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United States Patent	12391175
Kind Code	B2
Date of Patent	August 19, 2025
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Systems and methods for a lighting assembly for a golf cart

Abstract

In accordance with some aspects of the present disclosure, a lighting system for a golf cart includes a rocker panel secured to a side panel of the golf cart and including a pipe aperture disposed therein. The lighting system further includes a light pipe secured within the pipe aperture of the rocker panel, a light source housed within the light pipe, and a processor connected to the lighting system and configured to provide lighting instructions thereto. The light pipe directs light emitted from the light source outward from the side panel of the golf cart. The lighting instructions are configured for at least one of providing a first lighting sequence by the light source when an ignition of the golf cart is activated, and switching to and maintaining a second lighting sequence by the light source when a drivetrain of the golf cart is turned on.

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Appl. No.:	19/013771
Filed:	January 08, 2025

Prior Publication Data

Document Identifier	Publication Date
US 20250145083 A1	May. 08, 2025

Related U.S. Application Data

continuation parent-doc US 18419221 20240122 US 12311836 child-doc US 19013771
us-provisional-application US 63440654 20230123

Publication Classification

Int. Cl.: B60Q1/50 (20060101); B60Q1/26 (20060101); B60Q1/32 (20060101); F21S43/237 (20180101)

U.S. Cl.:

CPC B60Q1/543 (20220501); B60Q1/2619 (20130101); B60Q1/32 (20130101); F21S43/237 (20180101); B60Q2400/20 (20130101)

Field of Classification Search

CPC: A63B (55/60); A63B (2102/32); A63B (2055/601-605); B60Q (1/2619); B60Q (1/32); B60Q (1/50-549); B60Q (2400/20); F21S (43/235-241); F21V (23/04); F21W (2103/00); F21W (2107/10)

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS (1) This application is a continuation of U.S. application Ser. No. 18/419,221, filed on Jan. 22, 2024, which claims the benefit of U.S. Provisional Application No. 63/440,654, filed on Jan. 23, 2023, each of which is incorporated by reference herein in its entirety.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH

(1) N/A

BACKGROUND

1. Field of the Disclosure

(2) The present disclosure relates generally to golf cart lighting systems and methods. More specifically, the present disclosure relates to systems and methods for providing golf cart safety lighting, for example, that can provide an indication that the golf cart is turned on.

2. Description of the Background of the Disclosure

(3) Motor vehicles typically include rocker panels that offer a variety of utility and aesthetic benefits. There exists a need for rocker panels with light illumination on a golf cart in order to provide enhanced safety and visibility improvements.

SUMMARY

(4) The present disclosure overcomes the aforementioned drawbacks by providing systems and methods for creating providing enhanced safety features for a golf cart by enhancing visibility characteristics of the golf cart and providing illuminated signals when the golf cart is in an active state.

(5) In accordance with some aspects of the present disclosure, a lighting system for a golf cart includes a rocker panel secured to a side panel of the golf cart and including a pipe aperture disposed therein. The lighting system further includes a light pipe secured within the pipe aperture of the rocker panel, a light source housed within the light pipe, and a processor connected to the lighting system and configured to provide lighting instructions thereto. The light pipe directs light emitted from the light source in an outward direction from the side panel of the golf cart. The lighting instructions are configured for at least one of providing a first lighting sequence by the light source when an ignition of the golf cart is activated, and switching to and maintaining a second lighting sequence by the light source when a drivetrain of the golf cart is turned on.

(6) In accordance with some aspects of the present disclosure, a lighting system for a golf cart includes a rocker panel secured to a side panel of the golf cart that includes a pipe aperture disposed therein, a first end, a second end, a lateral axis defined between the first end and the second end, and a panel aperture. The lighting system further includes a light pipe secured within the pipe aperture of the rocker panel and a processor connected to the lighting system and configured to provide lighting instructions thereto. The light pipe includes a straight segment and a “U” shaped segment, the straight segment extends in line with the panel aperture in a direction parallel to the lateral axis, and the “U” shaped segment outlines the panel aperture.

(7) In accordance with some aspects of the present disclosure, a method of illuminating an exterior area of a golf cart includes the steps of receiving, by a processor, an ignition signal that an ignition

of the golf cart has been activated, the ignition of the golf cart activating a drivetrain of the golf cart, and instructing, by the processor, a light assembly to display a first lighting sequence. The method further includes the steps of switching from the first lighting sequence to a second lighting sequence, receiving, by the processor, a termination signal that the drivetrain of the golf cart has been deactivated, and deactivating, by the processor, the light assembly.

