PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

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PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing (*day/month/year*) 20 FEB 2020

Applicant's or agent's file reference	FOR FURTHER ACTION
SPLY-P04-PCT	See paragraph 2 below

International application No.	International filing date (*day/month/year*)	Priority date (*day/month/year*)
PCT/US 19/63745	27 November 2019 (27.11.2019)	28 November 2018 (28.11.2018)

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

IPC - G07F 19/00 (2020.01)

CPC - G06Q 20/10; H02J 50/10; G06Q 20/16

Applicant SUPPLY, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	15 January 2020	Lee Young PCT Help Desk Telephone No. 571-272-4300

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Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into ______________ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(b)).

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

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Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-14, 20	YES
	Claims	15-19	NO
Inventive step (IS)	Claims	5-12, 14, 20	YES
	Claims	1-4, 13, 15-19	NO
Industrial applicability (IA)	Claims	1-20	YES
	Claims	NONE	NO

2. Citations and explanations:
Claims 15-19 lack novelty under PCT Article 33(2) as being anticipated by US 2015/0326061 A1 to Otter Products LLC (hereinafter Otter).

Regarding claim 15, Otter discloses a system for wireless power transmission (para [0042]- "FIG. 1 shows a top perspective view of a disclosed wireless charger 100 applied in a cupholder 110, for example a cupholder in a vehicle. The wireless charger may include several source antennas 120, attached by leads 122 to electronic circuitry 130. The electronic circuitry 130 may include one or more antenna controllers 132 and a power receiving circuit 134 that may receive power from an external power source, each of which is described in detail below"), comprising:

a power transmitter comprising a plurality of transmission elements (wireless charger 100 with antennas 120 disposed within cupholder; para [0042]- "FIG. 1 shows a top perspective view of a disclosed wireless charger 100 applied in a cupholder 110, for example a cupholder in a vehicle. The wireless charger may include several source antennas 120, attached by leads 122 to electronic circuitry 130"; para [0043]- "In the implementation of FIG. 1, the source antennas 120 include coils of electrically conductive wire"), wherein:

the power transmitter controls the plurality of transmission elements to transmit RF power based on a first transmission parameter value set (para [0048]- "Antenna driver 420 may include a signal generator 422, such as an oscillator, that provides a current waveform. In some embodiments, the antenna driver 420 may further include phase delay circuitry or mechanisms 426 in order to provide a phase-delayed iteration of the current waveform generated by the signal generator 422. For example, use of multiple phase delay mechanisms or circuits may result in supply of 3-phase current to selected source antennas. Alternatively, a multi-phase inverter (not shown) may receive a single direct current (DC) voltage and provide a multi-phase changing current, such as 3-phase current, for application to source antennas"; para [0051]- "In embodiments having multiple source antennas, the multiple source antennas may be energized simultaneously with the same electrical current waveform at the same phase, or may be energized simultaneously by different phases of electrical current. For example, FIG. 6 illustrates three simultaneous phases 610, 612, 614 of a sine-wave electrical current, with each phase offset from the others by 120 degrees.");

the power transmitter receives a metric from the power receiver (para [0062]- "A device to be charged may include communications circuitry for communicating with an antenna controller described above and/or detection unit of the wireless charger via one or more of several communication means. Some disclosed embodiments may employ modulation of the coupled electromagnetic field used for power transfer. For example, circuitry associated with a receiving antenna may selectively modulate a load, thus affecting the amplitude of the induced magnetic field. This modulation may be decoded at the antenna controller of the power source as feedback indicating the power levels needed, power levels received, etc"; para [0063]- "The data received by the detection unit may include any of at least: the amount of power received at the receiving antenna of the device to be charged, a difference between power received and power expected, and/or expected losses at the receiving antenna");

based on the metric and the first transmission parameter value set, the power transmitter determines a second transmission parameter value set different from the first transmission parameter value set (para [0064]- "The detector may also include circuitry such as a processor or discrete components programmed or arranged to determine which source antenna or antennas best correspond to receiving antennas of a device to be charged. The determination of best-corresponding source antenna(s) may be performed periodically. The determination of best-corresponding source antenna(s) may include causing the source antenna controller to provide an amount of current to each source antenna, or selected subsets of the source antennas, in a predetermined sequence and receiving a communication from the device to be charged in response to each electrical current induced at the device to be charged, in which communication the device to be charged may report the strength of the induced current"); and
(continued of claim 15)

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Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

There are two figures labled 3C on separate sheets (5 and 6).

