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(54) Title: A SYSTEM AND METHOD FOR ILLUMINATING SURFACE OF GROUND SURROUNDING A PERIPHERY OF A VEHICLE

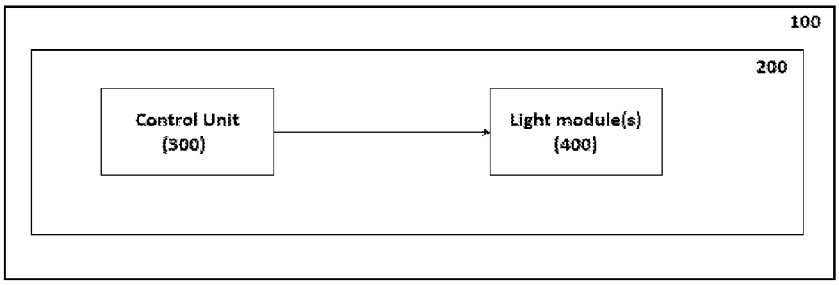

Figure 1

(57) **Abstract:** The present invention relates to a system (200) and method (500) for illuminating a surface of a ground surrounding a periphery of a vehicle (100). The system (200) comprises one or more light modules (400) mounted on the vehicle (100). The one or more light modules (400) are configured to illuminate at least an area of the surface of the ground surrounding the periphery of the vehicle (100). The control unit (300) is mounted on the vehicle (100) and in communication with the one or more light modules (400). The control unit (300) is configured to activate the one or more light modules (400) for a pre-defined interval of time on satisfaction of one or more pre-defined conditions.

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TITLE OF INVENTION

A SYSTEM AND METHOD FOR ILLUMINATING SURFACE OF GROUND SURROUNDING A PERIPHERY OF A VEHICLE

FIELD OF THE INVENTION

[001] The present invention relates to a vehicle. More particularly, the present invention relates to a system and method for illuminating at least an area of surface of a ground surrounding a periphery of a vehicle.

BACKGROUND OF THE INVENTION

[002] In the existing art, there are no features for illuminating a ground surface surrounding a periphery of a vehicle. In dark areas or dimly lit areas, when a rider steps down from the vehicle, he has zero or limited vision of the ground surface surrounding the periphery of the vehicle which can result in the rider stepping down on uneven surfaces, puddles, pits, rocks and the likes, thereby losing balance and resulting in a fall, which may be fatal. Similarly, when the vehicle is parked in dark areas or dimly lit areas, it is difficult to locate/identify the vehicle as well as to discern features of the ground surface surrounding the periphery of the vehicle. This may cause unnecessary anxiety to the rider as well as cause him to fall in case the vehicle is surrounded by uneven surfaces, puddles, pit, rocks and the likes.

[003] Further, the existing arts also do not disclose a simple and economical way of projecting a name, logo, an image or customized text on a surface of the ground surrounding the periphery of the vehicle to increase the aesthetics and market attractiveness of the vehicle.

[004] In view of the foregoing, there is a need felt to overcome at least the above-mentioned disadvantages of the prior arts.

SUMMARY OF THE INVENTION

[005] In one aspect of the present invention, the present invention relates to a system for illuminating at least an area of a surface of a ground surrounding a periphery of a vehicle. The system comprises one or more light modules and a control unit. The one or more light modules are mounted on the vehicle. The control unit is also mounted on the vehicle. On satisfaction of one or more pre-defined conditions, the control unit activates the one or more light modules for a pre-defined interval of time to illuminate at least the area of the surface of the ground surrounding the periphery of the vehicle.

[006] In an embodiment, the vehicle is a saddle type vehicle having a handlebar extending between a first end and a second end. The one or more light modules are mounted on one or both ends of the handlebar. The one or more light modules can be used to illuminate entire area of the ground surface surrounding the periphery of the vehicle or a part thereof. The one or

more light modules can, therefore, be mounted on various locations on rear portion, side portions and/or front portion of the saddle type vehicle.

[007] In an embodiment, the vehicle is a passenger vehicle and the one or more light modules can be mounted on one or more frame members proximate to ground surface of the passenger vehicle. The one or more light modules can be used to illuminate entire area of the ground surface surrounding the periphery of the passenger vehicle or a part thereof. The one or more light modules can, therefore, be mounted on various locations on rear portion, side portions and/or front portion of the passenger vehicle.

[008] In an embodiment, the pre-defined interval is 60 seconds. This embodiment should not be construed as limiting and the pre-defined interval can be any value set by the manufacturer and/or inputted by the rider of the vehicle.