(8) In accordance with some aspects of the present disclosure, a golf cart includes a rocker panel defining a first end, a second end opposite the first end, and a lateral axis that extends between the first end and the second end. The rocker panel includes a notch and a panel aperture disposed along the lateral axis, the panel aperture defining a first panel end that is located closer to the first end of the rocker panel and a second panel end that is located closer to the second end of the rocker panel. The rocker panel further includes a pipe aperture that extends along the lateral axis, the pipe aperture including a first aperture segment extending from the first end of the rocker panel to the notch, a second aperture segment extending from the notch to the first panel end of the panel aperture, and a third aperture segment extending from the second panel end of the panel aperture to the second end of the rocker panel. A panel is secured within the panel aperture and includes a logo applied thereto, and a light pipe is secured within the pipe aperture. The light pipe includes a first pipe segment secured within the first aperture segment, a second pipe segment secured within the second aperture segment, and a third pipe segment secured within the third aperture segment. A light source is disposed within the light pipe, and the light pipe is configured to direct light emitted from the light source outward from the rocker panel of the golf cart.

(9) In accordance with some aspects of the present disclosure, a golf cart includes a frame, a body disposed on the frame and including a side panel, and a rocker panel coupled to the side panel and defining a first end, a second end opposite the first end, and a lateral axis that extends between the first end and the second end. The rocker panel includes a panel aperture disposed along the lateral axis and defining a first panel end that is located closer to the first end of the rocker panel and a second panel end that is located closer to the second end of the rocker panel. The rocker panel further includes a pipe aperture that extends along the lateral axis, the pipe aperture including a first segment that is parallel with respect to the lateral axis and extends between the first end of the rocker panel and the first panel end of the panel aperture, and a second segment is parallel with respect to the lateral axis and extends between the second panel end of the panel aperture and the second end of the rocker panel. A light pipe is secured within the pipe aperture of the rocker panel, and a light source is housed within the light pipe. The light source is configured to emit a multi-color lighting sequence when a switch on the golf cart is activated, and the light pipe is configured to direct light emitted from the light source outward from the rocker panel of the golf cart.

(10) In accordance with some aspects of the present disclosure, a method of illuminating an exterior region of a golf cart includes receiving, by a processor, a first activation signal that a first switch of the golf cart has been activated, and instructing, by the processor, a light source housed within a light pipe to display a first lighting sequence. The light pipe is secured within a pipe aperture defined by a rocker panel of the golf cart. The method further includes receiving, by the processor, a second activation signal that a second switch of the golf cart has been activated, and instructing, by the processor, the light source to switch from the first lighting sequence to a second lighting sequence.

(11) The foregoing and other advantages of the invention will appear from the following description. In the description, reference is made to the accompanying drawings that form a part hereof, and in which there is shown by way of illustration a preferred embodiment of the invention. Such embodiment does not necessarily represent the full scope of the invention, however, and reference is made therefore to the claims and herein for interpreting the scope of the invention.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

- (1) FIG. 1 is an isometric view of a golf cart including a rocker panel according to some aspects of the present disclosure;
- (2) FIG. 2 is a left-side elevational view of the golf cart of FIG. 1;
- (3) FIG. 3 is a left-side elevational view of a rocker panel with a lighting assembly of the golf cart of FIG. 1 according to some aspects of the present disclosure;
- (4) FIG. 4 is a top elevational view of the rocker panel of FIG. 3;
- (5) FIG. 5 is a bottom elevational view of the rocker panel of FIG. 3;
- (6) FIG. 6 is a right-side elevational view of the rocker panel of FIG. 3 according to some aspects of the present disclosure;
- (7) FIG. 7 is an isometric view of a light pipe assembly according to some aspects of the present disclosure;
- (8) FIG. 8 is a right-side elevational view of a rocker panel with a lighting assembly according to some aspects of the present disclosure;
- (9) FIG. 9 is a rear elevational view of a rocker panel with a rectangular panel according to some aspects of the present disclosure;
- (10) FIG. 10 is a cross section view of the rocker panel with a light pipe assembly taken along line 10-10 of the rocker panel of FIG. 3;
- (11) FIG. 11 is a cross section view of the rocker panel with a light pipe assembly taken along line 11-11 of FIG. 3; and
- (12) FIG. 12 is a flowchart that illustrates a method of using a lighting assembly according to some aspects of the present disclosure.

DETAILED DESCRIPTION

(13) Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. The use of “including,” “comprising,” or “having” and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. Unless specified or limited otherwise, the terms “mounted,” “connected,” “supported,” and “coupled” and variations thereof are used broadly and encompass both direct and indirect mountings, connections, supports, and couplings. Further, “connected” and “coupled” are not restricted to physical or mechanical connections or couplings. When two or more ranges for a particular value are recited, this disclosure contemplates all combinations of the upper and lower bounds of those ranges that are not explicitly recited. For example, recitation of a value of between 1 and 10 or between 2 and 9 also contemplates a value of between 1 and 9 or between 2 and 10.

(14) The term “about,” as used herein, refers to variations in the numerical quantity that may occur, for example, through typical measuring and manufacturing procedures used for articles of footwear or other articles of manufacture that may include embodiments of the disclosure herein; through inadvertent error in these procedures; through differences in the manufacture, source, or purity of the ingredients used to make the compositions or mixtures or carry out the methods; and the like. Throughout the disclosure, the terms “about” and “approximately” refer to a range of values $\pm 5\%$ of the numeric value that the term precedes.

