PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: MICHAEL A. GUTH
2-2905 EAST CLIFF DRIVE
SANTA CRUZ, CA 95062

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	01 APR 2020

Applicant's or agent's file reference	FOR FURTHER ACTION
1342-PCT	See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US 19/68209	22 December 2019 (22.12.2019)	27 December 2018 (27.12.2018)

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

IPC - F16D 61/00; F16D 65/78; B60L 7/10; B60L 11/00; B62M 6/40; B62M 6/80; H02P 3/14 (2020.01)

CPC - F16D 61/00; F16D 65/02; F16D 65/78; B60T 1/02; B60L 7/10; B60L 11/00; B62M 6/40; B62M 6/80; H02P 3/14

Applicant
SAIKI, NEAL

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	10 March 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	1-24, 28-32	YES
	Claims	25-27	NO
Inventive step (IS)	Claims	1-24, 30-32	YES
	Claims	25-29	NO
Industrial applicability (IA)	Claims	1-32	YES
	Claims	None	NO

2. Citations and explanations:

Claims 25-27 lack novelty under PCT Article 33(2) as being anticipated by US 2016/0243927 A1 to Superpedestrian, Inc. (hereinafter Superpedestrian).

Regarding claim 25, Superpedestrian discloses a method of dissipating heat generated during braking of a bicycle (para [0301]- The electrically motorized wheel 100 may be used to provide additional motive force and braking to various types of otherwise human only powered vehicles. Thus, an entire vehicle may be sold as an integrated product, including an appropriately designed electrically motorized wheel 100; para [0693]- The heat sources are ultimately communicated to the shaft 924, thence to the bicycle frame along mechanical thermally conductive paths. The bicycle frame thus ultimately operates as a heat sink of significant volume), said method comprising the steps of: braking with a regenerative braking system (para [0660]- With reference to FIG. 23A, a braking dissipation algorithm 2300 accommodates an architecture in which the battery system 906 may be relatively limited in the amount of energy that can be absorbed during braking (in which energy can be directed to recharge the battery) without damage occurring to the battery), thereby generating electrical power (para [0660]- With reference to FIG. 23A, a braking dissipation algorithm 2300 accommodates an architecture in which the battery system 906 may be relatively limited in the amount of energy that can be absorbed during braking (in which energy can be directed to recharge the battery) without damage occurring to the battery); routing the electrical power generated by the regenerative braking system to an energy dissipation system (para [0662]- Since the battery protection algorithm limits the quantity of power that can be delivered back into the battery, the braking dissipation algorithm provides another place to send braking power in lieu of the battery without the addition of another dissipative load such as a traditional shunt resistor, thus allowing or causing more braking than would otherwise be allowed); and dissipating said energy in said energy dissipation system (para [0692]- With reference to FIG. 23D, an example thermal model schematic for the motor utilize capacitors to represent heat-sinking characteristic of the various thermal generating components in the hub shell assembly. They are responsible for the fact that it takes some time for these components to heat up, thus allowing the wheel to have higher performance until those thermal generating components are hot. The resistors represent the paths for heat to spread inside of, then ultimately escape the hub shell assembly).

Regarding claim 26, Superpedestrian discloses the method of claim 25. Superpedestrian discloses, wherein the step of dissipating said energy comprises routing said energy to one or more load resistors (para [0692]- With reference to FIG. 23D, an example thermal model schematic for the motor utilize capacitors to represent heat-sinking characteristic of the various thermal generating components in the hub shell assembly. They are responsible for the fact that it takes some time for these components to heat up, thus allowing the wheel to have higher performance until those thermal generating components are hot. The resistors represent the paths for heat to spread inside of, then ultimately escape the hub shell assembly).

Regarding claim 27, Superpedestrian discloses the method of claim 25. Superpedestrian discloses, wherein the regenerative braking system comprises a battery (para [0378]- In embodiments, the hub shell assembly 916 contains the battery system 906...), and wherein the step or routing electrical power generated by the regenerative braking system to an energy dissipation system comprises routing electrical power to a switch controller (para [0269]- The control system 214 may include processing capabilities for handling the collection of data from various sources... Processing may include performing computations and calculations, executing algorithms based on inputs...; para [0662]- Since the battery protection algorithm limits the quantity of power that can be delivered back into the battery, the braking dissipation algorithm provides another place to send braking power in lieu of the battery without the addition of another dissipative load such as a traditional shunt resistor) which directs said electrical power to said energy dissipation system when said battery is at or above a predetermined state of charge (para [0662]- Since the battery protection algorithm limits the quantity of power that can be delivered back into the battery, the braking dissipation algorithm provides another place to send braking power in lieu of the battery without the addition of another dissipative load such as a traditional shunt resistor; para [0673]- Further, even when the battery state of charge is low enough to accept regeneration energy, the rate at which the battery can accept the energy is bounded by its charging current limit).

