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(54) Title: LAMP POST WITH POWER RECEPTACLE FOR ELECTRIC VEHICLE CHARGING

(57) Abstract: An electric lamp post having a renewable electricity generating device and a electric power receptacle for supplying electric energy to an electric vehicle for charging.

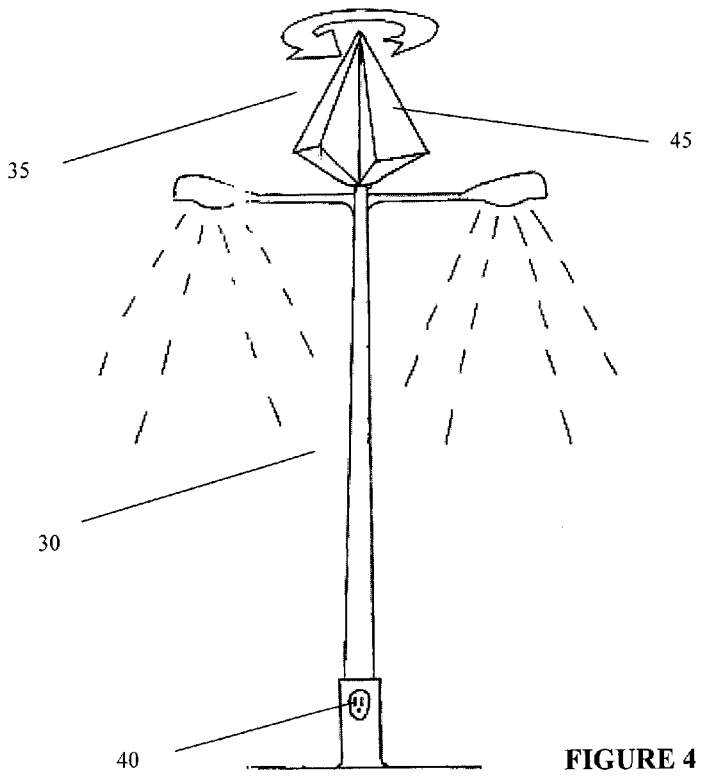

FIGURE 4

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

LAMP POST WITH POWER RECEPTACLE FOR ELECTRIC VEHICLE CHARGING

TECHNICAL FIELD

The present disclosure relates to the field of renewable energy. In particular, the present disclosure relates to the use of public lamp-posts for providing electricity to electric-powered vehicles, and for feeding electricity into a public grid.

BACKGROUND

There is an increasing use of electric powered vehicles to reduce pollution, green house gasses, use of fossil fuels and reduce carbon emissions.

A major impediment to the global adoption of electric powered vehicles is a phenomenon known as "range anxiety". This is a result of the range being predetermined by the amount of electricity in a battery of an electric vehicle when the vehicle leaves it's home base.

Current solutions for range anxiety for passenger vehicles involve the installation of municipal infrastructure (.e.g "charge pods") to provide charging points at a curb side in urban areas (such as Zip Cars in California), or in parking lots so the vehicle's electricity can be topped up to increase the effective range.

JP 2003102104A discloses a potable charging system unit for an electric vehicle which is capable of charging electricity to the electric vehicle, using electricity obtained by solar power and wind power.

CN 101090167A discloses a charging operation method for electromotive cars composed of a car charge station, ac of a network, solar cells, a wind generator, a lead acid battery, a nickel/hydrogen cell, an Li cell, equipment and apparatus, electromotive cars, charged batteries, highways and filling stations, in which, car charge stations should be set up in distance wherever there are highways such as filling stations and can be built beside filling stations independently so as to be convenient for cars using cells greatly.

WO2007039732A2 discloses a mobile power supply unit that comprises two or more solar panels with a hinge separating a first and a second panel and allowing the first panel to be folded onto the second panel. Alternatively, the mobile power supply unit comprises a trailer with a chassis; the trailer being adapted for towing; a solar and/or wind energy to electricity converter attached to the trailer and connected to one or more batteries for storing electricity; characterised in that the trailer is formed of two separable parts which may be separated when releasable attachment means are released; a first part being formed of the solar and/or wind energy to electricity converter and the one or more batteries; and a second part incorporating the chassis.