(15) The terms “upper,” “lower,” “right,” “left,” “rear,” “front,” “vertical,” “horizontal,” “interior,” “exterior,” and derivatives thereof shall relate to the device as oriented in FIG. 1. However, it is to be understood that the device may assume various alternative orientations, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes

described herein are simply exemplary embodiments of the inventive concepts defined in the appended claims. Therefore, specific dimensions and other physical characteristics relating to the embodiments disclosed herein are not to be considered as limiting, unless the claims expressly state otherwise. Additionally, unless otherwise specified, it is to be understood that discussion of a particular feature or component extending in or along a given direction, or the like, does not mean that the feature or component follows a straight line or axis in such a direction or that it only extends in such direction or on such a plane without other directional components or deviations, unless otherwise specified.

(16) The following discussion is presented to enable a person skilled in the art to make and use embodiments of the invention. Various modifications to the illustrated embodiments will be readily apparent to those skilled in the art, and the generic principles herein can be applied to other embodiments and applications without departing from embodiments of the invention. Thus, embodiments of the invention are not intended to be limited to embodiments shown, but are to be accorded the widest scope consistent with the principles and features disclosed herein. The following detailed description is to be read with reference to the figures, in which like elements in different figures have like reference numerals. The figures, which are not necessarily to scale, depict selected embodiments and are not intended to limit the scope of embodiments of the invention. Skilled artisans will recognize the examples provided herein have many useful alternatives and fall within the scope of embodiments of the invention.

(17) Referring now to FIGS. 1-3, a rocker panel 20 is illustrated with a lighting assembly 22 for a golf cart 24 according to the present disclosure. The golf cart 24 includes at least a frame 26, an ignition (not shown), a drivetrain (not shown), and an electrical system (not shown), and the golf cart 24 defines a front end 28, back end 30, right side 32, and a left side 34 thereof. An exterior body 36 is disposed on the frame 26 of the golf cart 24, and the exterior body 36 includes at least a front cover 38, a rear cover 40, and a side panel 42 such as a right-side cover 44 and/or a left-side cover 46. In some aspects, the exterior body 36 is a unitary construction, i.e., two or more of the front cover 38, rear cover 40, right-side cover 44, and left side 34 cover are formed integrally with one another, or two or more of the front cover 38, rear cover 40, right-side cover 44, and left side 34 cover are secured to one another using fasteners (not shown) or connecting tabs. In some aspects, the exterior body 36 of the golf cart 24 comprises sheet steel, fiberglass, sheet aluminum, or plastic.

(18) Referring now to FIG. 2, a left-side view of the rocker panel 20 with the lighting assembly 22 (see FIG. 1) is shown. While only a left-side rocker panel 48 is discussed, it will be understood that aspects of the rocker panel 20 and lighting assembly 22 as discussed herein are applicable to both a right-side rocker panel and a left-side rocker panel 48, and a right-side rocker panel is a mirror image of the left-side rocker panel 48 and similarly includes a mirror image lighting assembly. The left-side rocker panel 48 will hereinafter be generally referred to as the rocker panel 20. The rocker panel 20 is coupled to one or more elements of the exterior body 36 along the left side 34 of the golf cart 24 and extends along an entire length 50 of the golf cart 24 defined along a widest dimension of the golf cart 24 between the front end 28 of the golf cart 24 and the back end 30 of the golf cart 24. In some aspects, the rocker panel 20 extends between 0%-100%, 75%-100%, 50%-75%, 25%-100%, 25-50%, 35-50%, or 40-50% of the entire length 50 of the golf cart 24. By extending along a length of the golf cart 24, the rocker panel 20 provides increased structural reinforcement to the golf cart 24 as well as providing an aesthetic appeal to an operator. Occupants, passengers, and operators may generally be referred to as operators of the vehicle for clarity hereinafter. In some aspects, the rocker panel 20 is formed integrally with the exterior body 36 of the golf cart 24, and the rocker panel 20 comprises sheet steel, fiberglass, sheet aluminum, or plastic.

(19) Referring now to FIGS. 3-5, a side view is illustrated of the rocker panel 20 with the lighting assembly 22. The rocker panel 20 includes a top face 52, a right face 54, a bottom face 56, a left

face **58**, and a lateral axis **60** that extends between a first panel end **62** and a second panel end **64** of the rocker panel **20** parallel to the top face **52** and the bottom face **56**. The left face **58** is substantially trapezoidal in shape and defines a top edge **66** and a bottom edge **68**, although it is contemplated that a variety of shapes or geometries can be used to form the left face **58**. An upper region **70** of the rocker panel **20** is defined between the top edge **66** and a midplane **72** of the rocker panel **20** that exists along the lateral axis **60**, and a lower region **74** of the rocker panel **20** is adjacent to the upper region **70** and extends from the bottom edge **68** to the midplane **72**. The left face **58** further defines an exterior plane **76** of the rocker panel **20** (see FIG. 4). A plurality of mounting tabs **78** extends in an upward direction from the top face **52** and downward from the bottom face **56**, and is configured to secure the rocker panel **20** to an element of the exterior body **36**, e.g., the front cover **38**, the rear cover **40**, or the side cover (**44**, **46**). The rocker panel **20** also includes mounting brackets **80** having eyelets **82** that extend from the top face **52** and the bottom face **56**, and the eyelets **82** are configured to receive fasteners (not shown) therethrough, e.g., screws, bolts, or another type of fastener, for the purpose of further securing the rocker panel **20** to the exterior body **36**. In this way, the rocker panel **20** is retained on the frame **26**, directly or indirectly, in order to strengthen the construction and assembly of the golf cart **24**.