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:
Box No. V.2. Citations and Explanations:
(continued of claim 15)
the power transmitter controls the plurality of transmission elements to transmit RF power based on the second transmission parameter value set (para [0064]- "The determination of best-corresponding source antenna(s) may include causing the source antenna controller to provide an amount of current to each source antenna, or selected subsets of the source antennas, in a predetermined sequence and receiving a communication from the device to be charged in response to each electrical current induced at the device to be charged, in which communication the device to be charged may report the strength of the induced current. The source antenna(s) corresponding to the best (e.g., highest) induced current may be controlled to provide wireless charging to the device to be charged, while remaining source antenna(s) may be disabled until another of the periodic determinations of best-corresponding source antenna(s). Using these techniques, the wireless charger is able to automatically configure or reconfigure itself to increase the amount of charging current delivered to a device placed in the charger even though the device may be oriented differently each time it is placed in the charger");

a power receiver comprising a power measurement element (para [0062]- "A device to be charged may include communications circuitry for communicating with an antenna controller described above and/or detection unit of the wireless charger via one or more of several communication means. Some disclosed embodiments may employ modulation of the coupled electromagnetic field used for power transfer. For example, circuitry associated with a receiving antenna may selectively modulate a load, thus affecting the amplitude of the induced magnetic field. This modulation may be decoded at the antenna controller of the power source as feedback indicating the power levels needed, power levels received"; para [0063]- "The data received by the detection unit may include any of at least: the amount of power received at the receiving antenna of the device to be charged, a difference between power received and power expected, and/or expected losses at the receiving antenna"), wherein:

the power receiver receives RF power from the power transmitter (para [0062]- "A device to be charged may include communications circuitry for communicating with an antenna controller described above and/or detection unit of the wireless charger via one or more of several communication means; para [0063]- The data received by the detection unit may include any of at least: the amount of power received at the receiving antenna of the device to be charged, a difference between power received and power expected, and/or expected losses at the receiving antenna");

at the power measurement element, the power receiver determines a measurement of the RF power received (para [0062]- "A device to be charged may include communications circuitry for communicating with an antenna controller described above and/or detection unit of the wireless charger via one or more of several communication means. Some disclosed embodiments may employ modulation of the coupled electromagnetic field used for power transfer. For example, circuitry associated with a receiving antenna may selectively modulate a load, thus affecting the amplitude of the induced magnetic field. This modulation may be decoded at the antenna controller of the power source as feedback indicating the power levels needed, power levels received"; para [0063]- "The data received by the detection unit may include any of at least: the amount of power received at the receiving antenna of the device to be charged, a difference between power received and power expected, and/or expected losses at the receiving antenna");

the power receiver determines the metric based on the measurement; and the power receiver transmits the metric to the power transmitter (para [0062]- "A device to be charged may include communications circuitry for communicating with an antenna controller described above and/or detection unit of the wireless charger via one or more of several communication means. Some disclosed embodiments may employ modulation of the coupled electromagnetic field used for power transfer. For example, circuitry associated with a receiving antenna may selectively modulate a load, thus affecting the amplitude of the induced magnetic field. This modulation may be decoded at the antenna controller of the power source as feedback indicating the power levels needed, power levels received"; para [0063]- "The data received by the detection unit may include any of at least: the amount of power received at the receiving antenna of the device to be charged, a difference between power received and power expected, and/or expected losses at the receiving antenna"); and

a housing defining a cavity, the cavity enclosing the power receiver and the plurality of transmission elements (cupholder cavity; see figure 1; para [0046]- "The antennas may be placed in spaced configurations (as in FIG. 3) or overlapping configurations (as in FIG. 1) and may form a two- or three-dimensional array. For example, the ring of source antennas 120 shown in FIG. 1 could be duplicated above and/or below the source antennas 120. The source antennas may be uniformly (or non-uniformly) angled upward such that one or more of the source antennas is parallel with a back surface of an electronic device when placed in a leaning orientation within the charging area. Specifically, when a mobile phone is placed in a cupholder of a vehicle, it typically leans against a top edge of the cupholder with the back of the phone being at an angle with respect to a side wall of the cupholder. In some circumstances, a source antenna intended to communicate power to a receiving antenna in the back of the phone may thus provide better alignment when angled similarly to the phone's power receiving antenna").

