battery according to claim 13 as set forth above.

wherein the constant voltage/constant current supplier has a front end and a rear end, and wherein the constant voltage/constant current supplier receives a DC current from a rectifier at the front end and supplies a charging power at the rear end.

Chung-Sik discloses wherein the constant voltage/constant current supplier 52 has a front end and a rear end, and wherein the constant voltage/constant current supplier receives a DC current from a rectifier 80 at the front end and supplies a charging power at the rear end to battery 32 (Chung-Sik, English Translation, page 8-4, last paragraph) (Fig. 2).

Additionally, Kaite et al. disclosed constant voltage/constant current supplier 123 has a front end and a rear end, wherein the constant voltage/constant current supplier 123 receives the DC current at the front end from the rectifier 122 and supplies the charging power at the rear end to the battery cell 111 (col. 6, lines 25-36) (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the contact-less charging circuit of Chung-Sik and Matsuki by adding the constant voltage/constant current supplier disclosed by Kaite et al. to supply the charging power in a constant current mode at an initial charging stage and then supply the charging power in a constant voltage mode at a later charging stage for efficient charging of the battery.

Claim 38 (New): The contact-less charging device according to claim 13,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging device according to claim 13 as set forth above.

wherein the constant voltage/constant current supplier charges the battery in a constant current mode at an initial charging stage and then charges the battery in a constant voltage mode at a later charging stage.

Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English

Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 82, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage it would have been obvious over Kaite et al. (US 6,016,046).

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage (col. 6, lines 61-65) (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the charge control circuit disclosed by Chung-Sik by adding constant voltage/constant current supplier (122, 123) disclosed by Kaite et al. for charging the battery in a in a constant current mode at an initial charging stage for charging the battery and then supplies the charging power in a constant voltage mode at a later charging stage so that the charging current may gradually decrease according to the charging state of battery until the battery is fully charged.

Claim 39 (New): The contact-less charging device according to claim 13,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging device according to claim 13 as set forth above.

wherein the constant voltage/constant current supplier charges the battery in a constant voltage mode based on a charging voltage of the battery exceeding a predetermined level.

Chung-Sik discloses constant voltage/constant current supplier 52 charges the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level 120 (charge voltage normal?) (Fig. 3B).

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier charges the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level, it would have been obvious over Kaite et al.

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) charges the battery cell (batteries 111) (Fig. 2) in a constant voltage mode based on a charging voltage measured by the VOLTAGE MEASURING SECTION 126 of the battery cell 111 exceeding a predetermined level ("battery voltage or current are outside the specified range") (col. 6, line 64 to col. 7, line 4; col. 7, lines 45-46). Kaite et al. discloses computational circuit 124 stops charging (SWITCHING DEVICE OFF) (Fig. 3) when the rechargeable batteries 111 have reached full charge based on the charging voltage of the battery cell exceeding a predetermined level measured by voltage measuring section 126 (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the constant voltage/constant current supplier disclosed by Chung-Sik by adding computational circuit disclosed by Kaite et al to stop charging when the rechargeable

batteries have reached full charge based on the charging voltage of the battery cell exceeding a predetermined level measured by voltage measuring section.

Claim 40 (New, amended): The battery charging set according to claim 21,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses battery charging set according to claim 21 as set forth above.

wherein the constant voltage/constant current supplier includes circuitry controlled by at least one microprocessor.

Chung-Sik discloses wherein the constant voltage/constant current supplier 52 includes circuitry controlled by at least one microprocessor (48, 56) (Fig. 2).

To the extent that Chung-Sik may not specifically disclose wherein the constant voltage/constant current supplier and the overvoltage monitoring unit include circuitry controlled by at least one microprocessor, it would have been obvious over Kaite et al.

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) and the overvoltage monitoring unit 126 include circuitry controlled by at least one microprocessor 120 (CONTROL CIRCUIT). Kaite et al. discloses that the control circuit 120 may be a microprocessor (col. 7, lines 28-36) (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the constant voltage/constant current supplier disclosed by Chung-Sik by adding microprocessor disclosed by Kaite et al. for controlling the battery charging switching device (Fig. 3).

Claim 41 (New, amended): The battery charging set according to claim 21,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses battery charging set according to claim 21 as set forth above.

wherein the overvoltage monitoring unit controls, through wireless feedback control of the charging of the battery cell, the voltages at both ends of the constant voltage/constant current supplier by inducing a change of intensity of the magnetic field.

Chung-Sik discloses overvoltage monitoring unit 54 controls, through wireless feedback by (RADIO UNIT 34), the charging of the battery cell 32, by switching on and off transistor 64, inducing the change of intensity of the magnetic field in coil 77 of the induced voltage generating unit 46 to control the voltages at both ends of the constant voltage/constant current supplier 52. (Fig. 2).

Claim 42 (New): The battery charging set according to claim 21,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses battery charging set according to claim 21 as set forth above.

wherein the constant voltage/constant current supplier has a front end and a rear end, wherein the constant voltage/constant current supplier receives the DC current at the front end from the rectifier and supplies the charging power at the rear end to the battery cell.

Chung-Sik disclosed constant voltage/constant current supplier 52 receives the DC current at the front end from the rectifier 80 and supplies the charging power at the rear end to the battery cell 32 (The other end of the battery 32 is grounded) (Fig. 2).

Additionally, Kaite et al. disclosed constant voltage/constant current supplier 123 has a front end and a rear end, wherein the constant voltage/constant current supplier 123 receives the

DC current at the front end from the rectifier 122 and supplies the charging power at the rear end to the battery cell 111 (col. 6, lines 25-36) (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the contact-less charging circuit of Chung-Sik and Matsuki by adding the constant voltage/constant current supplier disclosed by Kaite et al. to supply the charging power in a constant current mode at an initial charging stage and then supply the charging power in a constant voltage mode at a later charging stage for efficient charging of the battery.

Claim 43 (New): The battery charging set according to claim 21,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses battery charging set according to claim 21, as set forth above.

wherein the constant voltage/constant current supplier supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage.

Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage it would have been obvious over Kaite et al. (US 6,016,046).

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage (col. 6, lines 61-65) (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the contact-less charging circuit of Chung-Sik and Matsuki by adding the constant voltage/constant current supplier disclosed by Kaite et al. to supply the charging power in a constant current mode at an initial charging stage and then supply the charging power in a constant voltage mode at a later charging stage for efficient charging of the battery.

Claim 44 (New): The battery charging set according to claim 21,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses battery charging set according to claim 21, as set forth above.

wherein the constant voltage/constant current supplier charges the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level.

Chung-Sik discloses constant voltage/constant current supplier 52 charges the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level 120 (charge voltage normal?) (Fig. 3B).

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier charges the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level, it would have been obvious over Kaite et al.

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) charges the battery cell (batteries 111) (Fig. 2) in a constant voltage mode based on a charging voltage measured by the VOLTAGE MEASURING SECTION 126 of the battery cell 111 exceeding a predetermined level ("battery voltage or current are outside the specified range") (col. 6, line 64 to col. 7, line 4; col. 7, lines 45-46). Kaite et al. discloses computational circuit 124 stops charging (SWITCHING DEVICE OFF) (Fig. 3) when the rechargeable batteries 111 have reached full charge based on the charging voltage of the battery cell exceeding a predetermined level measured by voltage measuring section 126 (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the constant voltage/constant current supplier disclosed by Chung-Sik by adding computational circuit disclosed by Kaite et al to stop charging when the rechargeable batteries have reached full charge based on the charging voltage of the battery cell exceeding a predetermined level measured by voltage measuring section.

Claim 45 (New): The method of claim 23, further comprising:

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses the method of claim 23, as set forth above.

receiving, by the constant voltage/constant current supplier, the DC current at a front end of the constant voltage/constant current supplier; and

supplying, by the constant voltage/constant current supplier, the DC current at a rear end of the constant voltage/constant current supplier to the battery cell.

Chung-Sik disclosed constant voltage/constant current supplier 52 receives the DC current at the front end from the rectifier 80 and supplies the charging power at the rear end to the battery cell 32 (The other end of the battery 32 is grounded) (Fig. 2).

Additionally, Kaite et al. disclosed constant voltage/constant current supplier 123 has a front end and a rear end, wherein the constant voltage/constant current supplier 123 receives the DC current at the front end from the rectifier 122 and supplies the charging power at the rear end to the battery cell 111 (col. 6, lines 25-36) (Fig. 2).

Claim 46 (New): The method of claim 23, further comprising:

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses the method of claim 23, as set forth above.

supplying, by the constant voltage/constant current supplier, the DC current to the battery cell in a constant current mode during an initial charging stage and then in a constant voltage mode at a later charging stage.

Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer

constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage it would have been obvious over Kaite et al. (US 6,016,046).

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage (col. 6, lines 61-65) (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the contact-less charging circuit of Chung-Sik and Matsuki by adding the constant voltage/constant current supplier disclosed by Kaite et al. to supply the charging power in a constant current mode at an initial charging stage and then supply the charging power in a constant voltage mode at a later charging stage for efficient charging of the battery.

Claim 47 (New): The method of claim 23, further comprising:

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses the method of claim 23, as set forth above.

charging, by the constant voltage/constant current supplier, the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level.

Chung-Sik discloses constant voltage/constant current supplier 52 charges the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level 120 (charge voltage normal?) (Fig. 3B).

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier charges the battery cell in a constant voltage mode based on a charging voltage of the battery cell exceeding a predetermined level, it would have been obvious over Kaite et al.

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) charges the battery cell (batteries 111) (Fig. 2) in a constant voltage mode based on a charging voltage measured by the VOLTAGE MEASURING SECTION 126 of the battery cell 111 exceeding a predetermined level ("battery voltage or current are outside the specified range") (col. 6, line 64 to col. 7, line 4; col. 7, lines 45-46). Kaite et al. discloses computational circuit 124 stops charging (SWITCHING DEVICE OFF) (Fig. 3) when the rechargeable batteries 111 have reached full charge based on the charging voltage of the battery cell exceeding a predetermined level measured by voltage measuring section 126 (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the constant voltage/constant current supplier disclosed by Chung-Sik by adding computational circuit disclosed by Kaite et al to stop charging when the rechargeable batteries have reached full charge based on the charging voltage of the battery cell exceeding a predetermined level measured by voltage measuring section.

Claim 48 (New): The method of claim 23, further comprising:

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses the method of claim 23, as set forth above.

controlling, through wireless feedback control of the charging of the battery cell, the voltages at both ends of the constant voltage/constant current supplier by inducing a change of intensity of the magnetic field.

Chung-Sik discloses controlling (by microprocessor 48, 56), through wireless feedback by (RADIO UNIT 34), switching on and off transistor 64, inducing the change of intensity of the magnetic field in coil 77 of the induced voltage generating unit 46, to control the voltages at both ends of the constant voltage/constant current supplier 52 for charging battery 32. (Fig. 2).

Claim 49 (New): A contact-less charging circuit module electrically connected to a battery cell and used for charging an electric energy to the battery cell in a contact-less method, the contact-less charging circuit module comprising:

Chung-Sik discloses contact-less charging circuit module electrically connected to a battery cell 32 and used for charging an electric energy to the battery cell 32 in a contact-less method (Fig. 1).

a high frequency AC current inducing unit that includes a secondary coil to which a high frequency AC current is induced by means of a magnetic field generated from a primary coil of an external contact-less charging device;

Chung-Sik disclosed high frequency AC current inducing unit 38 (CONTACTLESS CHARGING UNIT) to which a high frequency AC current (10 KHZ) is induced by means of a magnetic field generated from an external contact-less charging device (induced voltage generating unit) (page 8-2, lines 17-18, and page 8-4, lines 47-51).

a rectifier receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current;

Chung-Sik discloses rectifier 80 for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current (page 8-2, lines 17-19) (Fig. 2).

a constant voltage/constant current supplier receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode,

Chung-Sik discloses constant voltage/current supplier 52 for receiving DC current (DC voltage IDC) from the rectifier 80 and supplying a charging power to the battery cell 32 in a constant voltage/constant current charge mode (Fig. 2). (See "constant voltage unit", page 8-3, lines 24-27). Chung-Sik further discloses rectifier 80 supplies DC current at a constant voltage IDC. Chung-Sik specifically discloses a constant reference voltage V1 (reference voltage) is obtained by using resistors 88 and 90 for splitting the DC voltage IDC (See "voltage V1 is constant", page 8-5 line 5). Since voltage V1 is constant, therefore the voltage IDC is constant, and the constant voltage/current supplier 52 is receiving a constant DC voltage from rectifier 80 for supplying a charging power to the battery cell in a constant voltage/constant current mode.

Additionally, Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current

is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).

charge. Therefore, the charging control section 123 is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit 122, and a switching device to stop charging when the rechargeable batteries 111 reach full charge under control of the computation circuit 124. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the to modify the constant voltage supplier disclosed by Chung-Sik by adding the constant current constant voltage circuit disclosed by Kaite et al. to stabilize output from the rectifying circuit.

wherein the constant voltage/constant current supplier supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage; and

Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage it would have been obvious over Kaite et al. (US 6,016,046).

In analogous art Kaite et al. discloses constant voltage/constant current supplier (122, 123) supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage for efficient charging of the battery(col. 6, lines 61-65) (Fig. 2).

an overvoltage monitoring unit that includes a wireless transmitting unit, first and second voltage detectors respectively detecting voltages at both ends of the constant voltage/constant current supplier, and

Chung-Sik discloses overvoltage monitoring unit 54 includes a wireless transmitting unit (RADIO UNIT 34), first and second voltage detectors (V1, V2) respectively detecting voltages at both ends of the constant voltage/constant current supplier (84, 86).

a microprocessor monitoring the detected voltages at both ends of the constant voltage/constant current supplier and transmitting a monitoring result to the external contact-less charging device by means of wireless communication through the wireless transmitting unit so as to induce a change of intensity of the magnetic field,

Chung-Sik discloses a microprocessor 56 (second microcomputer) monitoring the detected voltages (V1, V2) at both ends of the constant voltage/constant current supplier (84, 86) and transmitting 34 (RADIO UNIT) (Fig. 1) a monitoring result to the external contact-less charging device 12 by means of wireless communication through the wireless transmitting unit (RADIO UNIT 34) so as to induce a change of intensity of the magnetic field,

Additionally Kaite et al. discloses constant voltage/constant current supplier (122, 123) and the overvoltage monitoring unit 126 include circuitry controlled by at least one microprocessor 120 (CONTROL CIRCUIT). Kaite et al. discloses that the control circuit 120 may be a microprocessor (col. 7, lines 28-36) (Fig. 2).

wherein the change of intensity of the magnetic field is based on relative positions of the primary coil and the secondary coil.