DE 102007038243A1 discloses a two-wheeler that has a charging connector arranged such that a power connection is formed between a street/light and the two-wheeler. A light barrier detects a proper connection for enabling power supply for a charging process. A navigation system and a positioning system are integrated in the two/wheeler. The navigation system controls wheels by a control system of the two/wheeler. A data transmission system is provided for storing, deleting, receiving and transmitting data and communicates with a control center.

US 8013569B2 discloses a renewable energy system for directly charging electric and hybrid vehicles which consists of a composite stanchion for mounting on a base in a parking lot that is both capable of supporting a medium sized wind turbine (or solar array) and serving as a battery storage and charging control station.

US 20100283426A1 discloses an electric vehicle charging system and method allows the power supply previously dedicated to the streetlight to be used for electric vehicle recharging whenever the streetlight is not lit. In some embodiments, if the total of the current drawn by the electric vehicle charging and the lit streetlight is less than the rating of the streetlight power supply, then charging may continue even while the streetlight is lit. Further, if an electric vehicle so charging offers a utility/interactive inverter, then upon demand the electric vehicle may be available to supply power back to the electric grid.

US 7952319B2 discloses a network/controlled charge transfer device for transferring charge between a local power grid and an electric vehicle is mounted to a street light. The charge transfer device includes: an electrical receptacle to receive an electrical connector for connection to the electric vehicle; an electric power line that couples the power grid to the electrical receptacle through a wiring box; a control device to switch the receptacle on and off; a current measuring device to measure current flowing through the electric power line; and a controller to operate the control device and to monitor output from the current measuring device.

KR 970158B1 discloses a street light to supply a charging power to a battery car of a battery for an electric bicycle by generating the power through a solar array panel or a wind generating unit.

The street light pole is perpendicularly installed on a surface. A solar array panel generates an electricity using a sunlight. A wind generation unit generates the electricity using a rotator power of a propeller. A storage unit stores the electricity generated from the solar array panel and the wind generation unit. A charging terminal box is connected with the storage unit. The charging terminal box supplies the electricity stored to the storage unit to a battery car or the battery for an electric bicycle. A controller controls the storage unit and the charging terminal box.

PCT Application No. WO2011/001280 discloses a device that allows for wind and solar energy to be directed back into the vehicle battery. Roof-mounted solar panels convert light to electricity, and integrated turbines convert wind energy into electricity as the vehicle travels. This hybrid device increases the range of the vehicle appreciably. However, such a solution is better suited to trucks, trains and busses, as their design affords sufficient space for the installation of the device.

Another impediment to the global adoption of electric-powered vehicles is the high cost of implementation of the installation of charge pods on a global scale. Such costs severely limit wide-scale adoption of electric vehicles as a viable option to current gasoline-based cars.

It is apparent from the foregoing that there is need of a universal, low-cost solution for charging electrical vehicles.

SUMMARY

The apparatus in its general form will first be described, and then its implementation in terms of specific embodiments will be detailed hereafter. These embodiments are intended to demonstrate the principle of the apparatus, and the manner of its implementation. The apparatus in its broadest and more specific forms will then be further described, and defined, in each of the individual claims which conclude this Specification.

The disclosure relates to using existing street lamp posts as the basic architecture of an electric vehicle charging infrastructure.

According to an aspect of the invention, there is provided a pod for the exchange of electricity between an electricity grid and an electric-powered vehicle, the pod comprising: a lamp post connected to the electricity grid, the lamp post comprising an electrical interface through which electricity is exchanged with the electric-powered vehicle. The pod can transfer electricity from the lamp post to the vehicle, and/or vice-versa.

The electrical interface can be fitted into an access hole in the lamp post. In addition, the electrical interface can be a female receptacle (for example, but not limited to, a J-1772 receptacle) or a male plug.

The connection between the pod and the vehicle may include a dual head charging system. Where the lamp post receptacle is female, the dual-head charging system includes two male plugs.