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Regarding claim 16, Otter discloses the system of claim 15. Otter discloses wherein an RF impedance of the housing is substantially different from free space (para [0068]- "Source antennas of a wireless charger may produce electromagnetic fields that could in certain situations affect surrounding circuits, including vehicle electronics, pacemakers, etc. Accordingly, a housing of the wireless charger, such as a vehicle cupholder, may include electromagnetic shielding placed to limit the area affected by the electromagnetic fields. For example, a cupholder implementing a disclosed wireless charger may include shielding around the sides and on the bottom of the cupholder. In some embodiments the cupholder may also include selectively removable electromagnetic shielding over its top"; para [0069]- "The source antennas may be placed internally to, externally to, or between walls of a device holder such as the cupholder shape described above. Electromagnetic shielding may be implemented to eliminate or reduce the external effects of electromagnetic fields generated by the wireless charger.").

Regarding claim 17, Otter discloses the system of claim 15. Otter discloses wherein a set of transmission elements of the plurality are arranged on a wall of the housing (para [0046]- "The antennas may be placed in spaced configurations (as in FIG. 3) or overlapping configurations (as in FIG. 1) and may form a two- or three-dimensional array. For example, the ring of source antennas 120 shown in FIG. 1 could be duplicated above and/or below the source antennas 120. The source antennas may be uniformly (or non-uniformly) angled upward such that one or more of the source antennas is parallel with a back surface of an electronic device when placed in a leaning orientation within the charging area. Specifically, when a mobile phone is placed in a cupholder of a vehicle, it typically leans against a top edge of the cupholder with the back of the phone being at an angle with respect to a side wall of the cupholder. In some circumstances, a source antenna intended to communicate power to a receiving antenna in the back of the phone may thus provide better alignment when angled similarly to the phone's power receiving antenna").

Regarding claim 18, Otter discloses the system of claim 17. Otter discloses wherein the set of transmission elements define a substantially uniform array on the wall (para [0046]- "The antennas may be placed in spaced configurations (as in FIG. 3) or overlapping configurations (as in FIG. 1) and may form a two- or three-dimensional array. For example, the ring of source antennas 120 shown in FIG. 1 could be duplicated above and/or below the source antennas 120. The source antennas may be uniformly (or non-uniformly) angled upward such that one or more of the source antennas is parallel with a back surface of an electronic device when placed in a leaning orientation within the charging area").

Regarding claim 19, Otter discloses the system of claim 17. Otter discloses wherein the transmission elements of the plurality are arranged surrounding the receiver (see figures 1, 3; para [0046]- "The antennas may be placed in spaced configurations (as in FIG. 3) or overlapping configurations (as in FIG. 1) and may form a two- or three-dimensional array. For example, the ring of source antennas 120 shown in FIG. 1 could be duplicated above and/or below the source antennas 120. The source antennas may be uniformly (or non-uniformly) angled upward such that one or more of the source antennas is parallel with a back surface of an electronic device when placed in a leaning orientation within the charging area. Specifically, when a mobile phone is placed in a cupholder of a vehicle, it typically leans against a top edge of the cupholder with the back of the phone being at an angle with respect to a side wall of the cupholder").

Claims 1-4, 13 lack an inventive step under PCT Article 33(3) as being obvious over Otter in view of US 2016/0099613 A1 to Energous Corporation (hereinafter Energous613).

Regarding claim 1, Otter discloses a method for wireless power transmission (para [0042]- "FIG. 1 shows a top perspective view of a disclosed wireless charger 100 applied in a cupholder 110, for example a cupholder in a vehicle"), comprising:

at a transmitter comprising a plurality of transmission elements within a cavity (wireless charger 100 with antennas 120 disposed within cupholder cavity; para [0042]- "FIG. 1 shows a top perspective view of a disclosed wireless charger 100 applied in a cupholder 110, for example a cupholder in a vehicle. The wireless charger may include several source antennas 120, attached by leads 122 to electronic circuitry 130"),

operating based on a first transmission parameter value set (providing current with different phases"; para [0048]- "Antenna driver 420 may include a signal generator 422, such as an oscillator, that provides a current waveform. The waveform produced by the antenna driver 420 may be predetermined, and the antenna driver 420 may in some embodiments produce the predetermined electric current waveform from a hard-configured arrangement of components or from a table of stored parameters for programmably configuring waveform-producing circuitry. For example, use of multiple phase delay mechanisms or circuits may result in supply of 3-phase current to selected source antennas. Alternatively, a multi-phase inverter (not shown) may receive a single direct current (DC) voltage and provide a multi-phase changing current, such as 3-phase current, for application to source antennas"; para [0051]- "In embodiments having multiple source antennas, the multiple source antennas may be energized simultaneously with the same electrical current waveform at the same phase, or may be energized simultaneously by different phases of electrical current. For example, FIG. 6 illustrates three simultaneous phases 610, 612, 614 of a sine-wave electrical current, with each phase offset from the others by 120 degrees");
(continued of claim 1)