(20) Referring now to FIG. 3, the rocker panel **20** is illustrated with the lighting assembly **22** housed therein. The left face **58** of the rocker panel **20** includes a pipe aperture **84** that is configured to receive a light pipe **86** therein. The pipe aperture **84** is spaced from the top edge **66** and the bottom edge **68** of the left face **58** and is disposed within the left face **58**. Additionally, the pipe aperture **84** includes a first segment **88** that is substantially straight and that is separated from a substantially curved or “U” shaped second segment **90** by a notch **92**. In some aspects, the notch **92** is not included in the rocker panel **20** such that the pipe aperture **84** is continuous along its length. In some aspects, the pipe aperture **84** begins at a front panel end **94**, first extending in a direction that is parallel to the lateral axis **60** to define the first segment **88**, and then extending in a downward diagonal direction with respect to the left face **58** to define a first leg **96** of the second segment **90**. The pipe aperture **84** then extends in a direction that is parallel to the lateral axis **60** to define a base **98** of the second segment **90**, and the pipe aperture **84** then extends in an upward diagonal direction with respect to the left face **58** to define a second leg **100** of the second segment **90**. The pipe aperture **84** further extends in a direction that is parallel to the lateral axis **60** and ends at a back panel end **102**. In some aspects, a length **104** of the pipe aperture **84**, i.e., a length of the first segment **88** combined with a length of the second segment **90** or the continuous length **104** of the pipe aperture **84**, is between 0.50 m and 3.00 m, between 0.50 m and 2.00 m, between 0.50 m and 1.00 m, between 1.00 m and 2.00 m, or between 1.50 m and 2.50 m.

(21) In some aspects, the rocker panel **20** further includes a rectangular aperture **106** that extends through the left face **58** and the right face **54** to define a panel aperture **108**. The panel aperture **108** is configured to receive a rectangular panel **110** including specific texts, images, or symbols desirable to a passenger, e.g., a logo, a name, a golf cart identification number, or another identifier. The panel aperture **108** is disposed between the top edge **66** and the pipe aperture **84** and is spaced from both the top edge **66** and the pipe aperture **84**. Specifically, the panel aperture **108** is disposed above the second segment **90** of the pipe aperture **84** such that second segment curves around a bottom end **112** of the panel aperture **108**. In other words, the pipe aperture **84** first extends from the front panel end **94** in line with the panel aperture **108** in a direction that is parallel to the lateral axis **60** to define the first segment **88** and then curves diagonally downward to define the first leg **96** of the second segment **90**. The pipe aperture **84** then extends under the panel aperture **108** in a direction that is parallel to the lateral axis **60** to define the base **98** of the second segment **90**. The pipe aperture then curves in a diagonally upward direction with respect to the lateral axis **60** to define the second leg **100** of the second segment **90** and further extends in line with the panel aperture **108** to the back panel end **102** in a direction that is parallel to the lateral axis **60**. In some aspects, the second segment **90** of the pipe aperture **84** alternatively curves around the panel

aperture **108** in a different way, such as around a top end **114** of the panel aperture **108** or around the entire panel aperture **108**. In this way, the second segment **90** of the pipe aperture **84** outlines the panel aperture **108**, which provides aesthetic and safety advantages such as those discussed further herein. The left face **58** can further include texturing **116** along a length thereof that is congruent with the geometry of the pipe aperture **84** or the panel aperture **108** in order to provide a unique aesthetic appeal and structural support for the rocker panel **20**.

(22) Referring now to FIG. **6**, the right face **54** of the rocker panel **20** is illustrated as discussed for FIGS. **3-5**. In addition to the pipe aperture **84** and the panel aperture **108**, the right face **54** also includes a plurality of fasteners **118** that are disposed on either side of the pipe aperture **84**. The plurality of fasteners **118** are used in conjunction with the plurality of mounting tabs **78** on the top face **52** and the bottom face **56** to secure the rocker panel **20** to the exterior body **36** and retain the rocker panel **20** on the frame **26** of the golf cart **24**. In some aspects, the plurality of fasteners **118** is formed integrally with the right face **54** of the rocker panel **20**. The rear view in FIG. **6** also illustrates texturing **122** included on the right face **54** that is complementary to the texturing **116** included on the left face **58**. The right face **54** further includes retaining tabs **120** along the bottom end **112** of the panel aperture **108** that are configured to retain the rectangular panel **110** including specific texts, images, or symbols.