In addition, a green energy generating device may be affixed to the lamp post. For example, a wind, solar or hybrid wind-solar energy device may be used. One example of a hybrid wind-solar energy device includes a wind-capture assembly comprising: i) one or more solid wind vanes evenly distributed circumferentially around a central axis thereof; and ii) a solar-energy capture means on an outer surface of the wind-capture assembly; and iii) a turbine assembly comprising an anchoring base, an electrical generator and an output shaft; the wind-capture assembly rotatably mounted on the output shaft and coupled thereto; the hybrid wind-solar energy device configured to convert energy harnessed by the wind capture assembly to electrical energy, wherein interaction of the one or more wind sails with wind induces rotation of the wind-capture assembly and turbine assembly around the central axis; and the outer surface of the wind capture assembly is directly exposed to sunlight throughout daylight hours.

In another aspect of the present invention, there is provided a pod for the exchange of electricity between an electricity grid and an electric-powered vehicle, the pod comprising: a lamp post connected to the electricity grid, the lamp post comprising a female receptacle through which electricity is exchanged with the electric-powered vehicle. The pod can transfer electricity from the lamp post to the vehicle, and/or vice-versa. In addition, the pod may further comprise a hybrid wind-solar energy device.

The female receptacle can be, for example, a J-1772 receptacle, and a dual head charging system having two male plugs can be used to connect the electrical vehicle to the electrical interface on the lamp post.

In yet another aspect of the present invention, there is provided a dual head electrical cable for use in the transfer of electricity between a pod and an electric-powered vehicle, the dual head consisting of either two male plugs, and the pod comprising: a lamp post connected to the electricity grid, the lamp post comprising a female receptacle through which electricity is exchanged with the electric-powered vehicle. The female receptacle can be, for example, a J-1772 receptacle.

The disclosure provides a number of benefits over other curb side or parking lot re-charging solution. A few advantages are as follows:

- Street lamp posts are more rugged, sturdy, and tamper-resistant, than a charging pod.
- Installing the charge pod into the street lamp is less expensive than dedicated charge pods.
- Street lamp posts are inefficient since they are only designed to function in the dark. Adding charging ability, and optionally, green generation, allows for the lamp post to be used at all times of the day, thereby making more efficient use of the lamp post.
- Parking lot lamps multi-pods can allow multiple cars to be charged simultaneously.
- Installing an electricity generating device (based on renewable energy sources) on the lamp-post reduces carbon and the cost of electricity.
- The green generating and charging pods can be retrofitted to existing street lamp posts.
- The green generating and charging pods can be designed into new efficient street lamps.

- Using existing street lamps as charge pods allows for strategic, scalable introduction.

The foregoing summarizes the principal features of the apparatus and some of its optional aspects. The apparatus may be further understood by the description of the specific embodiments which follow.

BRIEF DESCRIPTION OF FIGURES

Figure 1 illustrates an embodiment of a lamp post alternative energy charging source.

Figure 2 illustrates a close-up view of the plug receptacle shown in Figure 1.

Figure 3 illustrates a charging system for use with the embodiment shown in Figs. 1 and 2.

Figure 4 illustrates a hybrid embodiment of a lamp post alternative energy charging source.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

The following is given by way of illustration only and is not to be considered. Wherever ranges of values are referenced within this specification, sub-ranges therein are intended to be included unless otherwise indicated. Where characteristics are attributed to one or another variant of the apparatus, unless otherwise indicated, such characteristics are intended to apply to all other variants of the apparatus where such characteristics are appropriate or compatible with such other variants.

A street lamp post can be supplied by a main power grid, and can be used to recharge electric vehicles.

For example, a charging receptacle may be installed near the base of the existing street lamp posts so that an electric vehicle can "draw" electricity from the lamp post and recharge its battery to extend the vehicle's operational range.

The charging receptacle may be fitted with a two-way device that allows the electric vehicle to "feed" excess electricity back into the grid in a V2G Vehicle to Grid mode.