[009] In an embodiment, the one or more pre-defined conditions comprises either one or a combination of the following conditions: (i) an input from a keyless fob to unlock the vehicle, (ii) an input from a personal digital assistant of a rider to unlock the vehicle, (iii) insertion of a key to lock or unlock the vehicle, (iv) removal of a key from an ignition lock of the vehicle, (v) switching OFF of an internal combustion engine of the vehicle, (vi) switching OFF of one or more traction motors of the vehicle, (vii) switching OFF of an internal combustion engine and traction motor of the vehicle, (viii) switching OFF of an Ignition Start Stop (ISS) mode and an internal combustion engine of the

vehicle, (ix) detection of an enablement of a side stand of the vehicle from a side stand OFF condition to a side stand ON condition, and (x) switching OFF of an internal combustion engine on satisfaction of ISS stop conditions.

[010] In an embodiment, the one or more light modules projects a brand name, a logo, one or more pre-defined images and/or one or more pre-defined texts on at least the area of the surface of the ground surrounding the periphery of the vehicle.

[011] In an embodiment, each letter of the brand name and the pre-defined text is displayed in a sequential manner.

[012] In an embodiment, the one or more light modules are operated with a pre-defined frequency within the pre-defined interval of time.

[013] In an embodiment, one or more control buttons are provided on the vehicle to vary intensity of light from the one or more light modules. The one or more buttons are located such that they are easily accessible and operable by the rider of the vehicle.

[014] In another aspect of the invention, the present invention comprises a method for illuminating at least an area on a surface of a ground surrounding a periphery of a vehicle. The method comprises a step of determining if one or more pre-defined conditions are satisfied. The step of determining is performed by a control unit mounted on the vehicle. The method further comprises a step of transmitting an instruction to activate one or more light modules. The step of transmitting the instruction to activate the one or more

light modules is performed by the control unit. The method further comprises illuminating at least the area of the surface of the ground surrounding the periphery of the vehicle for a pre-defined interval of time. The step of illuminating is performed by the one or more light modules.

BRIEF DESCRIPTION OF THE DRAWINGS

[015] Reference will be made to embodiments of the invention, examples of which may be illustrated in accompanying figures. These figures are intended to be illustrative, not limiting. Although the invention is generally described in context of these embodiments, it should be understood that it is not intended to limit the scope of the invention to these particular embodiments.

Figure 1 is a block diagram of a system for illuminating a surface of a ground surrounding a periphery of a vehicle, in accordance with an embodiment of the present invention.

Figure 2 is a perspective view of handlebar of a saddle type vehicle 100, in accordance with an embodiment of the present invention.

Figure 3 is a perspective view of the left portion of the handlebar, in accordance with an embodiment of the present invention.

Figure 4 is schematic view of the right portion of the handlebar, in accordance with an embodiment of the present invention

Figure 5 is a flow chart illustrating a method for illuminating a surface of a ground surrounding a periphery of a vehicle, in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[016] Various features and embodiments of the present invention here will be discernible from the following further description thereof, set out hereunder.

[017] Figure 1 is a block diagram of a system 200 for illuminating at least an area on surface of a ground surrounding a periphery of a vehicle 100. As shown, the system 200 comprises a control unit 300 and one or more light modules 400. The control unit 300 is in communication with the one or more light modules 400. The control unit 300 is configured to determine whether one or more pre-defined conditions have been satisfied. The one or more pre-defined conditions are generally pre-configured in the control unit by the manufacturer. On satisfaction of the one or more pre-defined conditions, the control unit 300 is further configured to activate the one or more light modules 400. On receiving instructions of activation from the control unit 300, the one or more light modules 400 are switched ON to illuminate at least the area on the surface of the ground surrounding the periphery of the vehicle 100. The one or more light modules 400 may comprise a receiving unit to receive the instructions from the control unit 300. The one or more light modules 400 are

activated for a pre-defined duration of time. This duration of time can be set by the manufacturer of the vehicle 100 or by the rider of the vehicle 100. In an embodiment, the pre-defined interval is 60 seconds.

[018] The present invention can be implemented in saddle type vehicles as well as passenger vehicles. The saddle type vehicle comprises two-wheelers, three-wheelers and four-wheelers such as bicylces, motorcycles, scooters and the likes. The present invention can also be implemented in passenger vehicles such as cars, rickshaws, trucks, lorries and the likes. Both the saddle type vehicles and the passenger vehicles can be conventional type internal combustion engine vehicles, hybrid vehicles, electric vehicles or other now known or later developed vehicles.