(23) Referring now to FIG. **7**, a perspective view is shown of the lighting assembly **22**. The lighting assembly **22** includes the light pipe **86** that is integrally formed with and extends from a lighting base **124**. The light pipe **86** has a substantially similar shape as the pipe aperture **84** in the rocker panel **20** such that the light pipe **86** is received within the pipe aperture **84**. In some aspects, the light pipe **86** includes substantially planar sides and defines a substantially rectangular pipe body **126**, although it is contemplated that a variety of shapes or geometries can be used, e.g., a cylindrical pipe body or a tubular pipe body. Similar to the pipe aperture **84**, the light pipe **86** includes a first pipe segment **128** that is substantially straight and that is separated from a substantially curved or “U” shaped second pipe segment **130** by a light pipe gap **132**. However, in some aspects, the light pipe **86** does not include the light pipe gap **132** and is instead continuous along its length. The light pipe **86** houses a light source **134** which emits light using electric power drawn from the electrical system of the golf cart **24**. In some aspects, the light source **134** is a single incandescent bulb, a system of light emitting diodes (LEDs), a system of halogen bulbs, or another type of fluorescent tube. In some aspects, the light pipe **86** comprises a translucent material, a hard acrylic material, or a soft acrylic material, or the light pipe **86** is translucent only along an exterior face **136** thereof such that light from the light source **134** is directed in a direction outwards from the left face **58** of the rocker panel **20**.

(24) Specifically, the light pipe **86** illuminates an illuminated region that is exterior an exterior region of the golf cart **24**. In particular, the illuminated region is located in a lateral direction with respect to the side cover of each of the sides of the golf cart **24**. In some aspects, the illuminated region extends the entire length **50** of the golf cart **24** and encompasses a region located directly to the side of the rocker panel **20**, on the rocker panel **20**, and/or the region located by a perimeter around the golf cart **24**. Therefore, in some aspects, the illuminated region includes the ground that is located to the side of the rocker panel **20** and in the vicinity of the perimeter of the golf cart **24**. In some aspects, the illuminated region does not include the ground that is located to the side of the rocker panel, and the light from the light source **134** is instead directed in an upward, diagonal, and/or lateral direction with respect to the left face **58** of the rocker panel **20**. This is particularly advantageous since directing the light in an upward, diagonal, and/or lateral direction with respect to the left face **58** allows the illuminated region to be visible from farther distances away from the golf cart **24**. While the illuminated region is discussed as being projected near the left side **34** of the golf cart **24**, it will be apparent to those skilled in the art that the light assembly can be implemented on the right side **32** to illuminate a region to the side of a right-side rocker panel. It will be further apparent to those skilled in the art from this disclosure that while the light assembly

is illustrated as illuminating the region in the vicinity of the rocker panel **20**, the light assembly can illuminate different external regions that are in the vicinity of the golf cart **24** as needed and/or desired.

(25) The lighting base **124** has a similar shape to the light pipe **86**, and the lighting base **124** further defines a front base face **140** and a rear base face **142** (see FIG. **8**). The light pipe **86** extends from the front base face **140** in an outward of the lighting base **124**, and the rear base face **142** of the lighting base **124** includes a plurality of base tabs **144** disposed around a perimeter **146** thereof which are configured to engage with the right face **54** of the rocker panel **20** and secure the lighting assembly **22** to the rocker panel **20**. In some aspects, the lighting base **124** is formed integrally with the light pipe **86**, or the light pipe **86** is fastened to the lighting basing using an adhesive or another securing means. While the lighting base **124** is integral or independent of the light tube, in some aspects the lighting base **124** comprises a hard acrylic material, a soft acrylic material, sheet steel, fiberglass, sheet aluminum, or plastic. The lighting base **124** further includes a first connection end **148** and a second connection end **150** that are capable of forming structural or electrical connections with external structures, e.g., a processor, a controller, a control panel, a circuit board, or a power source (not shown). In some aspects, the circuit board supports the light source **134** within the light pipe **86**. The arrangement of any included lighting elements on the circuit board can be customized depending on the specific application to produce a desired output of light (e.g., an amount of light, a particular dispersion pattern, or a particular lighting sequence).

Correspondingly, various aspects of the lighting system can be tuned to provide a desired output, including, for example, the quantity, size, power, and spacing/location of any lighting elements.

(26) In some aspects, the lighting assembly **22** further includes other types of connection structures. That is, the lighting assembly **22** is further configured to provide structural or electrical connections with external structures (e.g., external devices). In some aspects, such connection structures serve as locating or orientating features configured to allow the lighting assembly **22** to couple with another object in a specific way. In some aspects, the lighting base **124** includes one or more access ports **152**. Access ports **152** are configured to be opened by a user to access components that may be generally contained within a housing. In some aspects, the access ports **152** are configured as tool-less access ports that can be operated by a user without the need for tools (e.g., a screwdriver), or they can require tools to open (e.g., an access port that is closed with fasteners). Access ports **152** can be provided for specific functions, such as facilitating charging or data transfer, or for storage or access internal components of the lighting assembly **22**. In particular, access ports **152** exist at the first connection end **148**, the second connection end **150**, or both the first connection end **148** and the second connection end **150** of the lighting base **124**. In some aspects the access ports **152** are connected to a central vehicle computer (not shown) through a wire or other connection means, and the access ports **152** provide a route for communication between the lighting source and a controller or a processor as will be later discussed herein.