While Chung-Sik discloses to adjust the power of the high frequency AC current applied to the magnetic field generating unit is based on the voltage of the contact-less chargeable battery, Chung-Sik did not specifically disclose the change of intensity of the magnetic field is based on relative positions of the primary coil and the secondary coil.

Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging device wherein charging current (power of the high frequency AC current applied to the magnetic field generating unit) can be adjusted based on the distance of output coil 7 of charging equipment 1 and input coil 6 of battery 2' ("storage battery") (Matsuki, Figs. 2-4 and English Translation, "Detailed explanation of the device" "Charging current can be adjusted by [which control a high frequency output or changes the distance of output coil 7 of charging equipment 1', and input coil 6 of storage battery 2']"). Thus Matsuki discloses the change of intensity of the magnetic field generated by primary coil 77 is based on relative positions of the primary coil and the secondary coil (distance between primary and secondary coil).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by changing the intensity of the magnetic field generated by primary coil based on relative positions of the contact-less chargeable battery and the external contact-less charging device disclosed by Matsuki for contact-less charging a battery.

Claim 50 (New): The contact-less charging circuit module according to claim 49, wherein a magnetic flux of the magnetic field generated from the external contact-less

charging device is linked to the secondary coil of the high frequency AC current inducing unit.

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging circuit module according to claim 49 as set forth above.

Chung-Sik discloses wherein magnetic flux of the magnetic field generated by coil 77 of the induced voltage generating unit 46 (Fig. 2) from the external contact-less charging device 12 (Fig. 1) is linked to the secondary coil 79 of the high frequency AC current inducing unit (induced voltage detecting unit 81) (Fig. 2, page 8-4).

> control signal (SCTL), and the signal is applied to a base of the transistor 64. Thus, when the control signal (SCTL) having a period of about 10 KHZ is output from the output port P1 of the first microcomputer 48, AC power having a period of about 10 KHZ is generated from a collector of the transistor 64. The AC voltage of 10 KHZ generated from the collector of the transistor 64 is applied to the coil 77 wound in the induced voltage generating unit 46 through the alternating current line (AVL). When current of an AC voltage that alternates with a period of 10 KHZ flows in the coil 77, an electromagnetic field is generated around the coil 77, and a portion of a magnetic line of force is linked with the coil 79 wound around the core 78 in the induced voltage detecting unit 81.

Claim 51 (New): The contact-less charging circuit module according to claim 49,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging circuit module according to claim 49 as set forth above.

wherein the wireless transmitting unit wirelessly propagates the monitoring result through an antenna,

Chung-Sik discloses wireless transmitting unit (RADIO UNIT 34) for wirelessly propagating the monitoring result through an antenna (Fig. 1, and Fig. 2, page 8-5).

> In this case, the data input to the line 49 is input as data that is wirelessly transmitted from the portable device 18 when the battery 32 is completely charged. If analysis of input data in operation 110 indicates the portable device is abnormal (i.e. charge is incomplete), the first microcomputer 48 jumps to the aforementioned step 106 to continuously generate a charge voltage, and when the portable device is normal, the first microcomputer 48 jumps to operation 112 to stop charging.
>
> When a charge level of the battery 32 is increased through the aforementioned operation, the charge level detection voltage V2 of a second voltage splitter 93 increases, and when the detection voltage V2 becomes higher than the reference voltage V1, the output VDL of the comparator 96 is transitioned to logic "high" from logic "low" and is input to the second microcomputer 56.

wherein the overvoltage monitoring unit includes a voltage comparator comparing first and second voltages detected by the first and second voltage detectors and outputting a voltage comparison result, and wherein the microprocessor outputs the monitoring result according to the voltage comparison result to the wireless transmitting unit.

Chung-Sik discloses overvoltage monitoring unit includes voltage comparator 96 for comparing first and second voltages (V1, V2) detected by the first and second voltage detectors (V1, V2) and outputs a voltage comparison result (charge state VDL). Chung-Sik further disclosed microprocessor 56 for outputting a monitoring result according to the voltage comparison result to the wireless transmitting unit (Fig. 2, page 8-4, 8-5).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

Claim 52 (New): The contact-less charging circuit module according to claim 51,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging circuit module according to claim 51 as set forth above.

wherein the magnetic field generated by the contact-less charging device is generated intermittently,

Chung-Sik discloses magnetic field generated by the contact-less charging device is generated intermittently (switches on/off transistor 70) (Fig. 2, page 8-4).

wherein the overvoltage monitoring unit further includes a charging pause detecting unit receiving the high frequency AC current output from the high frequency AC current inducing unit to detect a time point when the induction of high frequency AC current ends, and then outputting the end time point to the microprocessor, and

Chung-Sik also discloses contactless charge system for detecting a voltage of a rechargeable battery 32 including charging pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1).

Chung-Sik discloses overvoltage monitoring unit 38 (included in CONTACTLESS CHARGING UNIT) receiving the high frequency AC current output from the high frequency AC current inducing unit 28 (POWER TRANSMITTER) (Fig. 1). Chung-Sik discloses a control signal (SCTL) output from the output port Pl of FIRST MICRO COMPUTER 48 is applied to a base of the transistor 70 through a resistor 72 and switches "on/off' the transistor 70 around ten thousand times per second. In this case, a potential of a collector terminal of the transistor 70 is switched between "low" and "high" depending on a period of the control signal (SCTL) and the signal is applied to a base of the transistor 64." (Chung-Sik, page 8-4, Fig. 2).

Regarding detecting a time point when the induction of high frequency AC current ends, and then outputting the end time point to the microprocessor, Chung-Sik discloses that the charging of battery continues until the detection voltage V2 becomes higher than V1 and the output signal VDL of comparator 96 is transitioned to logic “high” from logic “low” and is input to second microcomputer 56 to produce charging completion alarm (Fig. 2, page 8-5, lines 31-43). The transition to logic “high” from logic “low” is considered a time point when the

induction of high frequency AC current ends, and then outputting the end time point (charge completion) to the microprocessor 56. The microcomputer 56 is broadly considered the same as charging pause detecting unit that produces charging completion alarm when the voltage of battery is determined to be normal and completely charged.

Additionally, Chung-Sik specifically disclosed a "time point" when the charge operation may be automatically stopped by communication between contact less charging unit 38 and power transmitter 28 (Chung-Sik, English Translation, page 8-5, lines 44-46 and Fig. 1).

Thus, in the present invention according to the above embodiments, a battery begins to be charged from a time point when the portable device 18 operated at an operating voltage of the battery is installed on the base unit 12, and the charge operation may be automatically stopped either by communication between devices or overheating of the devices.

To the extent that Chung-Sik may not specifically disclose a charging pause detecting unit it would have been obvious to modify the overvoltage monitoring unit disclosed by Chung-Sik by adding a charging pause detecting unit because Chung-Sik specifically disclosed battery begins to be charged from a "time point" and the charge operation may be automatically stopped by communication between devices.

wherein the monitoring result is transmitted to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced after the end time point is input.

Chung-Sik discloses wherein the monitoring result (VDL) output to second microprocessor 56 is transmitted to the external contact-less charging device by means of

wireless communication by an antenna connected to radio unit 34. (Fig. 2, page 8-5).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

To the extent that Chung-Sik may not specifically disclose monitoring result is transmitted to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced after the end time point is input, it would have been obvious for charging of the battery when voltage of the battery is determined to be less than normal (Fig. 2).

At the time the invention was made it would have been obvious for the charging power adjusting unit disclosed by Chung-Sik to transmit a monitoring result to the charging device by means of wireless communication while a high frequency AC current is not induced in the secondary coil for starting charging of the battery when voltage of the battery is determined to be less than normal.

Claim 53 (New): The contact-less charging circuit module according to claim 49,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging circuit module according to claim 49 as set forth above.

wherein the monitoring result is a charging power adjustment request signal.

Chung-Sik discloses outputting a charge state signal (VDL) which is input to second microcomputer 56 for controlling the portable device 18 (battery) (Fig. 2, page 8-3). Chung-Sik

discloses battery voltage detector circuit 54 that includes first and second voltage splitters 89 and 93 for comparing a voltage V1 of an input terminal of the charging unit 52 with a voltage V2 of an output terminal and clocking the result, and a comparator 96 for comparing outputs of the first and second voltage splitters 89 and 93 (V1, V2) and outputting a charge state signal (VDL) to second microcomputer 56 based on the difference of voltage (V1-V2) at both ends of the constant voltage/constant current supplier. The second microcomputer 56 searches for whether or not a charge voltage of the battery 32 is normal in an operation (120 of FIG. 3B) based on the result of the difference of voltage (V1-V2). Additionally, Chung-Sik discloses outputting code (NO) indicating (overvoltage state) if charge voltage is not normal (see (120 of FIG. 3B) (Fig. 2, page 8-4, lines 40-42).

Claim 54 (New): The contact-less charging circuit module according to claim 49,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging circuit module according to claim 49 as set forth above.

wherein the monitoring result is a difference of voltages at front and rear ends of the constant voltage/constant current supplier, voltage values of the front and rear ends, or a code indicating that the voltages at both ends are in an overvoltage state.

Chung-Sik discloses wherein the monitoring result is a difference of voltages (V1-V2) at front and rear ends of the constant voltage/constant current supplier (84, 86) (Fig. 2). Additionally, Chung-Sik discloses outputting code (NO) indicating (overvoltage state) and transmit alarm to base unit (step 122) (Fig. 3B) if charge voltage is not normal (see step 120 of FIG. 3B, page 8-4, lines 40-42).

Claim 56 (New): The contact-less charging circuit module according to claim 55,

Chung-Sik alone or Chung-Sik and Kaite discloses contact-less charging circuit module according to claim 55 as set forth above.

wherein at least one of the first charging power adjustment request signal and the second charging power adjustment request signal is based on relative positions of the primary coil and the secondary coil.

While Chung-Sik discloses to adjust the power of the high frequency AC current applied to the magnetic field generating unit is based on the voltage of the contact-less chargeable battery, Chung-Sik did not specifically disclose the change of intensity of the magnetic field is based on relative positions of the primary coil and the secondary coil.

Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging device wherein charging current (power of the high frequency AC current applied to the magnetic field generating unit) can be adjusted based on the distance of output coil 7 of charging equipment 1 and input coil 6 of battery 2' ("storage battery") (Matsuki, Figs. 2-4 and English Translation, "Detailed explanation of the device" "Charging current can be adjusted by [which control a high frequency output or changes the distance of output coil 7 of charging equipment 1', and input coil 6 of storage battery 2']"). Thus Matsuki discloses the change of intensity of the magnetic field generated by primary coil 77 is based on relative positions of the primary coil and the secondary coil (distance between primary and secondary coil).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by changing the intensity of the magnetic field generated by primary coil based on relative positions of the contact-less chargeable battery and the external contact-less charging device disclosed by Matsuki for contact-less charging a battery.

Claim 61 (New): The contact-less charging circuit module according to claim 60,

Chung-Sik alone or Chung-Sik and Kaite discloses contact-less charging circuit module according to claim 60 as set forth above.

wherein at least one of the first charging power adjustment request signal and the second charging power adjustment request signal is based on relative positions of the contact-less charging circuit module and the external contact-less charging device.

Chung-Sik disclosed transmitting a charging power adjustment signal when the battery voltage is less than a predetermined level.

Chung-Sik did not disclose charging power adjustment request signal is based on relative positions of the contact-less charging circuit module and the external contact-less charging device.

Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging wherein charging current can be adjusted based on the distance of output coil 7 of charging equipment 1 and input coil 6 of battery 2'(Figs. 2-4).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by adding charging power adjustment request signal based on relative positions of the contact-less charging circuit module and the external contact-less charging device disclosed by Matsuki for charging a battery.

Claim 65 (New): A contact-less charging circuit module electrically connected to a battery cell and used for charging an electric energy to the battery cell in a contact-less method, the contact-less charging circuit module comprising:

Chung-Sik discloses contact-less charging circuit module electrically connected to a battery cell 32 and used for charging an electric energy to the battery cell 32 in a contact-less method (page 8-2, lines 6-7) (Fig. 1).

The present invention relates to a charge system of a radio-telephone. More specifically, the present invention relates to a contactless charge system of a radio-telephone for charging a battery in a portable device without contact between a charger of a radio-telephone and a voltage terminal of the portable device.

a high frequency AC current inducing unit to which a high frequency AC current is induced by means of a magnetic field generated from an external contact-less charging device;

Chung-Sik disclosed high frequency AC current inducing unit 38 (CONTACTLESS CHARGING UNIT) to which a high frequency AC current (10 KHZ) is induced by means of a magnetic field generated from an external contact-less charging device (induced voltage generating unit) (page 8-2, lines 17-18, and page 8-4, lines 47-51).

a rectifier for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current;

Chung-Sik discloses rectifier 80 for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current (page 8-2, lines 17-19) (Fig. 2).

a constant voltage/constant current supplier receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode; and

Chung-Sik discloses constant voltage/current supplier for receiving DC current from the rectifier 80 and supplying a charging power to the battery cell 32 in a constant voltage/constant current charge mode (Fig. 2). (See "constant voltage unit", page 8-3, lines 24-27). Chung-Sik further discloses rectifier 80 supplies DC current at a constant voltage V1 (reference voltage) (See "voltage V1 is constant", page 8-5 line 5). Since voltage V1 is constant it is supplying a charging power to the battery cell in a constant voltage/constant current mode.