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In case the space in any of the preceding boxes is not sufficient.
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(continued of claim 1)
at a receiver within the cavity, receiving power transmitted by the transmitter (para [0062]- "A device to be charged may include communications circuitry for communicating with an antenna controller described above and/or detection unit of the wireless charger via one or more of several communication means"; para [0068]- "Accordingly, a housing of the wireless charger, such as a vehicle cupholder, may include electromagnetic shielding placed to limit the area affected by the electromagnetic fields. For example, a cupholder implementing a disclosed wireless charger may include shielding around the sides and on the bottom of the cupholder. In some embodiments the cupholder may also include selectively removable electromagnetic shielding over its top");

determining information associated with efficiency of power transmission from the transmitter to the receiver (para [0062]- "Some disclosed embodiments may employ modulation of the coupled electromagnetic field used for power transfer. For example, circuitry associated with a receiving antenna may selectively modulate a load, thus affecting the amplitude of the induced magnetic field. This modulation may be decoded at the antenna controller of the power source as feedback indicating the power levels needed, power levels received, etc. In other embodiments, data communication between the source and receiving devices may include other wireless communication circuitry and protocols");

determining a second transmission parameter value set based on the information and the first transmission parameter value set (para [0064]- "The determination of best-corresponding source antenna(s) may be performed periodically. The determination of best-corresponding source antenna(s) may include causing the source antenna controller to provide an amount of current to each source antenna, or selected subsets of the source antennas, in a predetermined sequence and receiving a communication from the device to be charged in response to each electrical current induced at the device to be charged, in which communication the device to be charged may report the strength of the induced current. The source antenna(s) corresponding to the best (e.g., highest) induced current may be controlled to provide wireless charging to the device to be charged, while remaining source antenna(s) may be disabled until another of the periodic determinations of best-corresponding source antenna(s)"); and

at the transmitter, in response to determining the second transmission parameter value set, transmitting power based on the second transmission parameter value set (para [0064]- "The detector may also include circuitry such as a processor or discrete components programmed or arranged to determine which source antenna or antennas best correspond to receiving antennas of a device to be charged. The source antenna(s) corresponding to the best (e.g., highest) induced current may be controlled to provide wireless charging to the device to be charged, while remaining source antenna(s) may be disabled until another of the periodic determinations of best-corresponding source antenna(s). Using these techniques, the wireless charger is able to automatically configure or reconfigure itself to increase the amount of charging current delivered to a device placed in the charger even though the device may be oriented differently each time it is placed in the charger");

wherein the first and second transmission parameter value sets are associated with the plurality of transmission elements (para [0051]- "In embodiments having multiple source antennas, the multiple source antennas may be energized simultaneously with the same electrical current waveform at the same phase, or may be energized simultaneously by different phases of electrical current. For example, FIG. 6 illustrates three simultaneous phases 610, 612, 614 of a sine-wave electrical current, with each phase offset from the others by 120 degrees"; para [0064]- "The source antenna(s) corresponding to the best (e.g., highest) induced current may be controlled to provide wireless charging to the device to be charged, while remaining source antenna(s) may be disabled until another of the periodic determinations of best-corresponding source antenna(s). Using these techniques, the wireless charger is able to automatically configure or reconfigure itself to increase the amount of charging current delivered to a device placed in the charger even though the device may be oriented differently each time it is placed in the charger").

Otter does not disclose time interval for operating the charging process.

Energous613 in the related art of wireless charging system disclose the time interval for charging operation (para [0259]- "FIG. 53 is a flowchart of a process 5300 to power a plurality of client devices using a time division multiplexing (TDM) method in a wireless power transmission system, according to an embodiment. Process 5300 may start when a system management GUI operated by a user in a wireless power transmitter system may command a system management server to manually or automatically power one or more client devices from wireless power receivers, at step S383. Subsequently, the system management server may communicate the commands to one or more wireless power transmitters in the wireless power transmission system, at step S385"; para [0263]- "The TDM power transmission process may allow wireless power transmitter to power all client devices enough at regular intervals of time (or time slots) using an automatic on/off line process, at step S399").