[019] In an embodiment, in the saddle type vehicle, a handlebar 102 (Refer Figure 2) extends between a first end 102a (Refer Figure 2) and a second end 102b (Refer Figure 2). The one or more light modules 400 are mounted on either one or both the ends 102a, 102b of the handlebar 102. In another embodiment, in the passenger type of vehicle 100, the one or more light modules 400 are mounted on frame members or components mounted on the frame members which are proximate to the surface of the ground. However, the above-mentioned locations of the one or more light modules 400 on the saddle type vehicle or passenger vehicle should not be construed as limiting and the one or more light modules 400 can be mounted or arranged on a front portion, rear portion or side portions of the saddle type vehicle or

passenger vehicle depending upon the area of the ground surrounding the periphery of the vehicle 100 which needs to be illuminated. In one non-limiting example, the one or more light modules 400 are mounted on the vehicle 100 such that the area around a side stand of the vehicle 100 is illuminated. In another non-limiting example, the one or more light modules 400 are mounted on the vehicle 100 such that area of the ground surface in front of the vehicle 100 is illuminated so that the rider has better visibility while approaching the vehicle 100. In another non-limiting example, the one or more light modules 400 are mounted on the vehicle 100 such that area of the ground surface in rear of the vehicle 100 is illuminated so that the peer riders can see that the vehicle 100 is in Ignition Start Stop (ISS) OFF mode.

[020] In an embodiment, the one or more pre-defined conditions comprises either one or a combination of the following conditions: an input from a keyless fob to unlock the vehicle 100, (ii) an input from a personal digital assistant such as a mobile phone of the rider to unlock the vehicle 100, (iii) insertion of a key to lock or unlock the vehicle 100, (iv) removal of a key from an ignition lock of the vehicle 100, (v) switching OFF of an internal combustion engine of the vehicle 100, (vi) switching OFF of one or more traction motors of the vehicle 100, (vii) switching OFF of an internal combustion engine and traction motor of the vehicle 100, (viii) switching OFF of an Ignition Start Stop (ISS) mode and an internal combustion engine of the vehicle 100, (ix) detection of an enablement of a side stand of the vehicle 100

from a side stand OFF condition to a side stand ON condition, and (x) switching OFF of an internal combustion engine of the vehicle 100 on satisfaction of ISS stop conditions.

[021] A keyless entry fob is generally known in the art and comprises a short-range radio transmitter and operates within a short-range. When a button is pushed, it sends a coded signal by radio waves to the vehicle 100, which locks or unlocks the vehicle 100. The keyless entry fob locks and unlocks the vehicle through some discrete combination of flashing vehicle lamps or a distinctive sound.

[022] In an embodiment, the one or more light modules 400 are capable of projecting a brand name, a logo, one or more pre-defined images and/or one or more pre-defined text to increase the aesthetics of the vehicle 100. The one or more brand name, logo, pre-defined images and/or pre-defined text may be projected in a sequential manner. Also, each letter of the one or more pre-defined texts may be displayed in a sequential manner. Also, options for selecting one or more colors, font sizes, font styles, visual effects may also be provided. Such options may be available to the user via a mobile application which can be downloaded on the personal digital assistant such as mobile phone of the rider of the vehicle 100. Such features generally increases the aesthetic and market attractiveness of the vehicle 100.

[023] In an embodiment, the one or more light modules 400 are operated with a pre-defined frequency within the pre-defined interval of time. In one

non-limiting example, the light modules blink after every 5 seconds in a time duration of 60 seconds.

[024] In an embodiment, the vehicle 100 may also be provided with one or more control buttons (not shown) to vary intensity of light from the one or more light modules 400. Such buttons are generally located on vehicle 100 such that they are easily accessible and operable by the rider of the vehicle 100.

[025] Figure 2 is a perspective view of handlebar 102 of a saddle type vehicle 100, in accordance with an embodiment of the present invention. Figure 3 is a perspective view of the left portion of the handlebar 102, in accordance with an embodiment of the present invention. Figure 4 is schematic view of the right portion of the handlebar 102, in accordance with an embodiment of the present invention

[026] As shown, in the saddle type vehicle 100, the handlebar 102 extends between a first end 102a and a second end 102b. The one or more light modules 400 can be mounted on one or both ends 102a, 102b of the handlebar 102. In one non-limiting example, the one or more light modules 400 are mounted such that projecting lens of the one or more light modules 400 faces the ground which provides visibility of the ground surface even in dark or dim light conditions and ensures a stylish appearance of the vehicle 100 with a significantly distinctive external look.