Chung-Sik further discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).

charge. Therefore, the charging control section **123** is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit **122**, and a switching device to stop charging when the rechargeable batteries **111** reach full charge under control of the computation circuit **124**. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the to modify the constant voltage supplier disclosed by Chung-Sik by adding the constant current constant voltage circuit disclosed by Kaite et al. to stabilize output from the rectifying circuit.

an overvoltage monitoring unit that includes: a microprocessor monitoring voltages at both ends of the constant voltage/constant current supplier, and a wireless transmitting

unit transmitting a monitoring result to the external contact-less charging device by means of wireless communication so as to induce a change of intensity of the magnetic field,

Chung-Sik also discloses contact-less charging circuit module detecting a voltage of a rechargeable battery 32 to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1) and specifically disclosed an over voltage monitoring unit 54 for monitoring voltages (V1, V2) at both ends of the constant voltage/current supplier 52 and microprocessor 56 scans the output VDL of the comparator 96 and searches for whether or not the charge voltage of battery 32 is normal. Microprocessor 56 transmits a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through line 37 so as to induce a change of intensity of the magnetic field of the induced voltage generating unit 46 (Fig. 1, 2) (page 8-2, lines 31-34, 40-55; page 8-3, lines 36-40; page 8-5, lines 35-43) (Fig. 2).

wherein the change of intensity of the magnetic field is based on relative positions of the contact-less charging circuit module and the external contact-less charging device.

While Chung-Sik discloses to induce the change of intensity of the magnetic field based on battery voltage monitoring it did not specifically disclose to induce the change of intensity of the magnetic field based on relative positions of the contact-less chargeable battery and the external contact-less charging device.

Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging wherein charging current can be adjusted based on the distance of output coil 7 of charging equipment 1 and input coil 6 of battery 2'(Figs. 2-4).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by adding wireless feedback control signal to induce the change of intensity of the magnetic field based on relative positions of the contact-less chargeable battery and the external contact-less charging device disclosed by Matsuki for charging a battery.

Claim 66 (New): A contact-less charging circuit module electrically connected to a battery cell and used for charging an electric energy to the battery cell in a contact-less method, the contact-less charging circuit module comprising:

Chung-Sik discloses contact-less charging circuit module electrically connected to a battery cell 32 of portable device 18 and used for receiving a charging power from an external contact-less charging device (charger) and charging an electric energy to the battery cell 32 in a contact-less method (Fig. 1, page 8-1).

The present invention relates to a charge system of a radio-telephone. More specifically, the present invention relates to a contactless charge system of a radio-telephone for charging a battery in a portable device without contact between a charger of a radio-telephone and a voltage terminal of the portable device.

a high frequency AC current inducing unit including a secondary coil to which a high frequency AC current is induced by means of a magnetic field generated from a primary coil in an external contact-less charging device;

Chung-Sik disclosed high frequency AC current inducing unit 38 (CONTACTLESS CHARGING UNIT) to which a high frequency AC current is induced by means of a magnetic field generated from a primary coil 77 (Fig. 2) in an external contact-less charging device 12 (Fig. 1) (page 8-2, lines 17-18).

a rectifier for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current;

Chung-Sik disclosed rectifier 80 for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current (page 8-2, lines 17-19) (Fig. 2).

a constant voltage/constant current supplier receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode; and

Chung-Sik discloses constant voltage/current supplier for receiving DC current from the rectifier 80 and supplying a charging power to the battery cell 32 in a constant voltage/constant current charge mode (Fig. 2). (See "constant voltage unit", page 8-3, lines 24-27). Chung-Sik further discloses rectifier 80 supplies DC current at a constant voltage V1 (reference voltage) (See "voltage V1 is constant", page 8-5 line 5). Since voltage V1 is constant it is supplying a charging power to the battery cell in a constant voltage/constant current mode.

Additionally, Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).

charge. Therefore, the charging control section **123** is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit **122**, and a switching device to stop charging when the rechargeable batteries **111** reach full charge under control of the computation circuit **124**. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the to modify the constant voltage supplier disclosed by Chung-Sik by adding the constant current constant voltage circuit disclosed by Kaite et al. to stabilize output from the rectifying circuit.

an overvoltage monitoring unit that includes: a microprocessor monitoring voltages at both ends of the constant voltage/constant current supplier, and a wireless transmitting

unit transmitting a monitoring result to the external contact-less charging device by means of wireless communication so as to induce a change of intensity of the magnetic field,

Chung-Sik also discloses contactless charge system for detecting a voltage of a rechargeable battery 32 including charge pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1) and specifically disclosed over voltage monitoring unit 54 and microprocessor 56 for monitoring voltages (V1, V2) at both ends of the constant voltage/current supplier 52 and microprocessor 56 scans the output VDL of the comparator 96 and searches for whether or not the charge voltage of battery 32 is normal. Microprocessor 56 transmits a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through line 37 so as to induce a change of intensity of the magnetic field of the induced voltage generating unit 46 (Fig. 1, 2) (page 8-2, lines 31-34, 40-55; page 8-3, lines 36-40; page 8-5, lines 35-43) (Fig. 2).

wherein the secondary coil is movable relative to the primary coil during the charging of the battery cell by the contact-less charging circuit module.

Chung-Sik did not specifically disclose wherein the secondary coil 79 (Fig. 2) is movable relative to the primary coil 77 (Fig. 2) during the charging of the battery cell 32 by the contact-less charging circuit module 12 (Fig. 1).

Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging wherein charging current can be adjusted based on the distance of output coil 7 of charging equipment 1 and input coil 6 of battery 2'(Figs. 2-4). Since Matsuki

discloses adjusting the charging current based on the distance between output and input coil means that the secondary coil is movable relative to the primary coil.

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by adding wireless feedback control signal to induce the change of intensity of the magnetic field based on relative positions of the contact-less chargeable battery and the external contact-less charging device (secondary coil is movable relative to the primary coil) disclosed by Matsuki for charging a battery.

Claim 67 (New): The contact-less charging circuit module according to claim 66,

Chung-Sik and Matsuki or Chung-Sik, Kaite and Matsuki discloses contact-less charging circuit module according to claim 66 as set forth above.

wherein the monitoring result includes an adjustment request signal being transmitted repeatedly during the battery charging process for adjusting the intensity of the magnetic field.

Chung-Sik discloses adjusting battery charging operation according to flowchart (Fig. 3A, 3B). It is obvious that the charge adjustment request signal is sent repeatedly depending upon whether or not the charge voltage of battery 32 is normal (Chung-Sik, English Translation, page, 8-5).

Claim 68 (New): A contact-less charging circuit module electrically connected to a battery cell and used for charging an electric energy to the battery cell in a contact-less method, the contact-less charging circuit module comprising:

Chung-Sik discloses contact-less charging circuit module electrically connected to a battery cell 32 of portable device 18 and used for receiving a charging power from an external contact-less charging device (charger) and charging an electric energy to the battery cell 32 in a contact-less method (Fig. 1, page 8-1).

The present invention relates to a charge system of a radio-telephone. More specifically, the present invention relates to a contactless charge system of a radio-telephone for charging a battery in a portable device without contact between a charger of a radio-telephone and a voltage terminal of the portable device.

a high frequency AC current inducing unit to which a high frequency AC current is induced by means of a magnetic field generated from an external contact-less charging device;

Chung-Sik disclosed high frequency AC current inducing unit 38 (CONTACTLESS CHARGING UNIT) to which a high frequency AC current is induced by means of a magnetic field generated from a primary coil 77 (Fig. 2) in an external contact-less charging device 12 (Fig. 1) (page 8-2, lines 17-18).

a rectifier for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current;

Chung-Sik disclosed rectifier 80 for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current (page 8-2, lines 17-19) (Fig. 2).

a constant voltage/constant current supplier receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode; and

Chung-Sik discloses constant voltage/current supplier for receiving DC current from the rectifier 80 and supplying a charging power to the battery cell 32 in a constant voltage/constant current charge mode (Fig. 2). (See "constant voltage unit", page 8-3, lines 24-27). Chung-Sik further discloses rectifier 80 supplies DC current at a constant voltage V1 (reference voltage) (See "voltage V1 is constant", page 8-5 line 5). Since voltage V1 is constant it is supplying a charging power to the battery cell in a constant voltage/constant current mode.

Additionally, Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

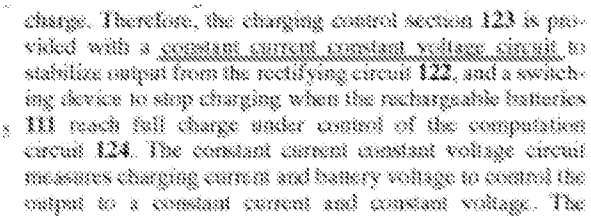
In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power

to the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).


charge. Therefore, the charging control section 123 is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit 122, and a switching device to stop charging when the rechargeable batteries 111 reach full charge under control of the computation circuit 124. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the to modify the constant voltage supplier disclosed by Chung-Sik by adding the constant current constant voltage circuit disclosed by Kaite et al. to stabilize output from the rectifying circuit.

an overvoltage monitoring unit that includes: a microprocessor monitoring voltages at both ends of the constant voltage/constant current supplier, and a wireless transmitting unit transmitting a monitoring result to the external contact-less charging device by means of wireless communication so as to induce a change of intensity of the magnetic field,

Chung-Sik also discloses contactless charge system for detecting a voltage of a rechargeable battery 32 including charge pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1) and specifically disclosed over voltage monitoring unit 54 and microprocessor 56 for monitoring voltages (V1,

V2) at both ends of the constant voltage/current supplier 52 and microprocessor 56 scans the output VDL of the comparator 96 and searches for whether or not the charge voltage of battery 32 is normal. Microprocessor 56 transmits a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through line 37 so as to induce a change of intensity of the magnetic field of the induced voltage generating unit 46 (Fig. 1, 2) (page 8-2, lines 31-34, 40-55; page 8-3, lines 36-40; page 8-5, lines 35-43) (Fig. 2).

wherein the contact-less charging circuit module is movable relative to the external contact-less charging device during the charging of the battery cell by the contact-less charging circuit module.

While Chung-Sik discloses the contact-less charging circuit module 38 (part of portable device 18) is movable relative to the external contact-less charging device 12 (base unit) (Fig. 1), Chung-Sik requires contact-less charging circuit module 38 (part of portable device 18) to be installed on the base unit 12 (external contact-less charging device) for contact-less charging of battery 32 (Fig. 1). Thus, Chung-Sik fails to disclose contact-less charging circuit module is movable relative to the external contact-less charging device during the charging of the battery cell by the contact-less charging circuit module.

Inventor Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging wherein charging current can be adjusted based on the distance of output coil 7 of charging equipment 1 (external contact-less charging device) and input coil 6 of battery 2' (contact-less charging circuit module) (Figs. 2-4). Since Matsuki discloses adjusting the charging current based on the distance between output and input coil means that the secondary coil is movable relative to the primary coil.

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by adding wireless feedback control signal to induce the change of intensity of the magnetic field based on relative positions of the contact-less chargeable battery and the external contact-less charging device (secondary coil is movable relative to the primary coil) disclosed by Matsuki for charging a battery.

Claim 73 (New): The contact-less charging circuit module according to claim 69,

Chung-Sik and Matsuki or discloses contact-less charging circuit module according to claim 69 as set forth above.

wherein the charging power adjustment request signal is based on relative positions of the contactless charging circuit module and the external contact-less charging device.

While Chung-Sik discloses charging power adjustment request signal (communication between devices) to induce the change of intensity of the magnetic field based on battery voltage (Fig. 3B), Chung-Sik did not specifically disclose charging power adjustment request signal is based on relative positions of the contactless charging circuit module and the external contact-less charging device.

Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging wherein charging current can be adjusted based on the distance of output coil 7 of charging equipment 1 and input coil 6 of battery 2' (Figs. 2-4).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by adding charging power adjustment request signal based on relative positions of the contactless charging circuit module and the external contact-less charging device disclosed by Matsuki for charging a battery.

Claim 74 (New): A contact-less charging device for transmitting a charging power by means of electromagnetic induction phenomenon to a contact-less chargeable battery that has a constant-voltage/constant current supplier to be capable of being charged in a constant voltage/constant current mode and wirelessly transmits a monitoring result for voltages at both ends of the constant voltage/constant current supplier, the contact-less charging device comprising:

Chung-Sik discloses contact-less charging device for transmitting a charging power by means of electromagnetic induction phenomenon to a contact-less chargeable battery 32 that has a constant-voltage/constant current supplier to be capable of being charged in a constant voltage/constant current mode (page 8-2, lines 6-7) (Fig. 1).

The present invention relates to a charge system of a radio-telephone. More specifically, the present invention relates to a contactless charge system of a radio-telephone for charging a battery in a portable device without contact between a charger of a radio-telephone and a voltage terminal of the portable device.

Chung-Sik discloses constant voltage/current supplier 42 for receiving DC current from the rectifier 80 and supplying a charging power to the battery cell 32 in a constant voltage/constant current charge mode (Fig. 2). (See "constant voltage unit", page 8-3, lines 24-27). Chung-Sik further discloses rectifier 80 supplies DC current at a constant voltage V1 (reference voltage). (See "voltage V1 is constant", page 8-5 line 5).

Chung-Sik discloses wirelessly transmitting a monitoring result for voltages at both ends of the constant voltage/constant current supplier (Chung-Sik, English Translation, pages 8-5, Fig. 2).

Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

a magnetic field generating unit for receiving an AC current and forming a magnetic field in an outer space;

Chung-Sik discloses magnetic field generating unit 46 (induced voltage generating unit) for receiving an AC current and forming a magnetic field in an outer space (space around coil 77). (Chung-Sik, English Translation, page 8-4 lines 47-51; and Fig. 2).