By affixing an electrical receptacle/plug near the base of the standard street lamp post, the existing electrical wiring is spliced in two, thereby energizing the receptacle/plug, so that electricity can be used as a source of power to re-charge electric vehicles, cars, vans, bikes, busses, or used for any other application where ready access to electricity would enable their use.

The receptacle/plug may be affixed to the standard lamp post by creating an access hole (if one does not already exist) of sufficient size to accommodate the receptacle/plug. Mounting holes may be created in the base of the standard street lamp to bolt, screw or some other acceptable fashion, secure the receptacle/plug housing to the standard street lamp post.

If the mating surfaces between the standard street lamp post and the housing on the receptacle/plug are not uniform or flush, a sponge rubber or some other acceptable intermediary gasket material can be used to ensure a tight and water resistant seal between the mating components.

The above is herein termed a "Lamp Post EV Charge Point".

Figure 1 illustrates a lamp post (5) fitted with, for example, a J-1772 "female" electric plug receptacle (10). The J-1772 (10) is the current North American standard plug configuration; however, lamp posts in other jurisdictions can be fitted with local plug configurations.

Figure 2 illustrates a close-up drawing of the J-1772 "female" electric plug (10) shown in Fig. 1. The female electric receptacle (10) is fitted to the lamp post to provide power to an electric vehicle. The transfer of electricity can take place via, for example, a dual head charging system shown in Fig. 3 (although other charging systems can be used).

As an added safety feature, the connection between the receptacle and the vehicle includes a dual head charging system, in which both heads are male since the standard receptacle on the vehicle and the lamp post receptacle are both female. An example of a dual head charging system, shown in Fig. 3, is fitted with two "male" plugs that become the umbilical cord between the electric vehicle, the lamp post, and the grid (if the pole is configured for V2G with a grid tied inverter).

Conventional charging bollards have a single outlet plug attached to cable that is permanently affixed to the charger. This method has many disadvantage such as: vandalism, theft of the copper cable and charging wand; and exposure of the system to snow and rain.
Instead, a dual-head charging system disclosed herein, is kept in the vehicle. The novel design ensures that no person can steal electricity without possessing this unique dual head charging system fitted with two identical plugs.

Figure 3 illustrates a dual head charging system (15) fitted with two "male" plugs (20, 25) that provide connection between the electric vehicle, the lamp post, and the grid (if the lamp post is configured for V2G with a grid tied inverter)

A green-energy generating device (e.g. based on wind and/or solar or other renewable means) may be fitted on top of the standard street lamp post. The green energy generated by the device is then fed back into the municipal grid via commercially available grid tied inverters. An embodiment wherein a hybrid device is added to a lamp post is herein termed a "Hybrid Lamp Post EV Charge Point."

For example, Fig. 4 shows a Hybrid Lamp Post EV Charge Point (30) with a hybrid wind-solar energy device (35) mounted on the top of the standard street lamp pole fitted with a generic electric plug receptacle (40). The wind turbines or solar panels of the hybrid wind-solar energy device (35) mounted at the top of the lamp post may be used for generating a clean energy supply.

The hybrid wind-solar energy device (35) shown in Fig. 4 comprises: a) a wind-capture assembly comprising: i) one or more solid wind vanes (45) evenly distributed circumferentially around a central axis thereof; ii) optionally, a solar-energy capture means on an outer surface of the wind-capture assembly; and iii) a turbine assembly comprising an anchoring base, an electrical generator and an output shaft; the wind-capture assembly rotatably mounted on the output shaft and coupled thereto; the hybrid wind-solar energy device configured to convert energy harnessed by the wind capture assembly to electrical energy, in which interaction of the one or more wind

sails with wind induces rotation of the wind-capture assembly and turbine assembly around the central axis; and the outer surface of the wind capture assembly is directly exposed to sunlight throughout daylight hours. The device is fully disclosed in WO2011134054.

To effect the change to "Hybrid" an energy-generating device can be affixed to an appropriate location on the standard street lamp post in accordance with the manufacturers direction, abiding at all times with any municipal, regional, provincial, federal, workplace health and safety, electrical safety, or standards organization who have authority and jurisdiction to legislate and enforce such standards and approvals for this type of electrical installation.