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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:

Claims 3 and 2 were written out of order, and claim 2 which would normally be ordered as claim 3, was written as dependent on itself. For the purposes of this opinion, claim 2 as originally written has been interpreted as claim 3, and original claim 3 has been interpreted as claim 2.

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Claims 28 and 29 lack an inventive step under PCT Article 33(3) as being obvious over Superpedestrian in view of EP 1225080 A2 to David+Baeder DBK GmbH (hereinafter David).

Regarding claim 28, Superdepestrian discloses the method of claim 26. Superpedestrian fails to disclose, wherein said load resistors are mounted to a dissipater plate. David, drawn to heatsinks, discloses, wherein said load resistors are mounted to a dissipater plate ((machine translation) Pg. 4- The PTC resistance element is electrically isolated from the pressure plate 203, the contact plates 201 and 202 by an insulating film (Kapton foil) 206 and the bracket 205 isolated... With this construction, the space between the PTC resistance element 200 and the cooling body 209 is to be completely or almost completely filled in order to achieve optimal heat extraction from the PTC resistance element 200 to the cooling body 209). It would have been obvious to a person having ordinary skill in the art to combine plate of David with the method of Superpedestrian to reduce the costs ((machine translation) Pg. 5- The metallic heatsink may be formed from an extruded profile also preferably, which offers the advantage that it is possible to produce the protective element inexpensively without expensive special tools in large numbers).

Regarding claim 29, Superpedestrian in view of David disclose the method of claim 28. David further discloses, wherein the step of dissipating said energy comprises the step of causing air to flow along said dissipater plate (para [0037]- Many types of heat exchangers are known. For example, the plate-type, the corrugated board type, the fin and tube-type and shell and tube-type heat exchangers; para [0052]- Each of the metallic sheets (301) includes a pair of ridges (321) which run along the edges of the metallic plates, thereby defining the boundary of the air channels formed between adjacent thermal exchanging sheets).

Claims 1-24 and 30-32 meet the criteria set out in PCT Article 33(2)-(3) because the prior art does not teach or fairly suggest the subject matter claimed.

The prior art for claims 1-24 is exemplified by Superpedestrian, David and US 2004/0104008 A1 to Yeung.

Regarding claim 1,
Superpedestrian discloses a regenerative braking energy dissipater system for a lightweight electric vehicle (para [0308]- In embodiments, the API and/or software development kit facilitates software and/or hardware access to the motor control system 208 of the electrically motorized wheel 100 such as when power is applied to electrically motorized wheel, when resistance is applied to electrically motorized wheel, energy regeneration...; para [0062]- The battery protection algorithm 2100 maintains regenerative charging currents within limits that will not damage the battery, for example, below about 5.5 A of regeneration in certain embodiments. Since the battery protection algorithm limits the quantity of power that can be delivered back into the battery, the braking dissipation algorithm provides another place to send braking power in lieu of the battery without the addition of another dissipative load such as a traditional shunt resistor...), said system comprising: a lightweight electric vehicle (para [0219]- FIG. 1A schematically illustrates an electrically motorized wheel 100 to convert a non-motorized vehicle, such as a bicycle...), said lightweight electric vehicle comprising: a mounting surface (Fig. 11A, element 924; para [0548]- ... as the stator 911 is mounted to the shaft 924 that is attached to the frame of the vehicle); and a regenerative braking system (para [0660]- With reference to FIG. 23A, a braking dissipation algorithm 2300 accommodates an architecture in which the battery system 906 may be relatively limited in the amount of energy that can be absorbed during braking (in which energy can be directed to recharge the battery) without damage occurring to the battery); and a dissipater (Fig. 9F, element 911; para [0547]- The control system thus utilizes a web 1307 of the stator 911 as a heat sink for the main control board 1430), said dissipater coupled to said mounting surface (para [0547]- The control system thus utilizes a web 1307 of the stator 911 as a heat sink for the main control board 1430; para [0548]- ... as the stator 911 is mounted to the shaft 924 that is attached to the frame of the vehicle). Superpedestrian fails to disclose, said dissipater comprising: a dissipater plate, said dissipater plate comprising a first side and a second side; a resistor assembly coupled to the first side of said dissipater plate, wherein said dissipater is coupled to said mounting surface such that an airflow passage exists between said first side of said dissipater plate and said mounting surface.