[027] Figure 5 is an exploded view of a light module 400, in accordance with one or more embodiments of the present invention.

[028] As shown, each light module 400 comprises a cover 401, a lens 402, one or more light source 403, a light source cover 404, a printed circuit board 405 and a heat sink 406. As shown, the cover 401 may be divided into a first part 401a and a second part 401b and is adapted to enclose the lens 402, the light source 403, the light source cover 404, the printed circuit board 405 and the heat sink 406. The printed circuit board 405 is used to support as well as power the one or more light sources 403 such as light emitting diodes and the heat sink 406. The light emitting diodes 403 are semiconductor diodes that emits light when voltage is applied or when current flows through it. The light emitting diodes 403 are generally covered with a protective cover 404 and in communication with the heat sink 406 to dissipate heat generated during operation of the one or more light modules 400. The lens 402 is used to project brand name, a logo, one or more pre-defined images and one or more pre-defined text on the surface of the ground. The construction of the light module 400 should not be construed as limiting and may include now known or later developed light modules.

[029] Figure 6 is a flow chart illustrating a method 500 for illuminating a surface of a ground surrounding a periphery of a vehicle 100, in accordance with an embodiment of the present invention.

[030] As shown, at step 501, the method comprises determining if one or more pre-defined conditions are satisfied. The step of determining is performed by a control unit 300 The one or more pre-defined conditions are pre-configured in the control unit 300 of the vehicle 100.

[031] At step 502, the method comprises transmitting an instruction to activate one or more light modules 400. The step of transmitting is performed by the control unit 300 and such instructions may be received by a receiving unit provided in the one or more light modules 400.

[032] At step 503, the method comprises illuminating at least an area of the surface of the ground surrounding the periphery of the vehicle 100 for a pre-defined interval of time. The step of illuminating is performed by the one or more light modules 400.

[033] In an embodiment, the one or more pre-defined conditions comprises either one or a combination of the following conditions: an input from a keyless fob to unlock the vehicle 100, (ii) an input from a personal digital assistant of a rider to unlock the vehicle 100, (iii) insertion of a key to lock or unlock the vehicle 100, (iv) removal of a key from an ignition lock of the vehicle 100, (v) switching OFF of an internal combustion engine of the vehicle 100, (vi) switching OFF of one or more traction motors of the vehicle 100, (vii) switching OFF of an internal combustion engine and traction motor of the vehicle 100, (viii) switching OFF of an Ignition Start Stop (ISS) mode and an internal combustion engine of the vehicle 100, (ix) detection of an enablement

of a side stand of the vehicle 100 from a side stand OFF condition to a side stand ON condition, and (x) switching OFF of an internal combustion engine on satisfaction of ISS stop conditions.

[034] In an embodiment, the one or more light modules 400 are capable of projecting a brand name, a logo, one or more pre-defined images and one or more pre-defined text to increase the aesthetics of the vehicle 100. The one or more pre-defined images and/or one or more pre-defined text may be projected in a sequential manner. Also, each letter of the one or more pre-defined texts may be displayed in a sequential manner. Also, options for selecting one or more colors, font sizes, font styles, visual effects may also be provided. Such options may be available to the user via a mobile application which can be downloaded on the personal digital assistant such as mobile phone of the rider of the vehicle 100. Such features generally increases the aesthetic and market attractiveness of the vehicle 100.

[035] In an embodiment, the one or more light modules 400 are operated with a pre-defined frequency within the pre-defined interval of time. In one non-limiting example, the one or more light modules 400 blink after every 5 seconds in a time duration of 60 seconds.

[036] It is to be understood that typical hardware configuration of the control unit 300 can include a set of instructions that can be executed to cause the control unit 300 to perform the above-disclosed method.

[037] The control unit 300 may include a processor which may be a central processing unit (CPU), a graphics processing unit (GPU), or both. The processor may be one or more general processors, digital signal processors, application specific integrated circuits, field programmable gate arrays, servers, networks, digital circuits, analog circuits, combinations thereof, or other now known or later developed devices for analysing and processing data. The processor may implement a software program, such as code generated manually i.e. programmed.

[038] The control unit 300 may include a memory. The memory may be a main memory, a static memory, or a dynamic memory. The memory may include, but is not limited to computer readable storage media such as various types of volatile and non-volatile storage media, including but not limited to random access memory, read-only memory, programmable read-only memory, electrically programmable read-only memory, electrically erasable read-only memory, flash memory, magnetic tape or disk, optical media and the like. The memory is operable to store instructions executable by the processor. The functions, acts or tasks illustrated in the figures or described may be performed by the programmed processor executing the instructions stored in the memory.