(27) Referring now to FIGS. **8** and **9**, the right face **54** of the rocker panel **20** is illustrated with the lighting assembly **22** secured thereto. As previously described the light pipe **86** has a substantially similar shape to the pipe aperture **84** such that the light pipe **86** can only be received into the pipe aperture **84** when the rocker panel **20** and the lighting assembly **22** are oriented congruently with respect to one another. When the light pipe **86** is inserted into the pipe aperture **84**, the front base face **140** is placed in contact with the right face **54** of the rocker panel **20**, and the plurality of base tabs **144** engage with the right face **54** in order to secure the lighting assembly **22** to the rocker panel **20**. In some aspects, the base tabs **144** do not directly engage with the right face **54**, and another securing means (e.g., an adhesive, a friction engagement, a separate securing structure, or a fastener) is instead used to retain the light pipe **86** within the pipe aperture **84** and the base **124** on the right face **54** of the rocker panel **20**. Referring now to FIG. **9**, the rectangular panel **110** is inserted into the panel aperture **108** and includes side tabs **154** that are configured to receive one or more fasteners (not shown) for the purpose of retaining the rectangular panel **110** within the panel

aperture **108** in addition to the retaining force provided by the retaining tabs **120**.

(28) Referring now to FIG. **10**, a cross section is illustrated of the rocker panel **20** with the lighting assembly **22** secured thereto taken along line **10-10** of FIG. **3**. The lighting assembly **22** is inserted into a rocker panel cavity **156** such that the light pipe **86** is aligned with the pipe aperture **84**, and the front base face **140** of the lighting assembly **22** is placed in contact with the right face **54** of the rocker panel **20**. In some embodiments, aligning the light pipe **86** with the pipe aperture **84** includes aligning the notch **92** of the pipe aperture **84** with the light pipe gap **132**. The light pipe **86** does not extend past the exterior plane **76** of the left face **58**, i.e., the light pipe **86** is flush with the left face **58** of the rocker panel **20**. In this way, the light pipe **86** is better protected than if it were disposed on the exterior of the golf cart **24**, and this can provide a longer life of the light pipe **86** while providing a sleek aesthetic design for the golf cart **24** exterior. Additionally, the retaining tabs **120** are configured to secure the rectangular panel **110** (see FIGS. **6** and **9**) and extend away from the rear surface of the rocker panel **20**. Still referring to FIG. **10**, the first segment **88** of the light pipe **86** is illustrated to extend through the upper region **70**, although in some aspects the first segment **88** extends through the lower region **74**, or both the upper region **70** and the lower region **74**.

(29) Referring now to FIG. **11**, a cross section is illustrated of the rocker panel **20** with the lighting assembly **22** secured thereto taken along line **11-11** of FIG. **3**. In FIG. **10**, the panel aperture **108** is visible, and the second segment **90** of the light pipe **86** curves around the bottom edge **68** of panel aperture **108**. This configuration is advantageous since the light pipe **86** provides contoured illumination of the panel aperture **108**, thus enhancing visibility of the panel aperture **108** at farther distances from the golf cart **24** while also providing a desirable aesthetic appeal of the left face **58** of the rocker panel **20**. Additionally, the second segment **90** of the light pipe **86** extends through the lower region **74** in this view, although in some aspects the second segment **90** extends through the upper region **70** to outline the panel aperture **108**. It will become apparent to those skilled in the art that a variety of different geometries and configurations can be used for both the light pipe **86** and the pipe aperture **84** for the purpose of illuminating the sides of the golf cart **24** and in the vicinity of the perimeter **138** of the golf cart **24**. For example, in some aspects, more than one light pipe **86** or pipe aperture **84** are disposed within the rocker panel **20**, or a continuous light pipe is received by a continuous pipe aperture around a perimeter of the rocker panel **20**.

(30) Referring now to FIG. **12**, a flowchart is illustrated of a method **158** of using the lighting assembly **22**. As previously discussed for FIG. **7**, the light source **134** emits light using electric power drawn from the electrical system of the golf cart **24**, and the lighting assembly **22** is connected to a controller, a processor, or a circuit board. In some aspects, the lighting assembly **22** is electrically connected directly to at least the ignition and drivetrain of the golf cart **24**, or the lighting assembly **22** is indirectly connected to the ignition and drivetrain of the golf cart **24** through an intermediary processor. The processor provides lighting instructions to the lighting assembly **22**. The ignition of the golf cart **24** is activated which further activates the drivetrain and effectively turns the golf cart **24** on, and an ignition signal is received by the processor at step **160**. The processor, upon receiving the ignition signal, instructs a first lighting sequence of the lighting assembly **22** to be displayed at step **162**. In some aspects, the first lighting sequence is a multi-color startup sequence which indicates that ignition of the golf cart **24** has occurred. In some aspects, the first lighting sequence is accompanied by sounds or tactile indications (e.g., vibrations on a steering wheel or seat) to ensure the operator is aware the ignition has been activated, or the first lighting sequence provides information about the status of the golf cart **24** (e.g., fuel or charge level, engine function, or another status indication).