10 KHZ is generated from a collector of the transistor 64. The AC voltage of 10 KHZ generated from the collector of the transistor 64 is applied to the coil 77 wound in the induced voltage generating unit 46 through the alternating current line (AVL). When current of an AC voltage that alternates with a period of 10 KHZ flows in the coil 77, an electromagnetic field is generated around the coil 77, and a portion of a magnetic line of force is linked with the coil 79 wound around the core 78 in the induced voltage detecting unit 81.

a high frequency power driving unit for applying a high frequency AC current to the magnetic field generating unit; and

Chung-Sik discloses a high frequency power driving unit (transistor 64) for applying a high frequency AC current to the magnetic field generating unit 46 (Fig. 2, page 8-4).

control signal (SCTL), and the signal is applied to a base of the transistor 64. Thus, when the control signal (SCTL) having a period of about 10 KHZ is output from the output port P1 of the first microcomputer 48, AC power having a period of about 10 KHZ is generated from a collector of the transistor 64. The AC voltage of 10 KHZ generated from the collector of the transistor 64 is applied to the coil 77 wound in the induced voltage generating unit 46 through the alternating current line (AVL). When current of an AC voltage that alternates with a period of 10 KHZ flows in the coil 77, an electromagnetic field is generated around the coil 77, and a portion of a magnetic line of force is linked with the coil 79 wound around the core 78 in the induced voltage detecting unit 81.

a charging power adjusting unit that includes: a wireless receiving unit receiving the monitoring result from the contact-less chargeable battery by means of wireless communication, and a microprocessor controlling the high frequency power driving unit to adjust a power of the high frequency AC current applied to the magnetic field generating unit so that the charging power transmitted to the contact-less chargeable battery is adjusted,

Chung-Sik disclosed charging power adjusting unit including first microcomputer 48 receiving the monitoring result from the contact-less chargeable battery 32 by means of wireless communication (RADIO UNIT 26 connected to antenna) and controlling the high frequency power driving unit 44 including transistor 64 to adjust a power of the high frequency AC current applied to the magnetic field generating unit 46 so that the charging power transmitted to the contact-less chargeable battery 32 is adjusted. (Chung-Sik, English Translation, page 8-5 and Figs. 1, 2 & 3A, 3B).

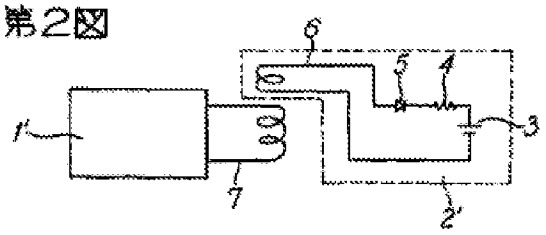
> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

wherein the adjustment to the power of the high frequency AC current applied to the magnetic field generating unit is based on relative positions of the contact-less chargeable battery and the contact-less charging device.

While Chung-Sik discloses adjustment to the power of the high frequency AC current applied to the magnetic field generating unit 46 having coil 77 (Fig. 2) is based on battery

voltage (Fig. 3B), Chung-Sik did not specifically disclose adjustment to the power of the high frequency AC current applied to the magnetic field generating unit is based on relative positions of the contact-less chargeable battery (portable device 18 having chargeable battery 32) and the contact-less charging device (charger, base unit 12).

Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging wherein charging current can be adjusted based on the distance of output coil 7 of charging equipment 1 (contact-less charging device) and input coil 6 of battery 2' (contact-less chargeable battery) (Figs. 2-4) (Example .Fig. 2 is reproduced below).



Matsuki. Fig. 2.

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by adding adjustment to the power of the high frequency AC current applied to the magnetic field generating unit is based on relative positions of the contact-less chargeable battery and the contact-less charging device disclosed by Matsuki for charging a battery.

Claim 75 (New): A contact-less charging circuit module electrically connected to a battery cell and used for charging an electric energy to the battery cell in a contact-less method, the contact-less charging circuit module comprising:

Chung-Sik discloses contact-less charging circuit module electrically connected to a battery cell 32 and used for charging an electric energy to the battery cell 32 in a contact-less method (Fig. 1, page 8-1).

The present invention relates to a charge system of a radio-telephone. More specifically, the present invention relates to a contactless charge system of a radio-telephone for charging a battery in a portable device without contact between a charger of a radio-telephone and a voltage terminal of the portable device.

a high frequency AC current inducing unit to which a high frequency AC current is induced by means of a magnetic field generated from an external contact-less charging device;

Chung-Sik disclosed high frequency AC current inducing unit 38 (CONTACTLESS CHARGING UNIT) to which a high frequency AC current is induced by means of a magnetic field generated from an external contact-less charging device (induced voltage generating unit) (page 8-2, lines 17-18).

a rectifier for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current;

Chung-Sik discloses rectifier 80 for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current (page 8-2, lines 17-19).(Fig. 2).

a constant voltage/constant current supplier receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode; and

Chung-Sik discloses constant voltage/current supplier 42 for receiving DC current from the rectifier 80 and supplying a charging power to the battery cell 32 in a constant voltage/constant current charge mode (Fig. 2). (See "constant voltage unit", page 8-3, lines 28-33). Chung-Sik further discloses rectifier 80 supplies DC current at a constant voltage V1 (reference voltage). (See "voltage V1 is constant", page 8-5 line 5).

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2 varies depending on a charge voltage level of the battery 32. Thus, when the first microcomputer 48 outputs the control signal

Additionally, Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

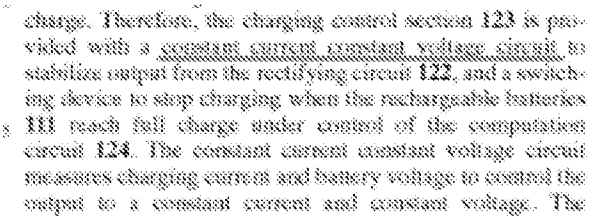
In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power

to the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).


charge. Therefore, the charging control section 123 is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit 122, and a switching device to stop charging when the rechargeable batteries 111 reach full charge under control of the computation circuit 124. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the to modify the constant voltage supplier disclosed by Chung-Sik by adding the constant current constant voltage circuit disclosed by Kaite et al. to stabilize output from the rectifying circuit.

an overvoltage monitoring unit that includes a microprocessor monitoring voltages at both ends of the constant voltage/constant current supplier and transmitting a monitoring result to the external contact-less charging device by means of wireless communication so as to induce a change of intensity of the magnetic field,

Chung-Sik also discloses contactless charge system for detecting a voltage of a rechargeable battery 32 including charge pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1) and specifically disclosed over voltage monitoring unit 54 and microprocessor 56 for monitoring voltages (V1,

V2) at both ends of the constant voltage/current supplier 52 and microprocessor 56 scans the output VDL of the comparator 96 and searches for whether or not the charge voltage of battery 32 is normal. Microprocessor 56 transmits a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through line 37 so as to induce a change of intensity of the magnetic field of the induced voltage generating unit 46 (Fig. 1, 2) (page 8-2, lines 31-34, 40-55; page 8-3, lines 36-40; page 8-5, lines 35-43) (Fig. 2).

wherein the change of intensity of the magnetic field includes a change of intensity of the magnetic field based on relative positions of the contact-less charging circuit module and the external contact-less charging device.

While Chung-Sik discloses the change of intensity of the magnetic field is based on battery voltage monitoring it did not specifically disclose change of intensity of the magnetic field based on relative positions of the contact-less charging circuit module and the external contact-less charging device.

Shigefumi Matsuki (JP H0145230 Y2), DATE PUBLISHED 1989-12-27 disclosed wireless battery charging device wherein charging current can be adjusted based on the distance of output coil 7 of charging equipment 1 and input coil 6 of battery 2' ("storage battery") (Matsuki, Figs. 2-4 and English Translation: "Detailed explanation of the device" "Charging current can be adjusted by [which control a high frequency output or changes the distance of output coil 7 of charging equipment 1', and input coil 6 of storage battery 2']").

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify contact-less wireless charging of battery disclosed by Chung-Sik by adding change of intensity of the magnetic field based on relative positions of contact-less charging

circuit module and the external contact-less charging device disclosed by Matsuki for charging a battery.

8.2 Chung-Sik, Matsuki, Cho (cl. 16-18)

Claims 16-18 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Chung-Sik and Matsuki as applied to claim 15 above, and further in view of Cho Gyu Hyeong et al. (KR 100451606 B1) (Hereafter Cho et al).

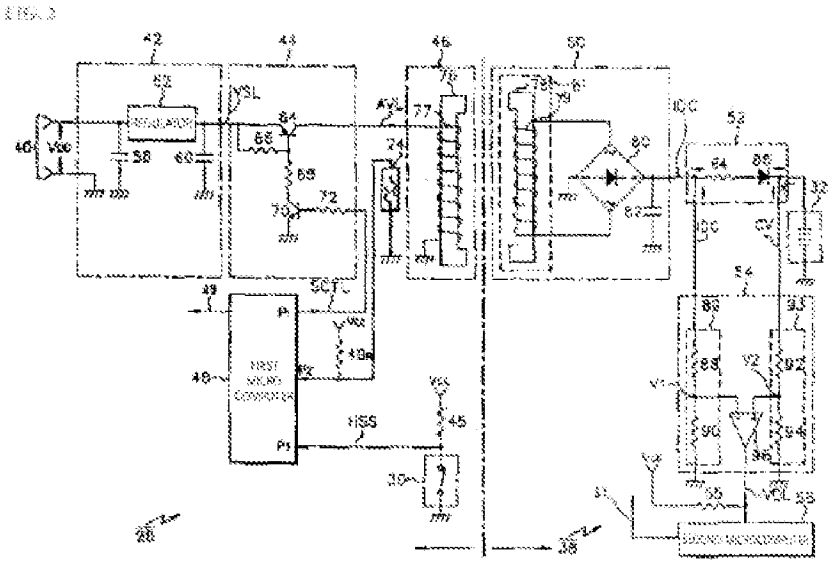
16. The contact-less charging device according to claim 15,

Chung-Sik and Matsuki discloses contact-less charging device according to claim 15 as set forth above.

further comprising a power supply receiving a common AC current, converting the common AC current into a DC current, and then supplying a constant-voltage current to the high frequency power driving unit,

Chung-Sik discloses constant voltage supplier 42 (constant voltage unit) that regulates the voltage input to power line 40 and outputting the voltage as a constant voltage, and then supplying a constant-voltage current to the high frequency power driving unit 44. Specifically, Chung-Sik discloses AC power having a period of about 10 KHZ is generated from a collector of the transistor 64 in the high frequency power driving unit 44. (Fig. 2, page 8-3, lines 24-27, page 8-4, lines 40-51).

control signal (SCTL), and the signal is applied to a base of the transistor 64. Thus, when the control signal (SCTL) having a period of about 10 KHZ is output from the output port P1 of the first microcomputer 48, AC power having a period of about 10 KHZ is generated from a collector of the transistor 64. The AC voltage of 10 KHZ generated from the collector of the transistor 64 is applied to the coil 77 wound in the induced voltage generating unit 40 through the alternating current line (AVL). When current of an AC voltage that alternates with a period of 10 KHZ flows in the coil 77, an electromagnetic field is generated around the coil 77, and a portion of a magnetic line of force is linked with the coil 79 wound around the core 78 in the induced voltage detecting unit 81.



Chung-Sik. Fig. 2

Chung-Sik did not disclose constant voltage supplier for converting a common AC current, converting the common AC current into a DC current, because Chung-Sik receives 12 VDC directly from the power line 40 (Fig. 1, page 8-4, lines 4-5). However, if a DC power supply is not available it would have been obvious to one of ordinary skill in the art to add a rectifier for the conversion of power line AC voltage to DC.

In analogous art Cho et al. (KR 100451606 B1) disclosed AC / DC rectifier 11 receives a low frequency AC input voltage, such as 110V or 220V, and converts it into direct current Vdc (Fig. 1). Cho et al. (KR 100451606 B1) further discloses a constant voltage supplying part (DC/DC converter 12) for receiving the converted DC current Vdc and outputs a constant voltage current (Vdc). (Fig. 2).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the contact-less charging device disclosed by Chung-Sik by adding a rectifier for rectifying the AC current received from AC power line to convert the AC current into a DC current disclosed by Cho et a. (KR 100451606 B1) and adding a constant voltage supplying part for receiving the converted DC current disclosed by Cho et a. (KR 100451606 B1) to output a constant voltage current.

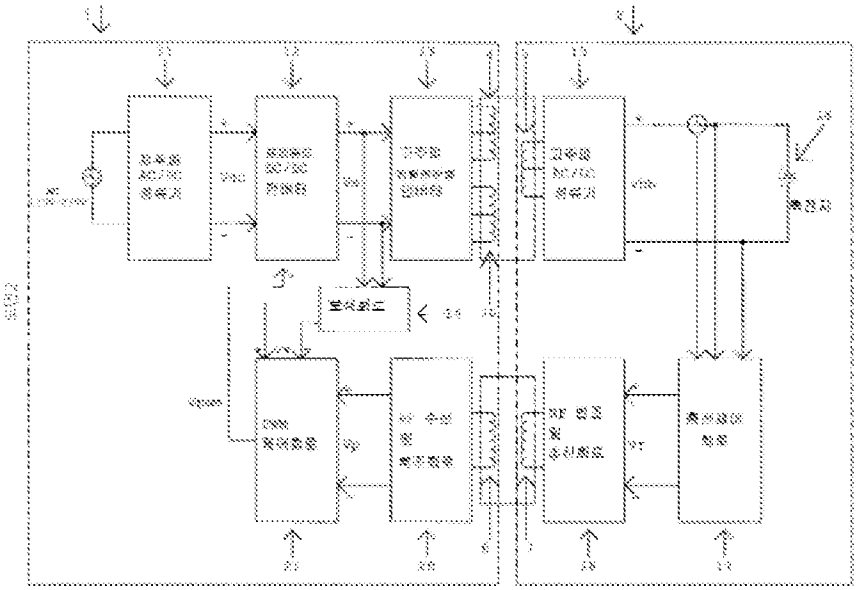


Fig. 2. Cho et al. (KR 100451606 B1)

wherein the high frequency power driving unit includes: a pulse signal generator for receiving a pulse driving signal from the microprocessor and outputting a pulse signal; and

Chung-Sik discloses high frequency power driving unit (voltage switching unit 44) receives driving signal SCTL (control signal) of predetermined period is output from first

microprocessor 48 and applied to voltage switching unit 44 (charge voltage generating unit 28 shown in Fig. 1) comprising transistors 72 and 64 (Fig. 2, page 8-3, lines 28-35. Chung-Sik specifically disclosed the charge voltage generating device includes a charge control pulse generator which generates a pulse sequence with a predetermined period. (Fig. 2, page 8-6, lines 21-24).

a charge voltage generating device including a charge control pulse generator which generates a pulse sequence with a predetermined period in response to input of a charge initiation signal, a voltage switch which converts and outputs a DC voltage at a predetermined level into an AC voltage in response to input of the generated pulse sequence, and a voltage

In an analogous art, Cho et al. disclosed contact-less chargeable battery comprising control circuit (PWM 21) configured to receive a control signal and generate a pulse width modulated signal (Vpwm) to be applied to the DC / DC converter to adjust the DC voltage (Fig. 2, Cho et al. English Translation, page 3, 2nd paragraph).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify Chung-Sik by adding pulse signal generator for generating a pulse width modulated signal (PWM) disclosed by Cho et al. for adjusting charging power for charging a contact-less chargeable battery.

a power driving part for receiving the pulse signal to rapidly switch the constant-voltage current input from the constant voltage supplier, thereby generating a high frequency AC current in a pulse pattern.