It would have been obvious to a person having ordinary skill in the art to modify the method of Otter with the teaching of the time interval for operating the charging process as disclosed by Energous613 as this would have provided the advantage for sufficiently charging all wireless receivers at regular time slots (para [0259], [0263]).

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Regarding claim 2, Otter in view of Energous613 discloses the method of claim 1. Otter discloses wherein the transmitter transmits power based on the first transmission parameter value set substantially throughout the time interval (para [0051]- "In embodiments having multiple source antennas, the multiple source antennas may be energized simultaneously with the same electrical current waveform at the same phase, or may be energized simultaneously by different phases of electrical current. For example, FIG. 6 illustrates three simultaneous phases 610, 612, 614 of a sine-wave electrical current, with each phase offset from the others by 120 degrees").

Regarding claim 3, Otter in view of Energous613 discloses the method of claim 1. Otter discloses wherein the information is determined at the receiver (para [0062]- "For example, circuitry associated with a receiving antenna may selectively modulate a load, thus affecting the amplitude of the induced magnetic field. This modulation may be decoded at the antenna controller of the power source as feedback indicating the power levels needed, power levels received"; para [0063]- "The data received by the detection unit may include any of at least: the amount of power received at the receiving antenna of the device to be charged, a difference between power received and power expected, and/or expected losses at the receiving antenna").

Regarding claim 4, Otter in view of Energous613 discloses the method of claim 3. Otter discloses wherein determining the information comprises determining an amount of power received at the receiver during the time interval (para [0062]- "A device to be charged may include communications circuitry for communicating with an antenna controller described above and/or detection unit of the wireless charger via one or more of several communication means. Some disclosed embodiments may employ modulation of the coupled electromagnetic field used for power transfer. For example, circuitry associated with a receiving antenna may selectively modulate a load, thus affecting the amplitude of the induced magnetic field. This modulation may be decoded at the antenna controller of the power source as feedback indicating the power levels needed, power levels received").

Regarding claim 13, Otter in view of Energous613 discloses the method of claim 1. Otter discloses wherein the second transmission parameter value set comprises, for each transmission element, a respective first phase value, and the second transmission parameter value set comprises, for each transmission element, a respective second phase value (para [0051]- "In embodiments having multiple source antennas, the multiple source antennas may be energized simultaneously with the same electrical current waveform at the same phase, or may be energized simultaneously by different phases of electrical current. For example, FIG. 6 illustrates three simultaneous phases 610, 612, 614 of a sine-wave electrical current, with each phase offset from the others by 120 degrees"; para [0064]- "The source antenna(s) corresponding to the best (e.g., highest) induced current may be controlled to provide wireless charging to the device to be charged, while remaining source antenna(s) may be disabled until another of the periodic determinations of best-corresponding source antenna(s). Using these techniques, the wireless charger is able to automatically configure or reconfigure itself to increase the amount of charging current delivered to a device placed in the charger even though the device may be oriented differently each time it is placed in the charger").

Claims 5-12, 14, 20 meet the criteria set forth under PCT Article 33(2)-(3) because the prior art does not teach or fairly suggest the subject matter claimed.

The prior art is exemplified by Otter, Energous613 and US 2016/0013656 A1 to Energous Corporation (hereinafter Energous156).

Regarding claim 5, Otter in view of Energous613 discloses the method of claim 1. Otter in view of Energous613 does not disclose further comprising, before transmitting power based on the first transmission parameter value set: at the transmitter, controlling the plurality of transmission elements to generate a localized excitation pattern, wherein the localized excitation pattern defines a high-intensity region within the cavity; while generating the localized excitation pattern, at the receiver, determining second information associated with efficiency of power transmission to the receiver via the localized excitation pattern; and determining the first transmission parameter value set based on the second information and the localized excitation pattern.