(31) Once the first lighting sequence has completed and the drivetrain is activated, meaning the golf cart **24** is capable of moving, the processor switches the lighting assembly **22** to display a second lighting sequence at step **164**. In some aspects, the second lighting sequence is a solid white illumination that remains active until the golf cart **24** is turned off. Specifically, once the drivetrain

is deactivated, a termination signal is received by the processor at step 166. The processor, upon reception of the termination signal, deactivates the lighting assembly 22 at step 168. The second lighting sequence remains activated while the golf cart 24 is on, regardless of whether the golf cart 24 is in an active state (i.e., if the golf cart 24 is moving) or if the golf cart 24 is in a stationary state. In this way, the lighting assembly 22 provides a visual cue that the drivetrain is turned on. (32) This provides a variety of benefits to an operator, such as, namely, enhanced safety features of the golf cart 24 which indicate that the golf cart 24 is in an active state. For example, the second lighting sequence provides a constant indication that informs a potential operator that the drivetrain is capable of being activated, thereby providing visual information on the state of the golf cart 24 at a distance therefrom. In some aspects, the second lighting sequence is visible a distance from the golf cart 24 that is between 0.00 m-499 m, 0.00 m-249 m, 0.00 m-99.0 m, 0.00 m-50.0 m, 0.00 m-25.0 m, or 0.00 m-10.0 m. If the second lighting sequence is activated, but an operator is not currently using the golf cart 24, the lighting assembly 22 provides a visual indication that the golf cart 24 has been left on and that the golf cart 24 is in an operable state. For example, if a golf cart 24 was inadvertently left on by an operator, the second lighting sequence would remain activated and indicate to the operator that cart had been improperly turned off. Similarly, the additional lighting provided on either side of the golf cart 24 by the lighting assembly 22 enhances visibility of the golf cart 24 from distances farther from the golf cart 24 than would be possible without the lighting assembly 22, and the additional lighting especially aids in visibility of the golf cart 24 at night or in dark conditions. Moreover, enhancing the visibility of the golf cart 24 provides an additional benefit of reducing the possibility of the golf cart 24 being lost or stolen, since the golf cart 24 can be seen from further away when the drivetrain is in an active state and the second light sequence is active. Thus, the safety features discussed herein related to the lighting assembly 22 and illumination of the rocker panel 20 are at least capable of increasing visibility of the golf cart 24, providing information to an operator indicating the operable status of the golf cart 24, and providing a unique and desirable aesthetic lighting appeal of the golf cart 24.

(33) In addition to the safety features related to increased visibility and status of the golf cart 24, the lighting sequences provided by the lighting assembly 22 are also advantageous when determining if the golf cart 24 is suitable for storage or charging. As discussed above, the second lighting sequence indicates that the golf cart 24 is on, and the second lighting sequence further indicates that the golf cart 24 has been turned off when it is subsequently deactivated. Deactivating the second lighting sequence signals to an operator that the golf cart 24 is capable of being stored without inadvertent movement of the golf cart 24. This reduces the risk of improper storage leading to damage of the golf cart 24 or other objects caused by improperly turning the golf cart 24 off. Moreover, deactivating the second lighting sequence advantageously reduces the risk of the golf cart 24 being left on and losing a charge during charging. This further reduces energy storage needed for the golf cart 24 since energy is only consumed by an active system (i.e., the charge of the golf cart 24 is not consumed when the second lighting sequence turns off since the cart is deactivated). In some aspects, the golf cart 24 only accepts charging when the second lighting sequence turns off, meaning the golf cart 24 can only be charged when it has been turned off.

(34) In some aspects, the lighting assembly 22 is configured to display lighting sequences other than those described above. For example, in some aspects, a processor is connected to other aspects of the golf cart 24 (i.e., steering, headlights, brake lights, motor, battery, fuel tank, or other aspects) and instructs the lighting assembly 22 to display visual cues related to the other aspects of the golf cart 24. In some aspects, colors other than white are used for the second lighting sequence, or the processor allows an operator to customize a variety of different lighting sequences based on the operator's preference. In some aspects, the lighting assembly 22 includes sensors housed within/on the rocker panel 20 that are configured to detect hazards encountered by the golf cart 24 and instruct the lighting assembly 22 to display a hazard lighting sequence. It will be understood by

those skilled in the art that different configurations of the rocker panel 20 and lighting assembly 22 capable of providing lighting indications to an operator exist other than those expressly stated. (35) The present invention has been described in terms of one or more preferred embodiments, and it should be appreciated that many equivalents, alternatives, variations, and modifications, aside from those expressly stated, are possible and within the scope of the invention.