Chung-Sik discloses power driving part (voltage switching unit 44) for receiving the pulse signal (SCTL) from the first microprocessor 48 to rapidly switch the constant-voltage current input from the constant voltage supplier 42, thereby generating a high frequency AC current in a pulse pattern (Fig. 2). Chung-Sik specifically discloses charge control pulse

generator which generates a pulse sequence (pulse pattern) with a predetermined period. (Fig. 2, page 8-6, lines 21-24).

a charge voltage generating device including a charge control pulse generator which generates a pulse sequence with a predetermined period in response to input of a charge initiation signal, a voltage switch which converts and outputs a DC voltage at a predetermined level into an AC voltage in response to input of the generated pulse sequence, and a voltage

Additionally, Cho et al. disclosed power driving part (DC / DC converter 12) for receiving the pulse signal (Vpwm) to rapidly switch the constant-voltage current input from the constant voltage supplier Vdc, thereby generating a high frequency AC current in a pulse pattern input to winding 4 of transformer (Fig. 2).

17. The contact-less charging device according to claim 16,

Chung-Sik, Matsuki and Cho et al. discloses contact-less charging device according to claim 16 as set forth above.

wherein the charging power adjusting unit adjusts the charging power by modulating a width of a pulse current, a frequency of the pulse current, an amplitude of a pulse, or a number of pulses.

Chung-Sik discloses the charging power adjustment unit (first microprocessor 48) receives the monitoring result from the contact-less chargeable battery by means of wireless communication (RADIO UNIT 26 connected to antenna) (Fig. 1). Chung-Sik discloses controlling the high frequency power driving unit (switching unit 44) to adjust a power of the high frequency AC current applied to the magnetic field generating unit by the switching unit 44 switching a power voltage at a predetermined level in response to an input of a control signal SCTL with a predetermined period and converting and outputting an AC voltage. When the

control signal (SCTL) is blocked, both the transistors 64 and 70 with respect to the voltage switching unit 44 are switched "off" to block a voltage of the AC line (AVL). Thus voltage switching unit 44 adjusts the charging power by switching on transistor 64 in response to the control signal SCTL with a predetermined period (Fig. 2, page 8-3, lines 28-33). Chung-Sik further discloses that the charging of battery continues until the detection voltage V2 becomes higher than V1 and the output signal VDL of comparator 96 is transitioned to logic “high” from logic “low” and is input to second microcomputer 56 to produce charging completion alarm (Fig. 2, page 8-5, lines 31-43). Thus Chung-Sik discloses adjusting the charging power by providing a number of pulses until charge completion. Chung-Sik also discloses charge voltage generating device includes a charge control pulse generator which generates a pulse sequence with a predetermined period. (Fig. 2, page 8-6, lines 21-24).

a charge voltage generating device including a charge control pulse generator which generates a pulse sequence with a predetermined period in response to input of a charge initiation signal, a voltage switch which converts and outputs a DC voltage at a predetermined level into an AC voltage in response to input of the generated pulse sequence, and a voltage

To the extent that Chung-Sik may not disclose adjusting unit adjusts the charging power by modulating a width of a pulse current, a frequency of the pulse current, an amplitude of a pulse, or a number of pulses it would have been obvious over Cho et al.

In and analogous art, Cho et al. disclosed control circuit (PWM 21) configured to receive a control signal and generates a pulse width modulated signal (Vpwm) to be applied to the DC / DC converter to adjust the DC voltage (Fig. 2, Cho et al. English Translation, page 3, 2nd paragraph).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify Chung-Sik by adding PWM that receives a control signal to generate a pulse

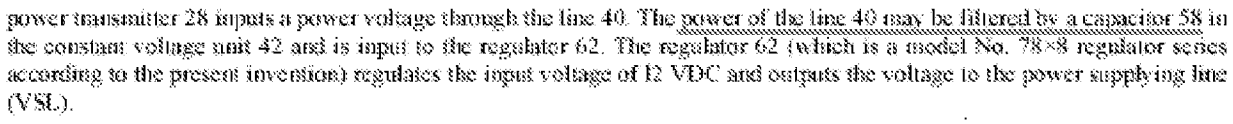
width modulated signal (Vpwm) disclosed by Cho et al. for adjusting charging power for charging a battery.

18. The contact-less charging device according to claim 16,

Chung-Sik, Matsuki and Cho et al. discloses contact-less charging device according to claim 16 as set forth above.

wherein the power supply includes: an overvoltage filter for receiving a common AC current and intercepting an overvoltage current.

Chung-Sik discloses power supply includes an overvoltage filter 58 (capacitor 58) for receiving the power supply 20 current and intercepting an overvoltage current (Fig. 2, page 8-4, lines 6-7).


power transmitter 28 inputs a power voltage through the line 40. The power of the line 40 may be filtered by a capacitor 58 in the constant voltage unit 42 and is input to the regulator 62. The regulator 62 (which is a model No. 78×8 regulator series according to the present invention) regulates the input voltage of 12 VDC and outputs the voltage to the power supplying line (VSL).

a rectifier for rectifying the AC current passing through the filter to convert the AC current into a DC current; and a constant voltage supplier that receives the converted DC current and outputs a constant voltage current.

Chung-Sik discloses current passing through the filter is input to regulator 62 that provides regulated 12 VDC. (Fig. 2).

Chung-Sik did not disclose rectifying an AC current because Chung-Sik receives 12 VDC directly from the power line 40 (Fig. 1, page 8-4, lines 4-5). However, if a DC power

supply is not available it would have been obvious to one of ordinary skill in the art to add a rectifier for the conversion of power line AC voltage to DC.

In analogous art Cho et al. (KR 100451606 B1) disclosed AC / DC rectifier 11 receives a low frequency AC input voltage, such as 110V or 220V, and converts it into direct current Vdc (Fig. 1). Cho et al. (KR 100451606 B1) further discloses a constant voltage supplying part (DC/DC converter 12) for receiving the converted DC current Vdc and outputs a constant voltage current (Vdc).

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the contact-less charging device disclosed by Chung-Sik by adding a rectifier for rectifying the AC current received from AC power line to convert the AC current into a DC current disclosed by Cho et a. (KR 100451606 B1) and adding a constant voltage supplying part for receiving the converted DC current disclosed by Cho et a. (KR 100451606 B1) to output a constant voltage current.

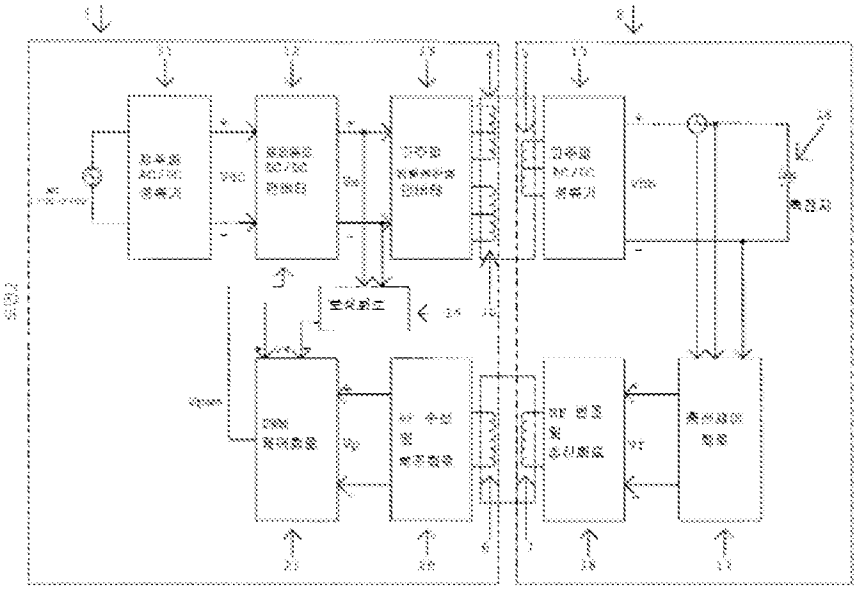


Fig. 2. Cho et al. (KR 100451606 B1)

9.0 REJECTION - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9.1 Chung-Sik/Kaite (cl. 55, 57-60, 62-64, 69-72)

Claim(s) 55, 57-60, 62-64, and 69-72 is/are rejected under pre-AIA 35 U.S.C. 102 (b) as anticipated by Chung-Sik (KR 950005819Bl) or, in the alternative, under pre-AIA 35 U.S.C. 103(a) as obvious over Chung-Sik (KR 950005819Bl) and Kaite et al. (US 6,016,046).

Claim 55 (New): A contact-less charging circuit module electrically connected to a battery cell and used for charging an electric energy to the battery cell in a contact-less method, the contact-less charging circuit module comprising:

Chung-Sik discloses contact-less charging circuit module 38 (CONTACTLESS CHARGING UNIT) electrically connected to a battery cell 32 and used for charging an electric energy to the battery cell 32 in a contact-less method (Fig. 1)

a high frequency AC current inducing unit that includes a secondary coil to which a high frequency AC current is induced by means of a magnetic field generated from a primary coil in an external contact-less charging device;

Chung-Sik discloses a high frequency AC current inducing unit that includes a secondary coil 79 to which a high frequency AC current is induced by means of a magnetic field generated from a primary coil 77 in an external contact-less charging device (Fig. 2).

a rectifier receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current;

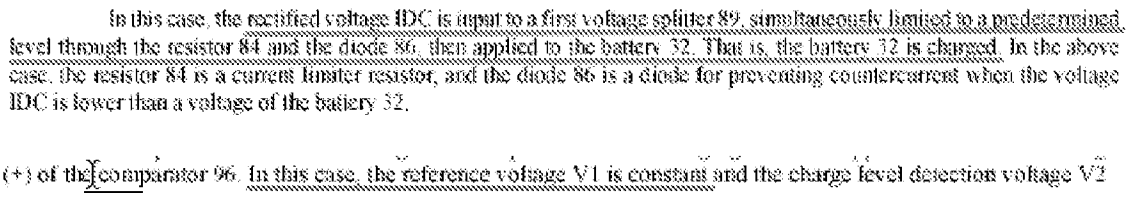
Chung-Sik discloses rectifier 80 for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current (page 8-2, lines 17-19) (Fig. 2).

a constant voltage/constant current supplier that includes circuitry controlled by at least one microprocessor, the constant voltage/constant current supplier receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode,

Chung-Sik discloses constant voltage/constant current supplier 52 includes circuitry controlled by at least one microprocessor (48, 56) (Fig. 2). Chung-Sik discloses constant voltage/current supplier 52 for receiving DC current (DC voltage IDC) from the rectifier 80 and supplying a charging power to the battery cell 32 in a constant voltage/constant current charge mode (Fig. 2). (See "constant voltage unit", page 8-3, lines 24-27). Chung-Sik further discloses rectifier 80 supplies DC current at a constant voltage IDC. Chung-Sik specifically discloses a constant reference voltage V1 (reference voltage) is obtained by using resistors 88 and 90 for splitting the DC voltage IDC (See "voltage V1 is constant", page 8-5 line 5). Since voltage V1 is constant, therefore the voltage IDC is constant, and the constant voltage/current supplier 52 is receiving a constant DC voltage from rectifier 80 for supplying a charging power to the battery cell in a constant voltage/constant current mode.

Additionally, Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode

86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

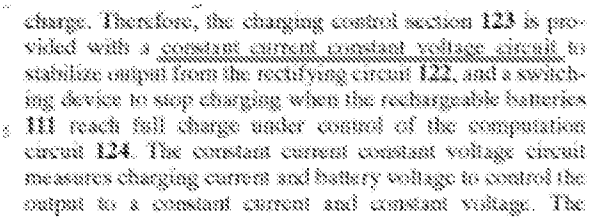


In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).



charge. Therefore, the charging control section **123** is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit **122**, and a switching device to stop charging when the rechargeable batteries **111** reach full charge under control of the computation circuit **124**. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the to modify the constant voltage supplier disclosed by Chung-Sik by adding the constant current constant voltage circuit disclosed by Kaite et al. to stabilize output from the rectifying circuit.

wherein the constant voltage/constant current supplier supplies the charging power in a constant current mode at an initial charging stage and then supplies the charging power in a constant voltage mode at a later charging stage; and

Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

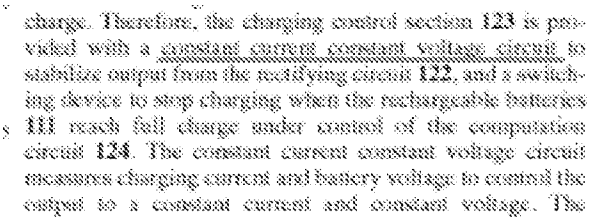
Additionally, Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).