Energous656 in the related art discloses a system and method for wireless power transmission using pocket-forming (para [0054]- "FIG. 1 illustrates wireless power transmission 100 using pocket-forming. A transmitter 102 may transmit controlled Radio Frequency (RF) waves 104 which may converge in 3-D space. RF waves 104 may be controlled through phase and/or relative amplitude adjustments to form constructive and destructive interference patterns (pocket-forming). Pockets of Energy 106 may form at constructive interference patterns and may be 3-Dimensional in shape, whereas null-spaces may be generated at destructive interference patterns. A Receiver 108 may then utilize Pockets of Energy 106 produced by pocket-forming for charging or powering an electronic device, for example a laptop computer 110, and thus providing wireless power transmission 100. In embodiments disclosed here, there may be two or more transmitters 102 and one or more receivers 108 for powering various electronic devices"). Energous656 does not disclose the deficiencies of Otter and Energous613.

Therefore the prior art of record does not teach or fairly suggest the subject matter claimed. Specifically, none of the prior art, alone or in combination, teaches or fairly suggests before transmitting power based on the first transmission parameter value set: at the transmitter, controlling the plurality of transmission elements to generate a localized excitation pattern, wherein the localized excitation pattern defines a high-intensity region within the cavity; while generating the localized excitation pattern, at the receiver, determining second information associated with efficiency of power transmission to the receiver via the localized excitation pattern; and determining the first transmission parameter value set based on the second information and the localized excitation pattern.

Therefore since the prior art of record does not disclose all of the elements of claim 5, claim 5 meets the criteria set out in PCT Article 33(2)-(3).

Claims 6-8 depend either directly or indirectly from claim 5, and, therefore, meet the criteria set out in PCT Article 33(2)-(3), as well.
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Box No. V.2. Citations and Explanations:

Regarding claim 9, Otter in view of Energous613 discloses the method of claim 1. Otter in view of Energous613 does not disclose wherein determining the second transmission parameter value set is performed according to an optimization algorithm, comprising, based on the information, determining a value of an objective function associated with the optimization algorithm.

Energous656 in the related art discloses a system and method for wireless power transmission using pocket-forming (para [0051]- "The wireless power transmitter establishes a real-time communication connection with each receiver for the purpose of receiving feedback in real-time (such as 100 samples per second). This feedback from each receiver includes the measurement of energy presently being received, which is used by the transmitter to control the direction of the transmitter's antenna array so that it stays aimed at the receiver, even if the receiver moves to a different physical 3-D location or is in 3-D motion that changes its physical 3-D location"; para [0054]- "FIG. 1 illustrates wireless power transmission 100 using pocket-forming. A transmitter 102 may transmit controlled Radio Frequency (RF) waves 104 which may converge in 3-D space. RF waves 104 may be controlled through phase and/or relative amplitude adjustments to form constructive and destructive interference patterns (pocket-forming). Pockets of Energy 106 may form at constructive interference patterns and may be 3-Dimensional in shape, whereas null-spaces may be generated at destructive interference patterns. A Receiver 108 may then utilize Pockets of Energy 106 produced by pocket-forming for charging or powering an electronic device, for example a laptop computer 110, and thus providing wireless power transmission 100. In embodiments disclosed here, there may be two or more transmitters 102 and one or more receivers 108 for powering various electronic devices"). Energous does not disclose the deficiencies of Otter and Energous613.

Therefore the prior art of record does not teach or fairly suggest the subject matter claimed. Specifically, none of the prior art, alone or in combination, teaches or fairly suggests wherein determining the second transmission parameter value set is performed according to an optimization algorithm, comprising, based on the information, determining a value of an objective function associated with the optimization algorithm.

Therefore since the prior art of record does not disclose all of the elements of claim 9, claim 9 meets the criteria set out in PCT Article 33(2)-(3).

Claims 10-12 depend either directly or indirectly from claim 9, and, therefore, meet the criteria set out in PCT Article 33(2)-(3), as well.

Regarding claim 14, Otter in view of Energous613 discloses the method of claim 1. Otter discloses further comprising, before the time interval, configuring the transmitter based on the first transmission parameter value set, comprising: at a set of one or more amplifiers of the transmitter, driving the plurality of transmission elements based on the first transmission parameter value set, wherein the plurality of transmission elements comprises an antenna resonantly coupled to an amplifier of the set via a connection chain of the transmitter; while driving the plurality of transmission elements based on the first transmission parameter value set, determining that a net power flow through the connection chain is a back-propagating flow directed from the antenna toward the amplifier; and in response to determining that the net power flow is back-propagating, controlling the connection chain in a low-coupling state, in which resonant coupling between the antenna and the amplifier is reduced; wherein, during the time interval, the connection chain is maintained in the low-coupling state.