Claims

1. A golf cart, comprising: a rocker panel defining a first end, a second end opposite the first end, and a lateral axis that extends between the first end and the second end, the rocker panel comprising: a notch and a panel aperture disposed along the lateral axis, the panel aperture defining a first panel end that is located closer to the first end of the rocker panel and a second panel end that is located closer to the second end of the rocker panel; a pipe aperture that extends along the lateral axis, the pipe aperture comprising: a first aperture segment extending from the first end of the rocker panel to the notch, a second aperture segment extending from the notch to the first panel end of the panel aperture, and a third aperture segment extending from the second panel end of the panel aperture to the second end of the rocker panel; a panel secured within the panel aperture and including a logo applied thereto; and a light pipe secured within the pipe aperture, the light pipe comprising: a first pipe segment secured within the first aperture segment; a second pipe segment secured within the second aperture segment; and a third pipe segment secured within the third aperture segment, wherein a light source is disposed within the light pipe and the light pipe is configured to direct light emitted from the light source outward from the rocker panel of the golf cart.
2. The golf cart of claim 1, wherein a length of the first aperture segment measured along the lateral axis is greater than a length of the third aperture segment measured along the lateral axis.
3. The golf cart of claim 1, wherein the second aperture segment and the third aperture segment extend in line with a midplane of the panel aperture.
4. The golf cart of claim 1, wherein the light source is configured to display a multi-color lighting sequence.
5. The golf cart of claim 1, wherein the pipe aperture is spaced from a top edge of the rocker panel and a bottom edge of the rocker panel.
6. The golf cart of claim 5, wherein the panel aperture is spaced from the top edge of the rocker panel and the bottom edge of the rocker panel.
7. The golf cart of claim 1, wherein a length of the pipe aperture is between 0.5 m and 3.0 m.
8. The golf cart of claim 1, wherein the rocker panel extends between 25% and 100% of a length of the golf cart, expressed as a percentage.
9. A golf cart, comprising: a frame; a body disposed on the frame and including a side panel; a rocker panel coupled to the side panel and defining a first end, a second end opposite the first end, and a lateral axis that extends between the first end and the second end, the rocker panel comprising: a panel aperture disposed along the lateral axis and defining a first panel end that is located closer to the first end of the rocker panel and a second panel end that is located closer to the second end of the rocker panel; and a pipe aperture that extends along the lateral axis, the pipe aperture comprising: a first segment that is parallel with respect to the lateral axis and extends between the first end of the rocker panel and the first panel end of the panel aperture; and a second segment that is parallel with respect to the lateral axis and extends between the second panel end of the panel aperture and the second end of the rocker panel; a light pipe secured within the pipe aperture of the rocker panel; and a light source housed within the light pipe, wherein the light source is configured to emit a multi-color lighting sequence when a switch on the golf cart is activated, and wherein the light pipe is configured to direct light emitted from the light source outward from the rocker panel of the golf cart.

10. The golf cart of claim 9, wherein the first segment and the second segment of the pipe aperture extend in line with a midplane of the panel aperture.
 11. The golf cart of claim 9, wherein the light source is electrically coupled to a controller that is configured to provide lighting instructions to the light source.
 12. The golf cart of claim 11, wherein the lighting instructions include at least the multi-color lighting sequence and a solid color sequence.
 13. The golf cart of claim 11 further comprising a panel secured within the panel aperture and including a logo applied thereto.
 14. A method of illuminating an exterior region of a golf cart, the method comprising: receiving, by a processor, a first activation signal that a first switch of the golf cart has been activated; instructing, by the processor, a light source housed within a light pipe to display a first lighting sequence, the light pipe secured within a pipe aperture defined by a rocker panel of the golf cart; receiving, by the processor, a second activation signal that a second switch of the golf cart has been activated; and instructing, by the processor, the light source to switch from the first lighting sequence to a second lighting sequence.
 15. The method of claim 14 further comprising: receiving, by the processor, a termination signal that the first switch has been deactivated; and deactivating, by the processor, the light source.
 16. The method of claim 14, wherein the first lighting sequence is a multi-color lighting sequence, and wherein the second lighting sequence is a solid color lighting sequence.
 17. The method of claim 14 further comprising instructing, by a controller, the light source to display additional lighting sequences.
 18. The method of claim 14, wherein the first switch is an ignition of the golf cart such that the processor instructs the light source to display the first lighting sequence when the ignition of the golf cart is activated.
 19. The method of claim 14, wherein deactivating the second lighting sequence indicates that the golf cart has been turned off.
 20. The method of claim 14 further comprising instructing, by the processor, the light source to display visual cues related to one or more features of the golf cart, wherein the one or more features of the golf cart includes at least one of steering, headlights, brake lights a motor, a battery, and a fuel tank of the golf cart.
 21. The method of claim 14, wherein the light source is configured to provide visual information on a state of the golf cart, and wherein the visual information is visible at a distance from the golf cart that is between 0.0 meters and 250 meters.
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