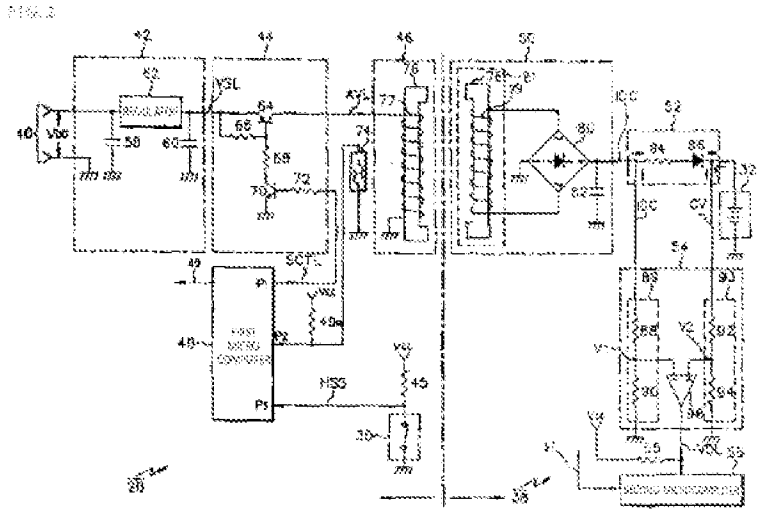

charge. Therefore, the charging control section 123 is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit 122, and a switching device to stop charging when the rechargeable batteries 111 reach full charge under control of the computation circuit 124. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the contact-less charging circuit of Chung-Sik and Matsuki by adding the constant voltage/constant current supplier disclosed by Kaite et al. to supply the charging power in a constant current mode at an initial charging stage and then supply the charging power in a constant voltage mode at a later charging stage for efficient charging of the battery.

an overvoltage monitoring unit that includes a wireless transmitting unit, first and second voltage detectors respectively detecting voltages at both ends of the constant voltage/constant current supplier, and the at least one microprocessor monitoring the detected voltages at both ends of the constant voltage/constant current supplier and transmitting a monitoring result to the external contact-less charging device by means of

wireless communication through the wireless transmitting unit so as to induce a change of intensity of the magnetic field,

Chung-Sik also discloses contactless charge system for detecting a voltage of a rechargeable battery 32 including charge pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1) and specifically disclosed over voltage monitoring unit 54 and microprocessor 56 for monitoring voltages (V1, V2) at both ends of the constant voltage/current supplier 52 and microprocessor 56 scans the output VDL of the comparator 96 and searches for whether or not the charge voltage of battery 32 is normal. Microprocessor 56 transmits a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through line 37 so as to induce a change of intensity of the magnetic field of the induced voltage generating unit 46 (Fig. 1, 2) (page 8-2, lines 31-34, 40-55; page 8-3, lines 36-40; page 8-5, lines 35-43) (Fig. 2).



Chung-Sik. Fig. 2

wherein the at least one microprocessor transmits a first charging power adjustment request signal to the external contact-less charging device for adjusting a power applied to the primary coil from a first level to a second level,

Regarding the above limitation, as best understood by the Examiner, Chung-Sik discloses wherein the at least one microprocessor 56 (MICROCOMPUTER) transmits a first charging power adjustment request signal to the external contact-less charging device for adjusting a power applied to the primary coil from a first level to a second level. Specifically, Chung-Sik discloses to charge the battery to a predetermined level. (Chung-Sik, English Translation, page 8-5).

wherein the at least one microprocessor transmits a second charging power adjustment request signal to the external contact-less charging device for adjusting the power applied to the primary coil from the second level to a third level.

Regarding the above limitation, as best understood by the Examiner, Chung-Sik discloses to charge the battery to a predetermined level. Therefore, adjusting a power applied to the primary coil from a second level to a third level is inherently disclosed as required to maintain the charging of the battery to a predetermined level.

Claim 57 (New): The contact-less charging circuit module according to claim 55,

Chung-Sik alone or Chung-Sik and Kaite et al. discloses contact-less charging circuit module according to claim 55 as set forth above.

wherein the wireless transmitting unit wirelessly propagates the monitoring result through an antenna, wherein the overvoltage monitoring unit includes a voltage comparator comparing first and second voltages detected by the first and second voltage detectors and outputting a voltage comparison result, and

Chung-Sik discloses over voltage monitoring unit 54 for monitoring first and second voltages (V1, V2) at front and rear ends of the constant voltage/current supplier 52 and transmitting a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through an antenna so as to induce a change of intensity of the magnetic field (page 8-2, paragraphs 7-8) of the induced voltage generating unit 46 (Fig. 2) (page 8-3, lines 31-34; page 8-5, lines 31-34) (Fig. 2).

wherein the at least one microprocessor outputs the monitoring result according to the voltage comparison result to the wireless transmitting unit.

Chung-Sik further disclosed microprocessor 56 for outputting a monitoring result according to the voltage comparison result to the wireless transmitting unit (RADIO UNIT 34) (Chung-Sik, Fig. 2, and English Translation, pages 8-4, 8-5).

"Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

Claim 58 (New): The contact-less charging circuit module according to claim 55,

Chung-Sik alone or Chung-Sik and Kaite et al. discloses contact-less charging circuit module according to claim 55 as set forth above.

wherein the magnetic field generated by the contact-less charging device is generated intermittently,

Chung-Sik discloses magnetic field generated by the contact-less charging device is generated intermittently (switches on/off transistor 64, 70) (Fig. 2, page 8-4).

wherein the overvoltage monitoring unit further includes a charging pause detecting unit receiving the high frequency AC current output from the high frequency AC current inducing unit to detect a time point when the induction of high frequency AC current ends, and then outputting the end time point to the at least one microprocessor, and

Chung-Sik also discloses contactless charge system for detecting a voltage of a rechargeable battery 32 including charging pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1).

Chung-Sik discloses a control signal (SCTL) output from the output port Pl of FIRST MICRO COMPUTER 48 is applied to a base of the transistor 70 through a resistor 72 and switches "on/off' the transistor 70 around ten thousand times per second. In this case, a potential of a collector terminal of the transistor 70 is switched between "low" and "high" depending on a period of the control signal (SCT) and the signal is applied to a base of the transistor 64." (Chung-Sik, English Translation, page 8-4 and Fig. 2).

Regarding charge pause detection unit and detecting a time point when the induction of high frequency AC current ends, and then outputting the end time point to the microprocessor, Chung-Sik discloses that the charging of battery continues until the detection voltage V2 in the overvoltage detection unit 54 becomes higher than V1 and the output signal VDL of comparator 96 is transitioned to logic "high" from logic "low" and is input to second microcomputer 56 to produce charging completion alarm (Fig. 2, page 8-5, lines 31-43). The transition to logic "high" from logic "low" is considered a time point when the induction of high frequency AC current ends, and then outputting the end time point (charge completion) to the microprocessor. The microcomputer 56 is broadly considered the same as charging pause detecting unit that produces charging completion alarm 122 (Fig. 3) when the voltage of battery is determined to be normal and completely charged. Thus the microprocessor 56 determines the ON/OFF period of charging the battery.

Additionally, Chung-Sik specifically disclosed a "time point" when the charge operation may be automatically stopped by communication between contact less charging unit 38 and power transmitter 28 (Chung-Sik, English Translation, page 8-5, lines 44-46 and Fig. 1).

> Thus, in the present invention according to the above embodiments, a battery begins to be charged from a time point when the portable device 18 operated at an operating voltage of the battery is installed on the base unit 12, and the charge operation may be automatically stopped either by communication between devices or overheating of the devices.

wherein the monitoring result is transmitted to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced after the end time point is input.

Chung-Sik discloses wherein the monitoring result is transmitted to the external contact-less charging device 12 by means of wireless communication by RADIO UNIT 34. (Chung-Sik,

page 8-5, lines 35-43, Fig. 1, 2).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

To the extent that Chung-Sik may not specifically disclose transmitting a monitoring result to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced it would have been obvious for charging the battery when a voltage of the battery is determined to be less than normal (Fig. 2).

At the time the invention was made it would have been obvious to modify the overvoltage monitoring unit disclosed by Chung-Sik to transmit the monitoring result while a high frequency AC current is not applied to the magnetic field generating unit for starting charging of the battery when voltage of the battery is determined to be less than normal.

Claim 59 (New): The contact-less charging circuit module according to claim 55,

Chung-Sik alone or Chung-Sik and Kaite et al. discloses contact-less charging circuit module according to claim 55 as set forth above.

wherein the monitoring result is a difference of voltages at front and rear ends of the constant voltage/constant current supplier, voltage values of the front and rear ends, or a code indicating that the voltages at both ends are in an overvoltage state.

Chung-Sik discloses battery voltage detector circuit 54 that includes first and second voltage splitters 89 and 93 for comparing a voltage V1 of an input terminal of the charging unit

52 with a voltage V2 of an output terminal and clocking the result, and a comparator 96 for comparing outputs of the first and second voltage splitters 89 and 93 (V1, V2) and outputting a charge state signal (VDL) to second microcomputer 56 based on the difference of voltage (V1-V2) at both ends of the constant voltage/constant current supplier. The second microcomputer 56 searches for whether or not a charge voltage of the battery 32 is normal in an operation (120 of FIG. 3B) based on the result of the difference of voltage (V1-V2). Additionally, Chung-Sik discloses outputting code (NO) indicating (overvoltage state) if charge voltage is not normal (see (120 of FIG. 3B) (Fig. 2, page 8-4, lines 40-42).

Claim 60 (New): A contact-less charging circuit module electrically connected to a battery cell and used for receiving a charging power from an external contact-less charging device and charging an electric energy to the battery cell in a contact-less method, the contact-less charging circuit module comprising:

Chung-Sik disclosed contact-less charging circuit module electrically connected to a battery cell 32 of portable device 18 and used for receiving a charging power from an external contact-less charging device (charger) and charging an electric energy to the battery cell 32 in a contact-less method (Fig. 1, page 8-1).

The present invention relates to a charge system of a radio-telephone. More specifically, the present invention relates to a contactless charge system of a radio-telephone for charging a battery in a portable device without contact between a charger of a radio-telephone and a voltage terminal of the portable device.

a high frequency AC current inducing unit to which a high frequency AC current is induced by means of a magnetic field generated from the external contact-less charging device;

Chung-Sik disclosed high frequency AC current inducing unit 38 (CONTACTLESS CHARGING UNIT) to which a high frequency AC current is induced by means of a magnetic field generated from an external contact-less charging device (induced voltage generating unit in charger) (page 8-2, lines 17-18).

a rectifier receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current;

Chung-Sik discloses rectifier 80 for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current (page 8-2, lines 17-19).(Fig. 2).

a constant voltage/constant current supplier receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode; and

Chung-Sik discloses constant voltage/current supplier 42 for receiving DC current from the rectifier 80 and supplying a charging power to the battery cell 32 in a constant voltage/constant current charge mode (Fig. 2). (See "constant voltage unit", page 8-3, lines 28-33). Chung-Sik further discloses rectifier 80 supplies DC current at a constant voltage V1 (reference voltage). (See "voltage V1 is constant", page 8-5 line 5).

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2 varies depending on a charge voltage level of the battery 32. Thus, when the first microcomputer 48 outputs the control signal

Additionally, Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-

Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).

charge. Therefore, the charging control section **123** is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit **122**, and a switching device to stop charging when the rechargeable batteries **111** reach full charge under control of the computation circuit **124**. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the contact-less charging circuit of Chung-Sik and Matsuki by adding the constant voltage/constant current supplier disclosed by Kaite et al. to supply the charging power

in a constant current mode at an initial charging stage and then supply the charging power in a constant voltage mode at a later charging stage for efficient charging of the battery.

an overvoltage monitoring unit that includes a microprocessor monitoring the voltages at both ends of the constant voltage/constant current supplier and transmitting a monitoring result to the external contact-less charging device by means of wireless communication so as to induce a change of intensity of the magnetic field,

Chung-Sik discloses overvoltage monitoring unit 54 that includes a microprocessor 56 monitoring voltages (V1, V2) at both ends of the constant voltage/constant current supplier 52 and transmitting a monitoring result VDL (Fig. 2) to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) so as to induce a change of intensity of the magnetic field of the induced voltage generating unit 46 (page 8-2, lines 31-34, 49-55; page 8-3, lines 36-40; page 8-5, lines 1-8) (Fig. 2).

wherein the microprocessor transmits a first charging power adjustment request signal to the external contact-less charging device for adjusting the charging power of the external contactless charging device from a first level to a second level,

Regarding the above limitation, as best understood by the Examiner, Chung-Sik also discloses wherein the at least one microprocessor 56 (MICROCOMPUTER) transmits a first charging power adjustment request signal to the external contact-less charging device for adjusting a power applied to the primary coil from a first level to a second level. Specifically, Chung-Sik discloses to charge the battery to a predetermined level. (Chung-Sik, English Translation, page 8-5).

wherein the microprocessor transmits a second charging power adjustment request signal to the external contact-less charging device for adjusting the charging power of the external contact-less charging device from the second level to a third level.

Regarding the above limitation, as best understood by the Examiner, Chung-Sik discloses to charge the battery to a predetermined level. Therefore, adjusting a power applied to the primary coil from a second level to a third level is inherently disclosed as required to maintain the charging of the battery to the predetermined level.

Claim 62 (New): The contact-less charging circuit module according to claim 60, wherein the overvoltage monitoring unit includes:

Chung-Sik alone or Chung-Sik and Kaite et al. discloses contact-less charging circuit module according to claim 60 as set forth above.

a wireless transmitting unit wirelessly propagating the monitoring result through an antenna;

Chung-Sik discloses over voltage monitoring unit 54 for monitoring first and second voltages (V1, V2) at front and rear ends of the constant voltage/current supplier 52 and transmitting a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through an antenna (Fig. 1) so as to induce a change of intensity of the magnetic field (page 8-2, paragraphs 7-8) of the induced voltage generating unit 46 (Fig. 2) (page 8-3, lines 31-34; page 8-5, lines 31-34) (Fig. 2).

first and second voltage detectors respectively detecting first and second voltages at front and rear ends of the constant voltage/constant current supplier; and a voltage comparator comparing the first and second voltages detected by the first and second voltage detectors and outputting a voltage comparison result, and

Chung-Sik discloses voltage comparator 96 for comparing first and second voltages (V1, V2) detected by the first and second voltage detectors and outputs a voltage comparison result (charge state VDL) (Fig. 2, page 8-4, 8-5).

wherein the microprocessor outputs the monitoring result according to the voltage comparison result to the wireless transmitting unit.