The foregoing has constituted a description of specific embodiments. These embodiments are only exemplary, and are not meant to be limitative.

CONCLUSION

The foregoing has constituted a description of specific embodiments showing how the apparatus may be applied and put into use. These embodiments are only exemplary. The apparatus in its broadest, and more specific aspects, is further described and defined in the claims which now follow.

CLAIMS

1. A pod for the exchange of electricity between an electricity grid and an electric-powered vehicle, the pod comprising:

   a lamp post connected to the electricity grid, the lamp post comprising an electrical interface through which electricity is exchanged with the electric-powered vehicle.

2. The pod of claim 1, wherein the electrical interface is fitted into an access hole in the lamp post.

3. The pod of claim 1 or 2, wherein the electrical interface is a female electrical receptacle.

4. The pod of claim 3, wherein the female electrical receptacle is a J-1772 receptacle.

5. The pod of claim 1 or 2, wherein the electrical interface is a male electrical plug.

6. The pod of any one of claims 1 to 5, wherein a dual head charging system is used to connect the electrical vehicle to the electrical interface on the lamp post.

7. The pod of claims 3 or 4, wherein a dual head charging system having two male plugs is used to connect the electrical vehicle to the electrical interface on the lamp post.

8. The pod of any one of claims 1 to 7, wherein the pod further comprises a green energy generating device.

9. The pod of claim 8, wherein the green energy generating device is selected from the group consisting of a wind-energy device, a solar-energy device, and a hybrid wind-solar energy device.

10. The pod of claim 9, wherein the green energy generating device is a hybrid wind-solar energy device.

11. The pod of claim 10, wherein the hybrid wind-solar energy device comprises

a) a wind-capture assembly comprising:

i) one or more solid wind vanes evenly distributed circumferentially around a central axis thereof; and

ii) a solar-energy capture means on an outer surface of the wind-capture assembly; and

iii) a turbine assembly comprising an anchoring base, an electrical generator and an output shaft;

the wind-capture assembly rotatably mounted on the output shaft and coupled thereto; the hybrid wind-solar energy device configured to convert energy harnessed by the wind capture assembly to electrical energy, wherein interaction of the one or more wind sails with wind induces rotation of the wind-capture assembly and turbine assembly around the central axis; and the outer surface of the wind capture assembly is directly exposed to sunlight throughout daylight hours.

12. The pod of any one of claims 1 to 11, wherein the lamp post transfers electricity from the electrical grid to the electric-powered vehicle.

13. The pod of any one of claims 1 to 12, wherein the electric-powered vehicle transfers electricity to the electrical grid.

14. A pod for the exchange of electricity between an electricity grid and an electric-powered vehicle, the pod comprising:

a lamp post connected to the electricity grid, the lamp post comprising a female receptacle through which electricity is exchanged with the electric-powered vehicle.

15. The pod of claim 14, wherein the female receptacle is a J-1772 receptacle, and a dual head charging system consisting of two male plugs is used to connect the electrical vehicle to the electrical interface on the lamp post.

16. The pod of claim 14 or 15, wherein electricity is transferred from the electricity grid to the electric-powered vehicle.

17. The pod of any one of claims 14 to 16, wherein electricity is transferred to the electricity grid from the electric-powered vehicle.

18. The pod of any one of claims 14 to 17, further comprising a hybrid wind-solar device.

19. A dual head electrical cable for use in the transfer of electricity between a pod and an electric-powered vehicle, the dual head consisting of either two male plugs, and the pod comprising: a lamp post connected to the electricity grid, the lamp post comprising a female receptacle through which electricity is exchanged with the electric-powered vehicle.