David, drawn to heatsinks, discloses, said dissipater comprising: a dissipater plate (Fig. 3B, element 209; (machine translation) Pg. 4- FIG. 3A shows the PTC resistance element mounted in a holder 209 designed as a cooling body), said dissipater plate comprising a first side and a second side (see Fig. 3B, first side facing resistor 200, and second side on the opposite side; (machine translation) Pg. 4- With this construction, the space between the PTC resistance element 200 and the cooling body 209 is to be completely or almost completely filled in order to achieve optimal heat extraction from the PTC resistance element 200 to the cooling body 209); a resistor assembly coupled to the first side of said dissipater plate ((machine translation) Pg. 4- The PTC resistance element is electrically isolated from the pressure plate 203, the contact plates 201 and 202 by an insulating film (Kapton foil) 206 and the bracket 205 isolated... With this construction, the space between the PTC resistance element 200 and the cooling body 209 is to be completely or almost completely filled in order to achieve optimal heat extraction from the PTC resistance element 200 to the cooling body 209). However, David otherwise fails to remedy the deficiencies of Superpedestrian.

Yeung, drawn to thermal exchangers, discloses, an airflow passage exists between said first side of said dissipater plate (para [0037]- Many types of heat exchangers are known. For example, the plate-type, the corrugated board type, the fin and tube-type and shell and tube-type heat exchangers; para [0052]- Each of the metallic sheets (301) includes a pair of ridges (321) which run along the edges of the metallic plates, thereby defining the boundary of the air channels formed between adjacent thermal exchanging sheets). However, Yeung otherwise fails to remedy the deficiencies of Superpedestrian.

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None of the prior art discloses, wherein said dissipater is coupled to said mounting surface such that the airflow passage exists between said first side of said dissipater plate and said mounting surface. Further, the prior art whether taken alone or combination, fails to disclose or suggest the particular arrangement of these parts as required by claim 1, therefore claim 1 meets the criteria set out in PCT Article 33(2)-(3).

Claims 2-13 depend from claim 1, and therefore, meet the criteria set out in PCT Article 33(2)-(3) as well.

Regarding claim 14,
Superpedestrian discloses a regenerative braking energy dissipater system for a bicycle (para [0308]- In embodiments, the API and/or software development kit facilitates software and/or hardware access to the motor control system 208 of the electrically motorized wheel 100 such as when power is applied to electrically motorized wheel, when resistance is applied to electrically motorized wheel, energy regeneration...; para [0062]- The battery protection algorithm 2100 maintains regenerative charging currents within limits that will not damage the battery, for example, below about 5.5 A of regeneration in certain embodiments. Since the battery protection algorithm limits the quantity of power that can be delivered back into the battery, the braking dissipation algorithm provides another place to send braking power in lieu of the battery without the addition of another dissipative load such as a traditional shunt resistor...; para [0219]- FIG. 1A schematically illustrates an electrically motorized wheel 100 to convert a non-motorized vehicle, such as a bicycle...), said system comprising: a bicycle (para [0219]- FIG. 1A schematically illustrates an electrically motorized wheel 100 to convert a non-motorized vehicle, such as a bicycle...), said bicycle comprising: a bicycle frame (para [0448]- ... other than the illustrated torque arm 1100 design that couples the non-rotating parts to a vehicle frame such as that of a bike); and a regenerative braking system (para [0660]- With reference to FIG. 23A, a braking dissipation algorithm 2300 accommodates an architecture in which the battery system 906 may be relatively limited in the amount of energy that can be absorbed during braking (in which energy can be directed to recharge the battery) without damage occurring to the battery); and a dissipater (Fig. 9F, element 911; para [0547]- The control system thus utilizes a web 1307 of the stator 911 as a heat sink for the main control board 1430), said dissipater coupled to said bicycle frame, said dissipater comprising (para [0547]- The control system thus utilizes a web 1307 of the stator 911 as a heat sink for the main control board 1430; para [0548]- ... as the stator 911 is mounted to the shaft 924 that is attached to the frame of the vehicle).
Superpedestrian fails to disclose, a dissipater plate, said dissipater plate comprising a first side and a second side; and a resistor assembly coupled to the first side of said dissipater plate; wherein said dissipater is coupled to said bicycle frame such that an airflow passage exists between said first side of said dissipater plate and the surface to which the dissipater plate is mounted.