Chung-Sik further disclosed microprocessor 56 for outputting a monitoring result according to the voltage comparison result to the wireless transmitting unit (radio unit 34) (Chung-Sik, Fig. 2, and English Translation, pages 8-4, 8-5).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

Claim 63 (New): The contact-less charging circuit module according to claim 60,

Chung-Sik alone or Chung-Sik and Kaite et al. discloses contact-less charging circuit module according to claim 60 as set forth above.

wherein the magnetic field generated by the contact-less charging device is generated intermittently,

Chung-Sik discloses magnetic field generated by the external contact-less charging device is generated intermittently (switches on/off transistor 64, 70) (Fig. 2, page 8-4).

wherein the overvoltage monitoring unit further includes a charging pause detecting unit receiving the high frequency AC current output from the high frequency AC current inducing unit to detect a time point when the induction of high frequency AC current ends, and then outputting the end time point to the microprocessor, and

Chung-Sik also discloses contactless charge system for detecting a voltage of a rechargeable battery 32 including charging pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1).

Chung-Sik discloses a control signal (SCTL) output from the output port Pl of FIRST MICRO COMPUTER 48 is applied to a base of the transistor 70 through a resistor 72 and switches "on/off' the transistor 70 around ten thousand times per second. In this case, a potential of a collector terminal of the transistor 70 is switched between "low" and "high" depending on a period of the control signal (SCT) and the signal is applied to a base of the transistor 64." (Chung-Sik, English Translation, page 8-4 and Fig. 2).

Regarding charge pause detection unit and detecting a time point when the induction of high frequency AC current ends, and then outputting the end time point to the microprocessor, Chung-Sik discloses that the charging of battery continues until the detection voltage V2 in the

overvoltage detection unit 54 becomes higher than V1 and the output signal VDL of comparator 96 is transitioned to logic "high" from logic "low" and is input to second microcomputer 56 to produce charging completion alarm (Fig. 2, page 8-5, lines 31-43). The transition to logic "high" from logic "low" is considered a time point when the induction of high frequency AC current ends, and then outputting the end time point (charge completion) to the microprocessor. The microcomputer 56 is broadly considered the same as charging pause detecting unit that produces charging completion alarm when the voltage of battery is determined to be normal and completely charged. Thus the microprocessor 56 determines the ON/OFF period of charging the battery.

Additionally, Chung-Sik specifically disclosed a "time point" when the charge operation may be automatically stopped by communication between contact less charging unit 38 and power transmitter 28 (Chung-Sik, English Translation, page 8-5, lines 44-46 and Fig. 1).

Thus, in the present invention according to the above embodiments, a battery begins to be charged from a time point when the portable device 18 operated at an operating voltage of the battery is installed on the base unit 12, and the charge operation may be automatically stopped either by communication between devices or overheating of the devices.

wherein the monitoring result is transmitted to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced after the end time point is input.

Chung-Sik discloses wherein the monitoring result is transmitted to the external contact-less charging device 12 by means of wireless communication by RADIO UNIT 34. (Chung-Sik,

page 8-5, lines 35-43, Fig. 1, 2).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

To the extent that Chung-Sik may not specifically disclose transmitting a monitoring result to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced it would have been obvious for charging the battery when a voltage of the battery is determined to be less than normal (Fig. 2).

At the time the invention was made it would have been obvious to modify the overvoltage monitoring unit disclosed by Chung-Sik to transmit the monitoring result while a high frequency AC current is not applied to the magnetic field generating unit for starting charging of the battery when voltage of the battery is determined to be less than normal.

Claim 64 (New): The contact-less charging circuit module according to claim 60,

Chung-Sik alone or Chung-Sik and Kaite et al. discloses contact-less charging circuit module according to claim 60 as set forth above.

wherein the monitoring result is a difference of voltages at front and rear ends of the constant voltage/constant current supplier, voltage values of the front and rear ends, or a code indicating that the voltages at both ends are in an overvoltage state.

Chung-Sik discloses battery voltage detector circuit 54 that includes first and second voltage splitters 89 and 93 for comparing a voltage V1 of an input terminal of the charging unit

52 with a voltage V2 of an output terminal and clocking the result, and a comparator 96 for comparing outputs of the first and second voltage splitters 89 and 93 (V1, V2) and outputting a charge state signal (VDL) to second microcomputer 56 based on the difference of voltage (V1-V2) at both ends of the constant voltage/constant current supplier. The second microcomputer 56 searches for whether or not a charge voltage of the battery 32 is normal in an operation (120 of FIG. 3B) based on the result of the difference of voltage (V1-V2). Additionally, Chung-Sik discloses outputting code (NO) indicating (overvoltage state) if charge voltage is not normal (see (120 of FIG. 3B) (Fig. 2, page 8-4, lines 40-42).

Claim 69 (New): A contact-less charging circuit module electrically connected to a battery cell and used for charging an electric energy to the battery cell in a contact-less method, the contact-less charging circuit module comprising:

Chung-Sik discloses contact-less charging circuit module electrically connected to a battery cell 32 of portable device 18 and used for receiving a charging power from an external contact-less charging device (charger) and charging an electric energy to the battery cell 32 in a contact-less method (Fig. 1, page 8-1).

The present invention relates to a charge system of a radio-telephone. More specifically, the present invention relates to a contactless charge system of a radio-telephone for charging a battery in a portable device without contact between a charger of a radio-telephone and a voltage terminal of the portable device.

a high frequency AC current inducing unit to which a high frequency AC current is induced by means of a magnetic field generated from an external contact-less charging device;

Chung-Sik disclosed high frequency AC current inducing unit 38 (CONTACTLESS CHARGING UNIT) to which a high frequency AC current is induced by means of a magnetic

field generated from a primary coil 77 (Fig. 2) in an external contact-less charging device 12 (Fig. 1) (page 8-2, lines 17-18).

a rectifier for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current;

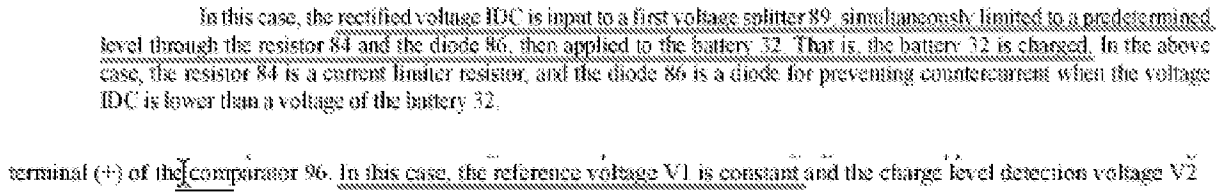
Chung-Sik disclosed rectifier 80 for receiving the induced high frequency AC current and converting the induced high frequency AC current into a DC current (page 8-2, lines 17-19) (Fig. 2).

a constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode; and

Chung-Sik discloses constant voltage/current supplier for receiving DC current from the rectifier 80 and supplying a charging power to the battery cell 32 in a constant voltage/constant current charge mode (Fig. 2). (See "constant voltage unit", page 8-3, lines 24-27). Chung-Sik further discloses rectifier 80 supplies DC current at a constant voltage V1 (reference voltage) (See "voltage V1 is constant", page 8-5 line 5). Since voltage V1 is constant it is supplying a charging power to the battery cell in a constant voltage/constant current mode.

Additionally, Chung-Sik discloses constant voltage/constant current supplier 52 supplies the charging power in a constant current mode at an initial charging stage by limiting the current drawn by the battery 32 by a resistor 84 ("the resistor 84 is a current limiter resistor") (Chung-Sik, English Translation, page 8-4, last paragraph 2nd last line) connected in series with diode 86 and when the battery begins to get charged the current drawn by the battery reduces (current

is no longer constant) and supplies the charging power at a constant voltage until the battery is fully charged. (Fig. 2).

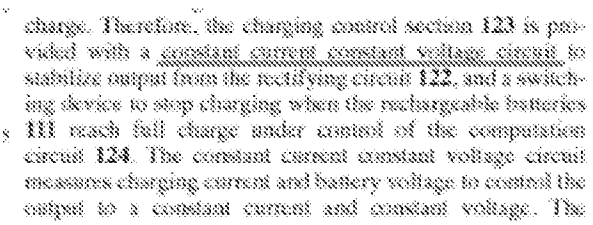


In this case, the rectified voltage IDC is input to a first voltage splitter 89, simultaneously limited to a predetermined level through the resistor 84 and the diode 86, then applied to the battery 32. That is, the battery 32 is charged. In the above case, the resistor 84 is a current limiter resistor, and the diode 86 is a diode for preventing countercurrent when the voltage IDC is lower than a voltage of the battery 32.

terminal (+) of the comparator 96. In this case, the reference voltage V1 is constant and the charge level detection voltage V2

To the extent that Chung-Sik may not specifically disclose constant voltage/constant current supplier for receiving the DC current from the rectifier and supplying a charging power to the battery cell in a constant voltage/constant current mode it would have been obvious over Kaite et al.

Kaite et al. specifically disclosed constant voltage constant current supplier 123 for receiving DC current from rectifier 122 and supplying a charging power to the battery cell 111 in a constant voltage/constant current mode (col. 6, lines 41-44) (Fig. 2).



charge. Therefore, the charging control section 123 is provided with a constant current constant voltage circuit to stabilize output from the rectifying circuit 122, and a switching device to stop charging when the rechargeable batteries 111 reach full charge under control of the computation circuit 124. The constant current constant voltage circuit measures charging current and battery voltage to control the output to a constant current and constant voltage. The

At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify the contact-less charging circuit of Chung-Sik and Matsuki by adding the constant voltage/constant current supplier disclosed by Kaite et al. to supply the charging power in a constant current mode at an initial charging stage and then supply the charging power in a constant voltage mode at a later charging stage for efficient charging of the battery.

an overvoltage monitoring unit for monitoring voltages at both ends of the constant voltage/constant current supplier and transmitting a monitoring result to the external contact-less charging device by means of wireless communication so as to induce a change of intensity of the magnetic field,

Chung-Sik also discloses contactless charge system for detecting a voltage of a rechargeable battery 32 to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1) and specifically disclosed an over voltage monitoring unit 54 for monitoring voltages (V1, V2) at both ends of the constant voltage/current supplier 52 and microprocessor 56 scans the output VDL of the comparator 96 and searches for whether or not the charge voltage of battery 32 is normal. Microprocessor 56 transmits a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through line 37 so as to induce a change of intensity of the magnetic field of the induced voltage generating unit 46 (Fig. 1, 2) (page 8-2, lines 31-34, 40-55; page 8-3, lines 36-40; page 8-5, lines 35-43) (Fig. 2).

wherein the monitoring result is a charging power adjustment request signal.

Chung-Sik also discloses Microprocessor 56 transmits a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through line 37 so as to induce a change of intensity of the magnetic field (**charging power adjustment)** of the induced voltage generating unit 46 (Fig. 1, 2) (page 8-2, lines 31-34, 40-55; page 8-3, lines 36-40; page 8-5, lines 35-43) (Fig. 2).

Claim 70 (New): The contact-less charging circuit module according to claim 69,

Chung-Sik alone or Chung-Sik and Kaite et al. discloses contact-less charging circuit module according to claim 69 as set forth above.

wherein the high frequency AC current inducing unit is a coil to which a magnetic flux of the magnetic field generated from the external contact-less charging device is linked.

Chung-Sik discloses wherein the high frequency AC current inducing unit is a coil 79 to which a magnetic flux of the magnetic field generated from the coil 77 of the external contact-less charging device (charger) is linked (Chung-Sik , English Translation, page 8-3)(Fig. 2).

Claim 71 (New): The contact-less charging circuit module according to claim 69, wherein the overvoltage monitoring unit includes:

Chung-Sik alone or Chung-Sik and Kaite et al. discloses contact-less charging circuit module according to claim 69 as set forth above.

a wireless transmitting unit for wirelessly propagating the monitoring result through an antenna;

Chung-Sik discloses microprocessor 56 transmits a monitoring result to the external contactless charging device 12 by means of wireless communication (RADIO UNIT 34) through line 37 so as to induce a change of intensity of the magnetic field of the induced voltage generating unit 46 (Fig. 1, 2) (page 8-2, lines 31-34, 40-55; page 8-3, lines 36-40; page 8-5, lines 35-43) (Fig. 2).

first and second voltage detectors for respectively detecting voltages at front and rear ends of the constant voltage/constant current supplier;

Chung-Sik discloses battery voltage detector circuit 54 that includes first and second voltage detectors (V1, V2) formed by voltage splitters 89 and 93 (Fig. 2).

a voltage comparator for comparing first and second voltages detected by the first and second voltage detectors and outputting a voltage comparison result; and

Chung-Sik discloses a voltage comparator 96 for comparing first and second voltages (V1, V2) detected by the first and second voltage detectors formed by voltage splitters 89 and 93 and outputting a voltage comparison result VDL (Fig. 2).

a microprocessor for outputting the monitoring result according to the voltage comparison result to the wireless transmitting unit.

Chung-Sik discloses a microprocessor 56 for outputting the monitoring result according to the voltage comparison result VDL (Fig. 2) to the wireless transmitting unit 34 (radio unit)(Fig. 1) (Chung-Sik , English Translation, page 8-5, paragraphs 5 and 6 copied below).