20. The dual head electrical cable of claim 19, wherein the female receptacle is a J-1772 receptacle.

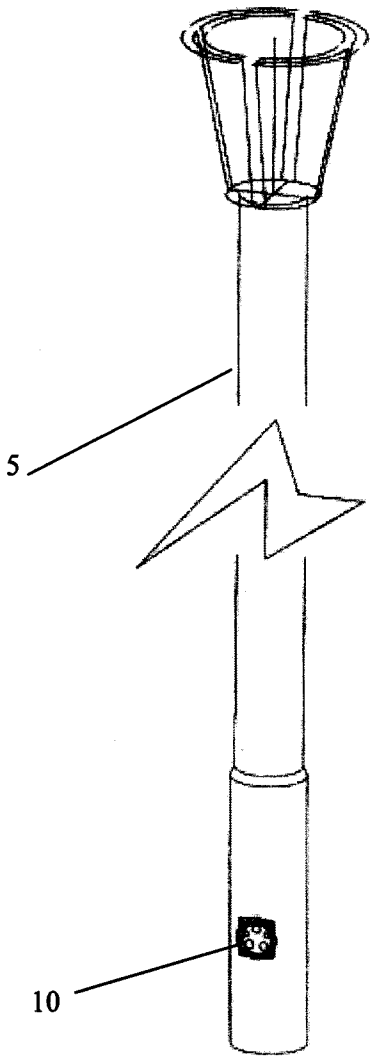

FIGURE 1

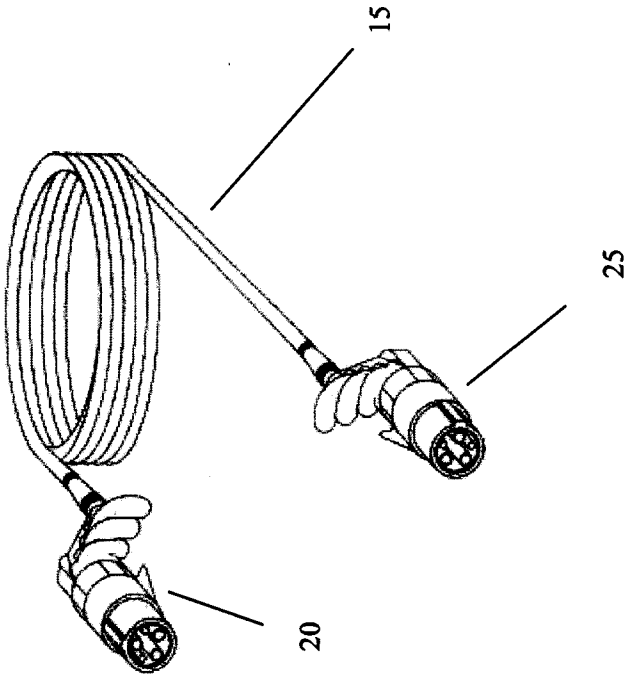

FIGURE 3

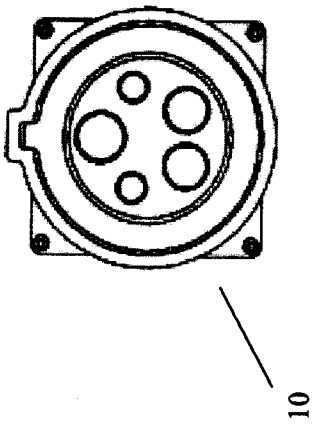

FIGURE 2

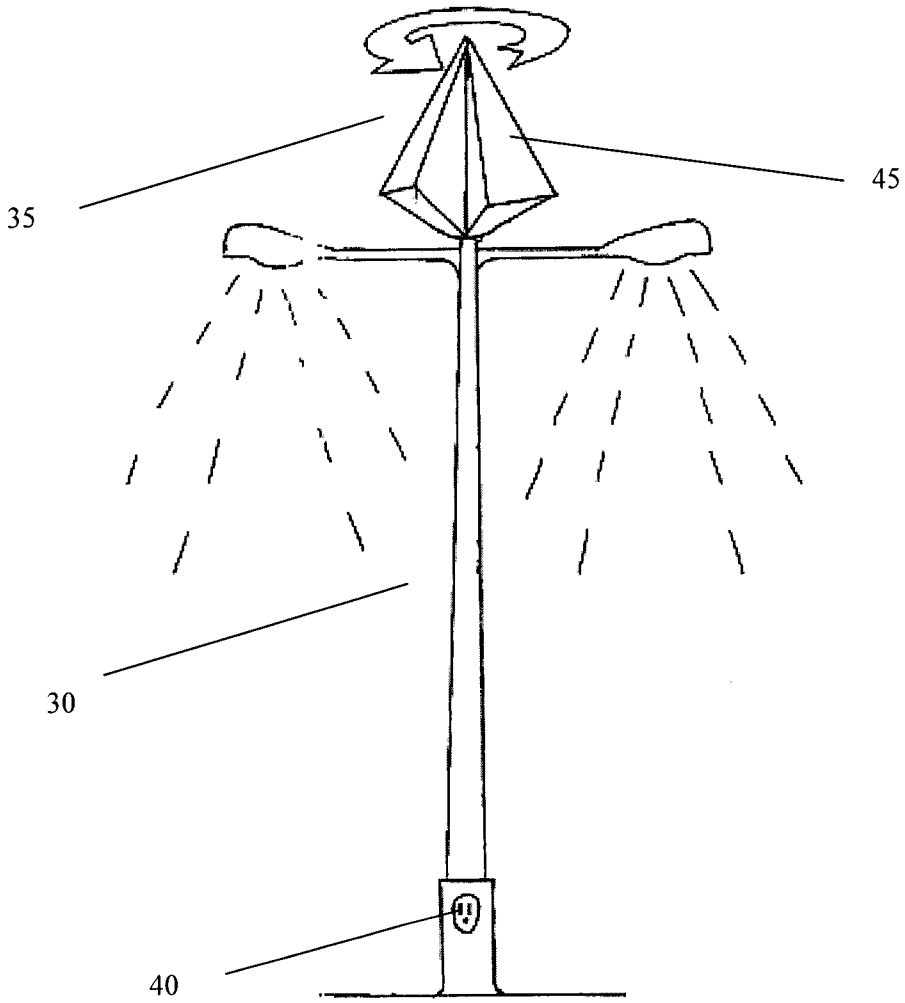

FIGURE 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2012/000349

A. CLASSIFICATION OF SUBJECT MATTER

IPC: ***H02J 7/02*** (2006.01), ***B60L 11/18*** (2006.01), ***B60S 5/06*** (2006.01), ***H01R 24/86*** (2011.01)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H02J* (2006.01), ***B60L 11/18*** (2006.01), ***B60S 5/06*** (2006.01), ***H01R 24/86*** (2011.01),

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

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)

Databases searched: Canadian Patent Database, TotalPatent, European Patent Database (EPOQUE), Abstracts of Japan, US Patent Database, WIPO-PCT Publications (Full text) and IEEE publications:

Keywords: (lamp post or street light or station), electric outlet or electric receptacle, power, charging

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---------- Y	US 2010/0283426A1 (Redmann), 11 November 2010 (11-11-2010) -see abstract; -see paras. [0033 & 0042]; -see figs. 1, 3-4; -see whole document.	1-7, 12-17, 19-20
Y	US D630,165S (Blain), 04 January 2011 (04-01-2011) -see abstract; -see figs. 1-7; -see whole document.	1-7, 12-17, 19-20
Y	US D631,439S (Blain), 25 January 2011 (25-01-2011) -see abstract; -see figs. 1-7; -see whole document.	1-7, 12-17, 19-20

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"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

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08 August 2012 (08-08-2012)	13 August 2012 (13-08-2012)

Name and mailing address of the ISA/CA	Authorized officer
Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Rajiv Agarwal (819) 997-2304

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3,215,831 (Gladsden et al.), 02 November 1965 (02-11-1965) -see abstract; -see fig. 2; -see whole document.	1-7, 12-17, 19-20

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2012/000349

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US2010/0283426A1	11 November 2010 (11-11-2010)	US2010283426A1 US8111043B2	11 November 2010 (11-11-2010) 07 February 2012 (07-02-2012)
US D630,165S	04 January 2011 (04-01-2011)	None	
US D631,439S	25 January 2011 (25-01-2011)	None	
US3,215,831A	02 November 1965 (02-11-1965)	None	