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(54) Title: LIGHT ELECTRIC VEHICLE PARKING AND CHARGING STATIONS AND SMART CHARGING SYSTEMS FOR THE VEHICLE BATTERIES

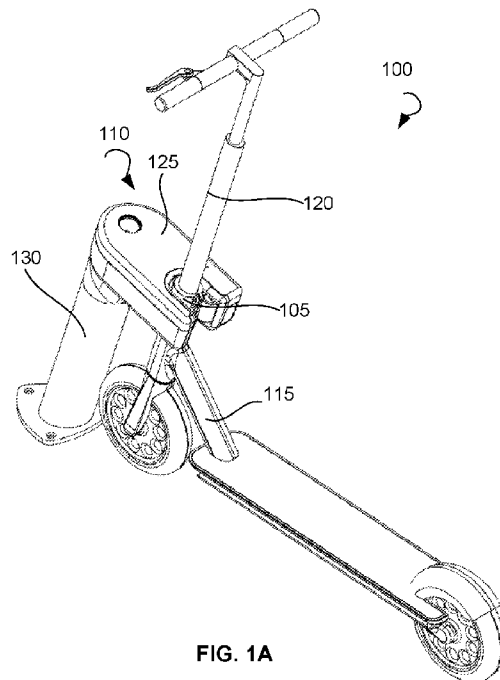


FIG. 1A

(57) Abstract: A universal charging system is provided. In one example embodiment, the universal charging system includes a charging adapter configured to be mounted on a light electric vehicle (LEV), a charging station, and a processor configured to control charging of the LEV. The charging adapter may have electrical contacts for docking with a charging station and a charging interface for supplying power from the charging station to a battery of the LEV. The charging station may have at least one docking unit for receiving the charging adapter of the LEV. The at least one docking unit may have further electrical contacts for connecting to the charging adapter of the LEV.



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INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER
 IPC - B60L 53/14; B60L 53/16; B60L 53/30; B60L 53/60; B60L 53/62; B60L 53/65 (2019.01)
 CPC - B60L 53/14; B60L 53/16; B60L 53/30; B60L 53/60; B60L 53/62; B60L 53/65; Y02T 90/121;
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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History document

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y --- A	US 2016/0311334 A1 (SWIFTMILE, INC) 27 October 2016 (27.10.2016) abstract, [0025]-[0029]	1-5 ----- 7-17 ----- 6, 18-20
Y	WO 2017/217936 A1 (NEURON MOBILITY PTE., LTD) 21 December 2017 (21.12.2017) abstract; para [0017], [0018], [0118]	7
Y	US 5,617,003 A (ODACHI et al.) 01 April 1997 (01.04.1997) abstract, Figure 7, col 4, ln 16-32, col 8 ln 1-15; col 9 ln 52-65	8-14
Y --- A	US 5,272,461 A (NEE) 21 December 1993 (21.12.1993) abstract, col 4 ln 24-49, col 6 ln 30-41	13, 15-17 ----- 18-20
Y	US 2017/0155266 A1 (GM GLOBAL TECHNOLOGY OPERATIONS LLC) 01 June 2017 (01.06.2017) abstract, [0015], [0027], [0038]	12
A	US 2010/0228405 A1 (MORGAL et al.) 09 September 2010 (09.09.2010) abstract, [0217], [0218], [0255]	1-20
A	US 2010/0045232 A1 (CHEN et al.) 25 February 2010 (25.02.2010) entire document	1-20

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"D" document cited by the applicant in the international application	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 19/43790

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I: Claims 1-7 drawn to a universal charging system.

Group II: Claim 8-14 drawn to a light electric vehicle docking station comprising a plurality of docking bays.

Group III: Claims 15-20 drawn to a system for controlling charging of one or more light electric vehicles.

-- Continued in Extra Sheet --

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

- Remark on Protest**
- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
 - The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
 - No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 19/43790

-- Continuation of Box III -- Observations where unity of invention is lacking

The inventions listed in the above-mentioned groups do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Special Technical Features

Group I includes the special technical features of a charging adapter not found in the other groups.

Group II includes the special technical feature of at least one wheel blocknot included in the other groups.

Group III includes the special technical feature of a processor being configured to determine a presence of a LEV connected to one of the one or more docking units; identify parameters associated with the LEV; based on the parameters, determine a charge voltage of the LEV; based on the charge voltage and the parameters, develop a charging profile for the LEV; and instruct the one of the one or more docking units to supply power to the LEV based on the charging profile; and a memory unit in communication with the processor, the memory unit being configured to store instructions executable by the processor not included in the other groups.

Common Technical Features:

The only technical features shared by Groups I-III that would otherwise unify the groups, is charging an LEV, a docking station, and a processor to control charging the LEV. However, these shared technical features do not represent a contribution over prior art, because the shared technical features are disclosed by US 2013/0314205A1 (Neupert).

Neupert discloses charging an LEV (para [0114] electric vehicle 2, in the present case an electric bicycle, and a module in form of a charging module, namely a charging column 3), a docking station (5) (Fig. 1 and para [0016] formed receptacle 5 for the interface 4), and a processor (14) to control charging the LEV (para [0118] the receptacle 5... a charging control 14, of the vehicle 2... for supply of an electric charging current of approx. 20 A as well as for control of the charging process, and thus comprises a microcontroller with an appropriate programming).

As the common technical features were known in the art at the time of the invention, these cannot be considered special technical features that would otherwise unify the groups.

Therefore, Groups I-III lack unity under PCT Rule 13.