> When a charge level of the battery 32 is increased through the aforementioned operation, the charge level detection voltage V2 of a second voltage splitter 93 increases, and when the detection voltage V2 becomes higher than the reference voltage V1, the output VDL of the comparator 96 is transitioned to logic "high" from logic "low" and is input to the second microcomputer 56.
>
> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 23 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge

Claim 72 (New): The contact-less charging circuit module according to claim 71,

Chung-Sik alone or Chung-Sik and Kaite et al. discloses contact-less charging circuit module according to claim 71 as set forth above.

wherein the magnetic field generated by the contact-less charging device is generated intermittently,

Chung-Sik discloses when the first microprocessor 48 receives charge completion data signal from the portable device 18 decides to supply current (Fig. 3A, operation 112) and the charge operation may be automatically stopped by communication between devices or overheating of the battery (Chung-Sik , English Translation, page 8-5). Thus Chung-Sik discloses magnetic field generated by the contact-less charging device is generated intermittently depending upon the charge state of the battery or overheating of the battery.

wherein the overvoltage monitoring unit further includes a charging pause detecting unit for receiving the high frequency AC current output from the high frequency AC current inducing unit to detect a time point when the induction of high frequency AC current ends, and then outputting the end time point to the microprocessor, and

Chung-Sik also discloses overvoltage monitoring unit further includes charge pause detection unit comprising microprocessor 56 that receives clock and power information 104 (Fig. 1)(page 8-4, lines 32-39) to control the charge between the charger 12 and the portable device 18 (page 8-2, lines 8-9) (Fig. 1).

Chung-Sik discloses a control signal (SCTL) output from the output port Pl of FIRST MICRO COMPUTER 48 is applied to a base of the transistor 70 through a resistor 72 and switches "on/off' the transistor 70 around ten thousand times per second. In this case, a potential of a collector terminal of the transistor 70 is switched between "low" and "high" depending on a

period of the control signal (SCT) and the signal is applied to a base of the transistor 64." (Chung-Sik, English Translation, page 8-4 and Fig. 2).

Regarding charge pause detection unit and detecting a time point when the induction of high frequency AC current ends, and then outputting the end time point to the microprocessor, Chung-Sik discloses that the charging of battery continues until the detection voltage V2 in the overvoltage detection unit 54 becomes higher than V1 and the output signal VDL of comparator 96 is transitioned to logic "high" from logic "low" and is input to second microcomputer 56 to produce charging completion alarm (Fig. 2, page 8-5, lines 31-43). The transition to logic "high" from logic "low" is considered a time point when the induction of high frequency AC current ends, and then outputting the end time point (charge completion) to the microprocessor. The microcomputer 56 is broadly considered the same as charging pause detecting unit that produces charging completion alarm when the voltage of battery is determined to be normal and completely charged. Thus the microprocessor 56 determines the ON/OFF period of charging the battery.

Additionally, Chung-Sik specifically disclosed a "time point" when the charge operation may be automatically stopped by communication between contact less charging unit 38 and power transmitter 28 (Chung-Sik, English Translation, page 8-5, lines 44-46 and Fig. 1).

Thus, in the present invention according to the above embodiments, a battery begins to be charged from a time point when the portable device 18 operated at an operating voltage of the battery is installed on the base unit 12, and the charge operation may be automatically stopped either by communication between devices or overheating of the devices.

wherein the monitoring result is transmitted to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced after the end time point is input.

Chung-Sik discloses wherein the monitoring result is transmitted to the external contact-less charging device 12 by means of wireless communication by RADIO UNIT 34. (Chung-Sik, page 8-5, lines 35-43, Fig. 1, 2).

> Here, in the aforementioned operation 120 of FIG. 3B, the second microcomputer 56 that scans the output VDL of the comparator 96 and searches for whether or not the charge voltage is normal determines that the charge voltage of the battery 32 is normal. That is, a voltage of the battery 32 is determined to be completely charged to a set voltage level, and a charge completion alarm signal is output through line 37 in operation 122. The charge completion alarm signal through line 37 is transmitted to the base unit 12 through the audio and logic unit 36 and the radio unit 34, and the radio unit 25 and the audio and logic unit 24 of the base unit 12 receive and demodulate the signal and input the signal to the first microcomputer 48 through the line 49. The first microcomputer 48 that receives a data signal through the line 49 determines that the charge completion signal is received from the portable device 18 in the aforementioned operation 110 of FIG. 3A (the portable device is normal), and performs operation 112.

To the extent that Chung-Sik may not specifically disclose transmitting a monitoring result to the external contact-less charging device by means of wireless communication while a high frequency AC current is not induced it would have been obvious for charging the battery when a voltage of the battery is determined to be less than normal (Fig. 2).

At the time the invention was made it would have been obvious to modify the overvoltage monitoring unit disclosed by Chung-Sik to transmit the monitoring result while a high frequency AC current is not applied to the magnetic field generating unit for starting charging of the battery when voltage of the battery is determined to be less than normal.

10.0 CONCLUSION

10.1 ACTION IS MADE FINAL

Patent owner's amendment filed 11/29/2021 necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

A shortened statutory period for response to this action is set to expire 2 from the mailing date of this action.

Extensions of time under 37 CFR 1.136(a) do not apply in reexamination proceedings. The provisions of 37 CFR 1.136 apply only to "an applicant" and not to parties in a reexamination proceeding. Further, in 35 U.S.C. 305 and in 37 CFR 1.550(a), it is required that reexamination proceedings "will be conducted with special dispatch within the Office."

Extensions of time in reexamination proceedings are provided for in 37 CFR 1.550(c). A request for extension of time must specify the requested period of extension and it must be accompanied by the petition fee set forth in 37 CFR 1.17(g). Any request for an extension in a third party requested ex parte reexamination must be filed on or before the day on which action by the patent owner is due, and the mere filing of a request will not affect any extension of time. A request for an extension of time in a third party requested ex parte reexamination will be granted only for sufficient cause, and for a reasonable time specified. Any request for extension in a patent owner requested ex parte reexamination (including reexamination ordered under 35 U.S.C. 257) for up to two months from the time period set in the Office action must be filed no later than two months from the expiration of the time period set in the Office action. A request for an extension in a patent owner requested ex parte reexamination for more than two months from the time period set in the Office action must be filed on or before the day on which action by the patent owner is due, and the mere filing of a request for an extension for more than two months will not affect the extension. The time for taking action in a patent owner requested ex parte reexamination will not be extended for more than two months from the time period set in the Office action in the absence of sufficient cause or for more than a reasonable time.

The filing of a timely first response to this final rejection will be construed as including a request to extend the shortened statutory period for an additional two months. In no event,

however, will the statutory period for response expire later than SIX MONTHS from the mailing date of the final action. See MPEP § 2265.

10.2 Pertinent Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Giannopoulos et al. (US 2003/0214821 A1) discloses METHOD AND APPARATUS FOR CONTACT-LESS BATTERY CHARGING WITH DYNAMIC CONTROL uses signal Vb to control the gates G1 140 and G2 141 of the power switches S1 130 and S2 131 respectively for controlling the charging current for charging battery (Fig. 2). Signal Vb is related to the current suppled to battery measured by voltage Va across resistor Rsec and capacitance C1 and C2 given by [0018],

$$Vb = Rpr * [C1*C2/(C1+C2)]*[dVa/dt]$$

As known in the art capacitance C1 and C2 depends upon the distance between charger 102 and portable device 102 (Fig. 1).

Jo Kyu-Hyung (KR 100451606 B1) DATE PUBLISHED 2004-10-08 discloses feedback control of contactless battery charging by monitoring 17 the state of charge of battery 14 and wirelessly transmitting 18 the state of charge of battery 14 which is received by RF reception and demodulation circuit 20 in the charging matrix 1 (charger) and pulse width modulation (PWM) control circuit 21 receives a demodulated signal from the RF reception and demodulation circuit 20 and receives a pulse width modulated signal to control the DC / DC converter 12 voltage applied to the coil 4 of charging unit and inducing current in coil 5 of battery charging circuit to increase battery charging current. (Fig. 2).

Kitamura et al. (CN 101507091 B), published on 2012-03-07, disclosed wireless charging battery 21 comprising adjusting the charging current to battery 21 (adjusting charging current flows to the diode D2) by feedback (feedback coil L3) as a function of changing distance between the load coil L2 and power supply coil L1 (resonant coil) (Fig. 16). See CN 101507091 B paragraphs [0116] and [0118] and Fig. 16.

Fernandez et al (US 6,184,651 B1) published 2001-02-06, disclosed contactless charging system, charging energy is transferred across an inductive coupler to charge a battery (21) of a portable device, such as a two-way radio, cellular phone, paging device, or wireless communicator (Abstract, Fig. 1). The secondary charging device 19 is electrically coupled to a sensing device 38 which provides to a radio transceiver 35 a feedback signal indicative of a charging parameter of the secondary charging device 19, such as indicative of a charging voltage. The radio transceiver 35 preferably comprises an encoder/decoder to encode a signal for radio transmission through antenna 37 of radio transceiver 35. The radio signal from antenna 37 is received wirelessly by antenna 52 of transceiver 39 providing feedback to primary controller 11. The primary controller 11 then uses the feedback control signal, such as to regulate a parameter of the charging process, a charging signal voltage, and/or a cycling rate, and thereby improving the efficiency of the overall charging process and the energy transfer to the battery 21 (Fig. 3).

Kubota et al. (US 7208915) published 2007-04-24, foreign priority date 2004-09-30 disclosed constant current battery charger includes voltage monitor (Fig. 1).

Extensions of Time

Extensions of time under 37 CFR 1.136(a) will not be permitted in these proceedings because the provisions of 37 CFR 1.136 apply only to "an applicant" and not to parties in a reexamination proceeding. Additionally, 35 U.S.C. 305 requires that *ex parte* reexamination proceedings "will be conducted with special dispatch" (37 CFR 1.550(a)). Extensions of time in ex parte reexamination proceedings are provided for in 37 CFR 1.550(c).

Waiver of Right to File Patent Owner Statement

In a reexamination proceeding, Patent Owner may waive the right under 37 C.F.R. 1.530 to file a Patent Owner Statement. The document needs to contain a statement that Patent Owner waives the right under 37 C.F.R. 1.530 to file a Patent Owner Statement and proof of service in the manner provided by 37 C.F.R. 1.248, if the request for reexamination was made by a third party requester, see 37 C.F.R 1.550(f). The Patent Owner may consider using the following statement in a document waiving the right to file a Patent Owner Statement:

Patent Owner waives the right under 37 C.F.R. 1.530 to file a Patent Owner Statement.

Amendment in Reexamination Proceedings

Patent owner is notified that any proposed amendment to the specification and/or claims in this reexamination proceeding must comply with 37 CFR 1.530(d)-(j), must be formally presented pursuant to 37 CFR § 1.52(a) and (b), and must contain any fees required by 37 CFR § 1.20(c). See MPEP § 2250(IV) for examples to assist in the preparation of proper proposed amendments in reexamination proceedings.

Submissions

If the patent owner fails to file a timely and appropriate response to any Office action or any written statement of an interview required under 37 CFR § 1.560(b), the *ex parte* reexamination proceeding will be terminated, and the Director will proceed to issue a certificate under 37 CFR §1.570 in accordance with the last Office action.

Service of Papers

After the filing of a request for reexamination by a third party requester, any document filed by either the patent owner or the third party requester must be served on the other party (or parties where two or more third party requester proceedings are merged) in the reexamination proceeding in the manner provided in 37 CFR 1.248. See 37 CFR 1.550(f).

Notification of Concurrent Proceedings

The patent owner is reminded of the continuing responsibility under 37 CFR 1.565(a) to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving Patent No. US 8,013,568B2 throughout the course of this reexamination proceeding. The third party requester is also reminded of the ability to similarly apprise the Office of any such activity or proceeding throughout the course of this reexamination proceeding. See MPEP §§ 2207, 2282 and 2286.

All correspondence relating to this ex parte reexamination proceeding should be directed:

By Mail to: Mail Stop *Ex Parte* Reexam
Central Reexamination Unit
Commissioner for Patents
United States Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

By FAX to: (571) 273-9900
Central Reexamination Unit

By hand: Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Any inquiry concerning this communication should be directed to the Central Reexamination Unit at telephone number (571) 272-7705.

/ANJAN K DEB/
Primary Examiner, Art Unit 3992

Conferees:

/FRED O FERRIS III/
Reexamination Specialist, Art Unit 3992

/HBP/

Office Action in Ex Parte Reexamination	Control No. 96/000,355	Patent Under Reexamination 8013568	
	Examiner ANJAN K DEB	Art Unit 3992	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

a. ☑ Responsive to the communication(s) filed on 29 November 2021.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

b. ☑ This action is made FINAL.

c. ☐ A statement under 37 CFR 1.530 has not been received from the patent owner.

A shortened statutory period for response to this action is set to expire _____ month(s) from the mailing date of this letter. Failure to respond within the period for response will result in termination of the proceeding and issuance of an *ex parte* reexamination certificate in accordance with this action. 37 CFR 1.550(d). **EXTENSIONS OF TIME ARE GOVERNED BY 37 CFR 1.550(c).** If the period for response specified above is less than thirty (30) days, a response within the statutory minimum of thirty (30) days will be considered timely.

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

1. ☐ Notice of References Cited by Examiner, PTO-892.
2. ☐ Information Disclosure Statement, PTO/SB/08.
3. ☐ Interview Summary, PTO-474.
4. ☐ _____.

Part II SUMMARY OF ACTION

1a. ☑ Claims 1-35 and 37-75 are subject to reexamination.
1b. ☐ Claims _____ are not subject to reexamination.
2. ☐ Claims _____ have been canceled in the present reexamination proceeding.
3. ☐ Claims _____ are patentable and/or confirmed.
4. ☑ Claims 1-35 and 37-75 are rejected.
5. ☐ Claims _____ are objected to.
6. ☐ The drawings, filed on _____ are acceptable.
7. ☐ The proposed drawing correction, filed on _____ has been (7a) ☐ approved (7b) ☐ disapproved.
8. ☐ Acknowledgment is made of the priority claim under 35 U.S.C. 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the certified copies have
   1 ☐ been received.
   2 ☐ not been received.
   3 ☐ been filed in Application No. _____.
   4 ☐ been filed in reexamination Control No. _____.
   5 ☐ been received by the International Bureau in PCT application No. _____.
   * See the attached detailed Office action for a list of the certified copies not received.
9. ☐ Since the proceeding appears to be in condition for issuance of an *ex parte* reexamination certificate except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte* Quayle, 1935 C.D. 11, 453 O.G. 213.
10. ☑ Other: Interview summary and agenda

cc: Requester (if third party requester)