[039] The control unit 300 may further include a display unit such as a liquid crystal display (LCD), an organic light emitting diode (OLED), a flat panel display, a solid state display, a cathode ray tube or other now known or later

developed display device for outputting determined information. The display may act as an interface for the user to see the functioning of the processor, or specifically as an interface with the software stored in the memory.

[040] Additionally, the control unit 300 may include an input device configured to allow a user to interact with any of the components of the control unit 300. The input device may be a number pad, a keyboard, or a cursor control device, such as a mouse, or a joystick, touch screen display, remote control or any other device operative to interact with the control unit 300.

[041] The control unit 300 may also include a disk or optical drive unit. The disk drive unit may include a computer-readable medium in which one or more sets of instructions, e.g. software, can be embedded. Further, the instructions may embody one or more of the methods or logic as described. In a particular example, the instructions may reside completely, or at least partially, within the memory or within the processor during execution by the control unit 300. The memory and the processor also may include computer-readable media as discussed above. The present invention contemplates a computer-readable medium that includes instructions or receives and executes instructions responsive to a propagated signal so that a device connected to a network can communicate data over the network. Further, the instructions may be transmitted or received over the network. The network may include wired networks, wireless networks, Ethernet AVB networks, or

combinations thereof. The wireless network may be a cellular telephone network. Further, the network may be a public network, such as the Internet, a private network, such as an intranet, or combinations thereof, and may utilize a variety of networking protocols now available or later developed.

[042] The claimed features/method steps of the present invention as discussed above are not routine, conventional, or well understood in the art, as the claimed steps enable the following solutions to the existing problems in conventional technologies. Specifically, the technical problem of zero or limited visibility of the ground surface surrounding a periphery of the vehicle 100 in dark or dimly lit areas is solved by present invention.

[043] The present invention illuminates at least an area of the ground surface surrounding the periphery of the vehicle 100 in dark or dimly lit areas. This assists the rider when he is stepping out from the vehicle 100 in dark or dimly lit areas and also assist the rider when the rider is approaching the vehicle 100 parked in dark or dimly lit areas. The system also assist is easy identification of the vehicle 100 in dark or dimly lit areas. Such illumination may also assist the peer riders to recognize that ISS stop conditions are activated in the vehicle during a traffic light or a traffic jam.

[044] The present invention also increases the market attractiveness of the vehicle 100 as projection of brand name, logo, pre-defined images and pre-defined text increase the aesthetics of the vehicle 100.

[045] While the present invention has been described with respect to certain embodiments, it will be apparent to those skilled in the art that various changes and modification may be made without departing from the scope of the invention as defined in the following claims.

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CLAIMS:

1. A system (200) for illuminating a surface of a ground surrounding a periphery of a vehicle (100), the system (200) comprising:
   - one or more light modules (400) mounted on the vehicle (100), the one or more light modules (400) configured to illuminate at least an area of the surface of the ground surrounding the periphery of the vehicle (100) ; and
   - a control unit (300) mounted on the vehicle (100) and in communication with the one or more light modules (400), the control unit (300) configured to activate the one or more light modules (400) for a pre-defined interval of time on satisfaction of one or more pre-defined conditions.

2. The system (200) as claimed in claim 1, wherein the vehicle (100) is a saddle type vehicle comprising a handlebar (102) extending between a first end (102a) and a second end (102b), the one or more light modules (400) being mounted on at least one of the first end (102a) and the second end (102b) of the handlebar (102).

3. The system (200) as claimed in claim 1, wherein the vehicle (100) is a passenger vehicle, the one or more light modules (400) being mounted on

one or more frame members proximate to the ground surface of the vehicle (100).

4. The system (200) as claimed in claim 1, where the pre-defined interval of time is 60 seconds.

5. The system (200) as claimed in claim 1, wherein the one or more pre-defined conditions comprises at least one of:
   - an input from a keyless fob to unlock the vehicle (100);
   - an input from a personal digital assistant of a rider to unlock the vehicle (100);
   - insertion of a key to lock or unlock the vehicle (100);
   - removal of a key from an ignition lock of the vehicle (100);
   - switching OFF of an internal combustion engine of the vehicle (100);
   - switching OFF of one or more traction motors of the vehicle (100);
   - switching OFF of an internal combustion engine and traction motor of the vehicle (100);
   - switching OFF of an internal combustion engine of the vehicle (100) on satisfaction of Ignition Start Stop (ISS) stop condition;
   - switching OFF of an Ignition Start Stop (ISS) mode and an internal combustion engine of the vehicle (100); and

- detection of an enablement of a side stand of the vehicle (100) from a side stand OFF condition to a side stand ON condition.