Energous656 in the related art discloses a system and method for wireless power transmission using pocket-forming (para [0054]- "FIG. 1 illustrates wireless power transmission 100 using pocket-forming. A transmitter 102 may transmit controlled Radio Frequency (RF) waves 104 which may converge in 3-D space. RF waves 104 may be controlled through phase and/or relative amplitude adjustments to form constructive and destructive interference patterns (pocket-forming). Pockets of Energy 106 may form at constructive interference patterns and may be 3-Dimensional in shape, whereas null-spaces may be generated at destructive interference patterns. A Receiver 108 may then utilize Pockets of Energy 106 produced by pocket-forming for charging or powering an electronic device, for example a laptop computer 110, and thus providing wireless power transmission 100). Energous fails to disclose the deficiencies of Otter and Energous613.

Therefore the prior art of record does not teach or fairly suggest the subject matter claimed. Specifically, none of the prior art, alone or in combination, teaches or fairly suggests before the time interval, configuring the transmitter based on the first transmission parameter value set, comprising: at a set of one or more amplifiers of the transmitter, driving the plurality of transmission elements based on the first transmission parameter value set, wherein the plurality of transmission elements comprises an antenna resonantly coupled to an amplifier of the set via a connection chain of the transmitter; while driving the plurality of transmission elements based on the first transmission parameter value set, determining that a net power flow through the connection chain is a back-propagating flow directed from the antenna toward the amplifier; and in response to determining that the net power flow is back-propagating, controlling the connection chain in a low-coupling state, in which resonant coupling between the antenna and the amplifier is reduced; wherein, during the time interval, the connection chain is maintained in the low-coupling state.

Therefore since the prior art of record does not disclose all of the elements of claim 14, claim 14 meets the criteria set out in PCT Article 33(2)-(3).

---see continuation on supplemental page---

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 19/63745

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:
Box No. V.2. Citations and Explanations:
Regarding claim 20, Otter discloses the system of claim 15. Otter does not disclose wherein the power transmitter further comprises a set of connection chains, wherein: each connection chain of the set is associated with a respective transmission element of the plurality; each connection chain of the set comprises a coupling control module and a power measurement module; the power measurement module measures net power flow through the respective transmission element; the coupling control module controls RF coupling between the respective transmission element and a set of amplifiers of the power transmitter; and in response to detecting back-propagating power flow through a transmission element, the associated coupling control module reduces the RF coupling between the transmission element and the set of amplifiers.

Energous656 in the related art discloses a system and method for wireless power transmission using pocket-forming ((para [0051]- The wireless power transmitter establishes a real-time communication connection with each receiver for the purpose of receiving feedback in real-time (such as 100 samples per second). This feedback from each receiver includes the measurement of energy presently being received, which is used by the transmitter to control the direction of the transmitter's antenna array so that it stays aimed at the receiver, even if the receiver moves to a different physical 3-D location or is in 3-D motion that changes its physical 3-D location; para [0054]- FIG. 1 illustrates wireless power transmission 100 using pocket-forming. A transmitter 102 may transmit controlled Radio Frequency (RF) waves 104 which may converge in 3-D space. RF waves 104 may be controlled through phase and/or relative amplitude adjustments to form constructive and destructive interference patterns (pocket-forming). Pockets of Energy 106 may form at constructive interference patterns and may be 3-Dimensional in shape, whereas null-spaces may be generated at destructive interference patterns. A Receiver 108 may then utilize Pockets of Energy 106 produced by pocket-forming for charging or powering an electronic device, for example a laptop computer 110, and thus providing wireless power transmission 100. In embodiments disclosed here, there may be two or more transmitters 102 and one or more receivers 108 for powering various electronic devices). Energous does not disclose the deficiencies of Otter.

Therefore the prior art of record does not teach or fairly suggest the subject matter claimed. Specifically, none of the prior art, alone or in combination, teaches or fairly suggests wherein the power transmitter further comprises a set of connection chains, wherein: each connection chain of the set is associated with a respective transmission element of the plurality; each connection chain of the set comprises a coupling control module and a power measurement module; the power measurement module measures net power flow through the respective transmission element; the coupling control module controls RF coupling between the respective transmission element and a set of amplifiers of the power transmitter; and in response to detecting back-propagating power flow through a transmission element, the associated coupling control module reduces the RF coupling between the transmission element and the set of amplifiers.

Therefore since the prior art of record does not disclose all of the elements of claim 20, claim 20 meets the criteria set out in PCT Article 33(2)-(3).

Claims 1-20 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.