David, drawn to heatsinks, dislcoses, a dissipater plate (Fig. 3B, element 209; (machine translation) Pg. 4- FIG. 3A shows the PTC resistance element mounted in a holder 209 designed as a cooling body), said dissipater plate comprising a first side and a second side (see Fig. 3B, first side facing resistor 200, and second side on the opposite side; (machine translation) Pg. 4- With this construction, the space between the PTC resistance element 200 and the cooling body 209 is to be completely or almost completely filled in order to achieve optimal heat extraction from the PTC resistance element 200 to the cooling body 209); and a resistor assembly coupled to the first side of said dissipater plate ((machine translation) Pg. 4- The PTC resistance element is electrically isolated from the pressure plate 203, the contact plates 201 and 202 by an insulating film (Kapton foil) 206 and the bracket 205 isolated... With this construction, the space between the PTC resistance element 200 and the cooling body 209 is to be completely or almost completely filled in order to achieve optimal heat extraction from the PTC resistance element 200 to the cooling body 209). However, David otherwise fails to remedy the deficiencies of Superpedestrian.

Yeung, drawn to thermal exchangers, discloses, an airflow passage exists between said first side of said dissipater plate (para [0037]- Many types of heat exchangers are known. For example, the plate-type, the corrugated board type, the fin and tube-type and shell and tube-type heat exchangers; para [0052]- Each of the metallic sheets (301) includes a pair of ridges (321) which run along the edges of the metallic plates, thereby defining the boundary of the air channels formed between adjacent thermal exchanging sheets).
However, Yeung otherwise fails to remedy the deficiencies of Superpedestrian.

None of the prior art discloses, wherein said dissipater is coupled to said bicycle frame such that the airflow passage exists between said first side of said dissipater plate and the surface to which the dissipater plate is mounted. Further, the prior art whether taken alone or combination, fails to disclose or suggest the particular arrangement of these parts as required by claim 14, therefore claim 14 meets the criteria set out in PCT Article 33(2)-(3).

Claims 15-24 depend from claim 14, and therefore, meet the criteria set out in PCT Article 33(2)-(3) as well.

The prior art for claims 30 and 32 is exemplified by Superpedestrian, David and US 2014/0356652 A1 to Ford Global Technologies, LLC. (hereinafter Ford).

Regarding claim 30,
Superpedestrian in view David disclose the method of claim 29. Neither Superpedestrian nor David disclose, wherein said dissipater plate is mounted to a battery case.

Ford, drawn to heat dissipating batteries, discloses, wherein said dissipater plate is mounted to a battery case (para [0004]- A battery module according to an exemplary aspect of the present disclosure includes, among other things, a battery cell, a plate adjacent to the battery cell and a heat pipe attached to the plate and containing a first heat transfer medium). However, this combination would not have been obvious to a person having ordinary skill in the art since it would require a modification of the dissipation plate introduced by secondary reference David.

Claims 32 depends from claim 30, and therefore, meet the criteria set out in PCT Article 33(2)-(3) as well.

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The prior art for claim 31 is exemplified by Superpedestrian, David, and Yeung.

Regarding claim 31, Superpedestrian in view of David disclose the method of claim 29. Neither Superpedestrian nor David disclose, wherein said air flows above and below said dissipater plate.

Yeung, drawn to heat sinks, discloses, wherein said air flows above and below said dissipater plate (para [0049]- Turning now to a preferred example of a thermal exchanger which can be used in the present preferred embodiment, the thermal exchanger unit (30) shown in Fig. 6 includes an assembly of parallelly stacked thermal exchanger elements (32) which are generally thin metallic sheets, plates or foils, such as aluminium sheets or foils. Thin metallic sheets or foils are preferred because their high thermal conductivity offers high thermal transfer rate and their small thickness offers high thermal sensitivity. These characteristics together offer a high thermal efficiency. The thermal exchanger elements (32) are preformed with spacers which are in the form of parallel ribs (32) distributed along the width of the element. Since thin metallic sheets, especially sheets made of aluminium or aluminium alloys, are substantially semi-rigid, the ribs (32) can be formed by pressing. At the same time of the formation of the protruding ribs, corresponding grooves are formed on the other side of the ribs, thereby providing maximized air-flow space for a given volume of heat exchanger (30)). However, this combination would not have been obvious to a person having ordinary skill in the art since it would require a modification of the dissipation plate introduced by secondary reference David.

Claims 1-32 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used by industry.