6. The system (200) as claimed in claim 1, wherein the one or more light modules (400) project at least one of: a brand name, a logo, one or more pre-defined images and one or more pre-defined texts on at least the area of the surface of the ground surrounding the periphery of the vehicle (100).

7. The system (200) as claimed in claim 6, wherein each letter of the brand name and the pre-defined text is displayed in a sequential manner.

8. The system (200) as claimed in claim 1, wherein the one or more light modules (400) are operated with a pre-defined frequency within the pre-defined interval of time.

9. The system (200) as claimed in claim 1, wherein one or more control buttons are provided on the vehicle (100) to vary intensity of light from the one or more light modules (400), the one or more buttons being operable by a rider of the vehicle (100).

10. A method (500) for illuminating a surface of a ground surrounding a periphery of a vehicle (100), the method (500) comprising:

- determining (501), by a control unit (300) mounted on the vehicle (100), satisfaction of one or more pre-defined conditions;
- transmitting (502), by the control unit (300), an instruction to activate one or more light modules (400);
- illuminating (503), by the one or more light modules (400), at least an area of the surface of the ground surrounding the periphery of the vehicle (100) for a pre-defined interval of time.

11. The method (500) as claimed in claim 10, wherein the one or more pre-defined conditions comprises at least one of:
- input from a keyless fob to unlock the vehicle (100);
- input from a personal digital assistant of a rider to unlock the vehicle (100);
- insertion of a mechanical key to lock or unlock the vehicle (100);
- removal of a key from an ignition lock of the vehicle (100);
- switching OFF of an internal combustion engine of the vehicle (100);
- switching OFF of one or more traction motors of the vehicle (100);
- switching OFF of an internal combustion engine and traction motor of the vehicle (100);
- switching OFF of an internal combustion engine of the vehicle (100) on satisfaction of Ignition Start Stop (ISS) stop condition;

- switching OFF of an Ignition Start Stop (ISS) mode and an internal combustion engine of the vehicle (100); and
- detection of an enablement of a side stand of the vehicle (100) from a side stand OFF condition to a side stand ON condition.

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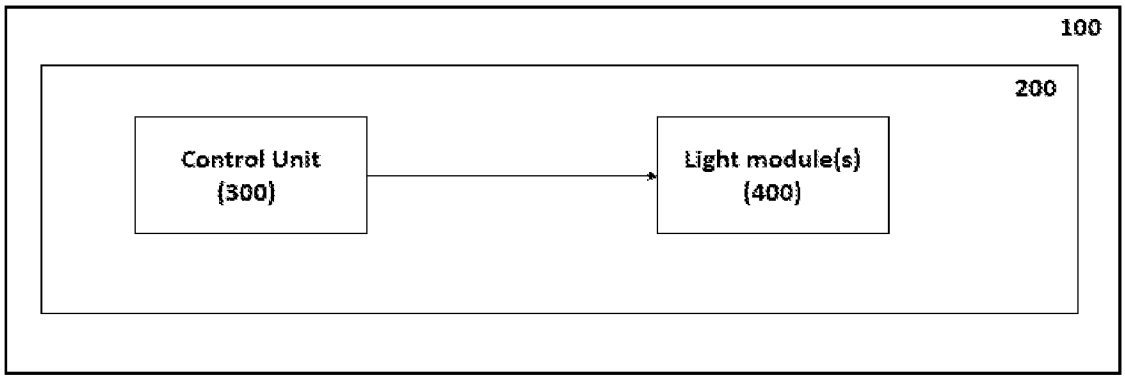

Figure 1

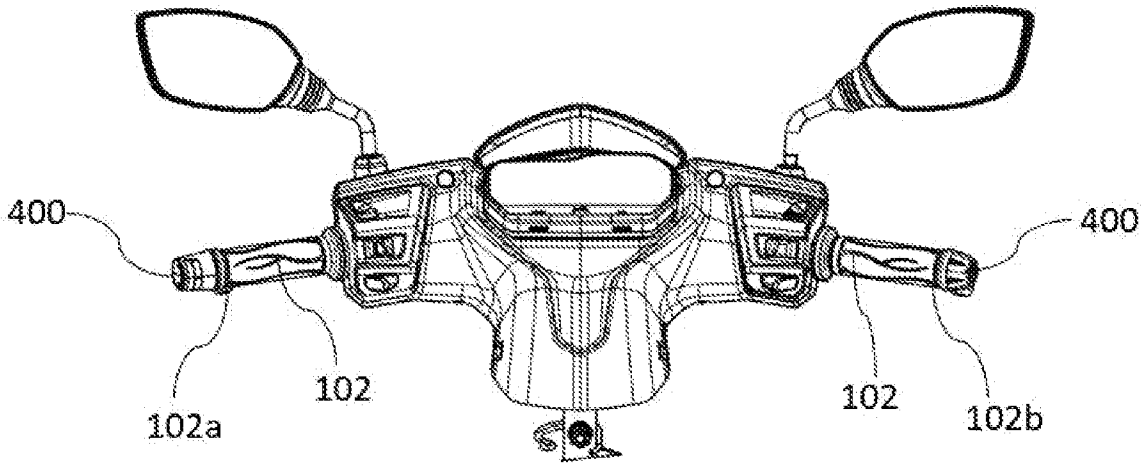

Figure 2

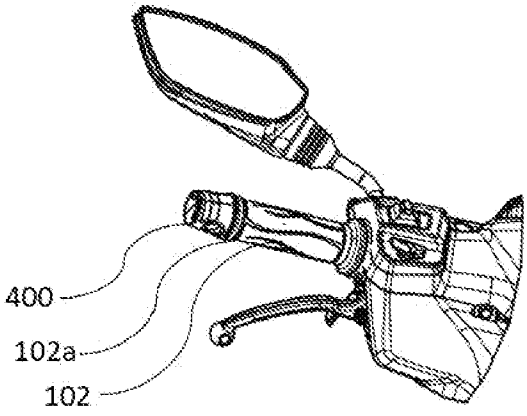

Figure 3

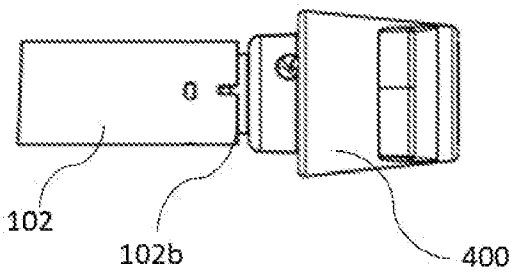

Figure 4

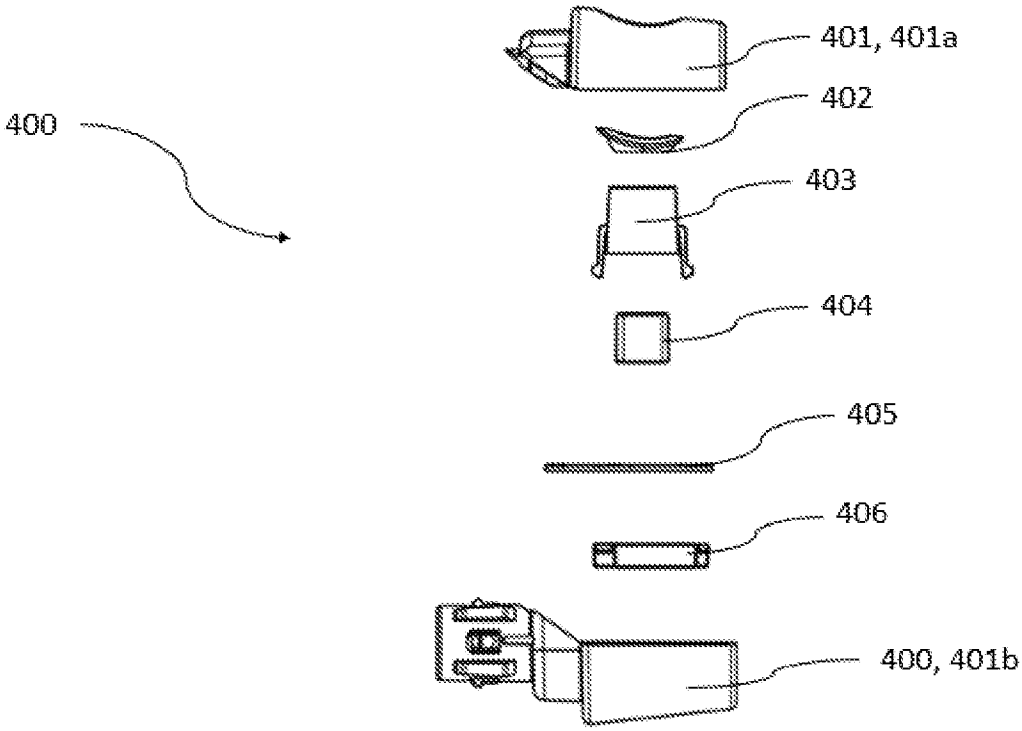

Figure 5

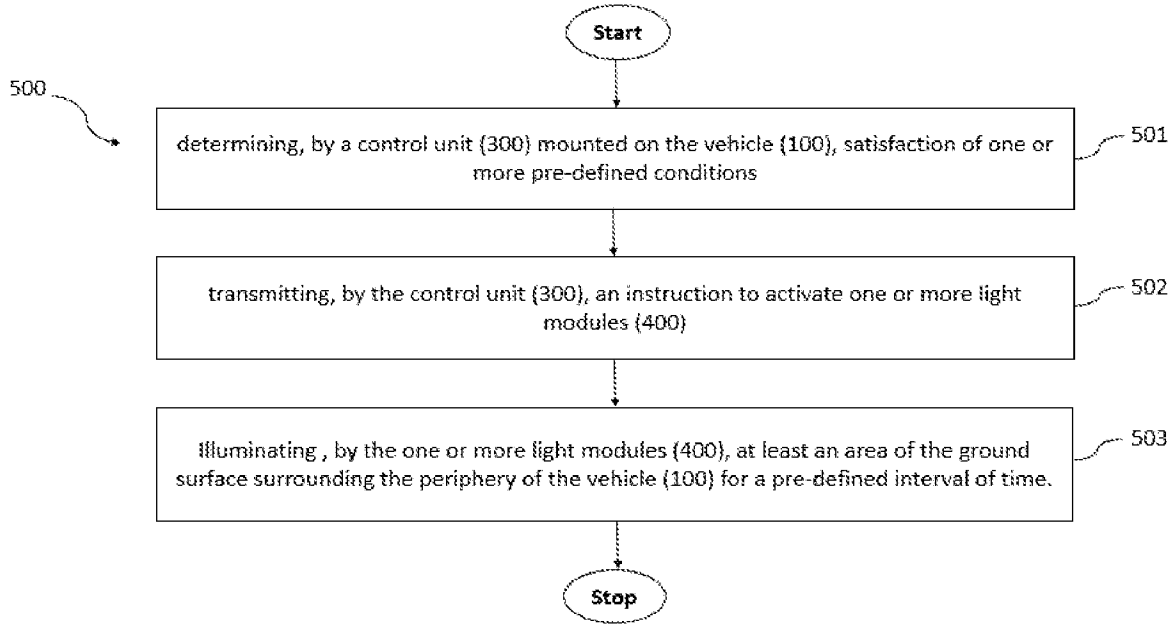
Start
500
determining, by a control unit (300) mounted on the vehicle (100), satisfaction of one or more pre-defined conditions
501
transmitting, by the control unit (300), an instruction to activate one or more light modules (400)
502
Illuminating , by the one or more light modules (400), at least an area of the ground surface surrounding the periphery of the vehicle (100) for a pre-defined interval of time.
503
Stop

Figure 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2022/050985

A. CLASSIFICATION OF SUBJECT MATTER
B60Q1/24 Version=2023.01

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)

B60Q

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

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

Databases: Patseer, IPO Internal Database,
Keywords: Vehicle, Illumination System, Control unit, Projector

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 20190337444 A1 (PIAGGIO & C SPA); 07 NOVEMBER 2019 (07-11-2019), Abstract; Figs. 1-6; Paragraphs [0003], [0022]-[0025], [0027], [0030], [0033], [0036]-[0038]	1, 3, 10
Y	Whole document	2, 4-9, 11
Y	KR 20180006144 A (KOREA PHOTONICS TECH INST); 17 JANUARY 2018 (17-01-2018), Whole document	2, 4, 7-10
Y	US 20140320823 A1 (FORD MOTOR CO); 30 OCTOBER 2014 (30-10-2014), Whole document	4-11

☐ Further documents are listed in the continuation of Box C. ☒ 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
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
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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
10-03-2023	10-03-2023
Name and mailing address of the ISA/ Indian Patent Office Plot No.32, Sector 14,Dwarka,New Delhi-110075 Facsimile No.	Authorized officer Md. Tanveer Ur Rahman Telephone No. +91-1125300200

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IN2022/050985

Citation	Pub.Date	Family	Pub.Date
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