Abstract: A door handle apparatus for a vehicle is provided. The door handle includes a door handle body that is configured to be disposed at a door of the vehicle. A light source is mounted inside the door handle body. A light-transmitting member is located between the light source and the door handle body. The light-transmitting member is partially exposed to an exterior of the door handle body.
TITLE OF THE INVENTION

LIT DOOR HANDLE FOR A VEHICLE

CROSS-REFERENCE TO RELATED APPLICATIONS:

[0001] This document claims priority to U.S. Provisional Application No. 61/407,808 filed October 28, 2010, and U.S. Serial Number 13/071,942 filed March 25, 2011, the entire contents of which are hereby incorporated by reference.

FIELD OF THE INVENTION

[0002] A lit door handle for a vehicle is provided. More particularly, a door handle is provided that includes a light source, such as an LED inside a door handle body of a vehicle, and a light-transmitting member, such as clear resin, positioned between the light source and the door handle body, and partially exposed to the door handle body.

BACKGROUND OF THE INVENTION

DISCUSSION OF BACKGROUND

[0003] It is known to include at least one LED in a door handle. Conventional door handle lighting systems, such as those described in U.S. Patent Application Publication No. 2010/01 17381, light a back side of a door handle, so as to illuminate a car body side of the door handle. Other conventional door handles, such as those described in U.S. Patent Application Publication No. 2006/0282987, include LEDs that are located on a face of the door handle.
SUMMARY OF EXEMPLARY ASPECTS OF THE ADVANCEMENTS

[0004] In one aspect, a door handle apparatus for a vehicle is provided. The door handle includes a door handle body that is configured to be disposed at a door of the vehicle. A light source is mounted inside the door handle body. A light-transmitting member is located between the light source and the door handle body. The light-transmitting member is partially exposed to an exterior of the door handle body.

[0005] A door handle for a vehicle that includes an intelligent lighting system that provides continuous lighting is provided. The door handle includes a door handle body. The door handle body includes a first body member and a second body member. The first body member and a second body member are assembled together so as to define an interior space within the door handle. A light source is disposed within the interior space of the door handle body. At least one light transmission member extends from the interior space of the door handle to an exterior surface of the door handle body so as to provide a continuous band of light along each of an upper and lower surface of the door handle.

[0006] In another aspect, a method for providing door lock status information via an intelligent lighting system that provides continuous lighting from a door handle is provided. The method includes transmitting a first light signal having a first color from a door handle when a user approaches a vehicle and comes within a predetermined area such that a key fob carried by the vehicle owner is detected by a smart antenna in the handle. When the user touches a smart sensor, a second light signal having a second color is transmitted from the door handle and all of the vehicle doors are unlocked. If the user does not get into the vehicle after a predetermined period of time, a third light signal having a third color is transmitted from the door handle and all of the doors are locked.
BRIEF DESCRIPTION OF THE DRAWINGS

[0007] A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

[0008] Figures 1A-1C illustrate various views of a door handle in accordance with an exemplary aspect of the disclosure;

[0009] Figures 2A and 2B illustrate exploded views the door handle in accordance with an exemplary aspect of the disclosure;

[0010] Figure 3A illustrates a side cut-away view of the door handle in accordance with an exemplary aspect of the disclosure

[0011] Figure 3B illustrates a top cut-away view of a door handle in accordance with an exemplary aspect of the disclosure;

[0012] Figures 4A-4F illustrate cross sectional views along a cross-section of the door handle in accordance with several exemplary aspects of the disclosure; and

[0013] Figures 5A-5D illustrate cross sectional views along the cross-section of the door handle in accordance with several further exemplary aspects of the disclosure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] Various kinds of key-less entry systems exist in the market. Some keyless entry systems require activation (such as by pushing a button) by a user in order to unlock a door lock. Other types are able to unlock a door lock without an activation by a user since a wireless key detector ("key fob") recognizes an approaching user with the key fob within a predetermined area.
A smart entry system, as referred to herein may be one of the key-less entry system which has a wireless key fob detector, a touch sensor, a user hand or grip detector and so on. The concept of this present disclosure can be applied to all kinds of key-less entry systems including smart entry system for vehicles.

I. Hardware.

Figures 1A-1C illustrate various views of a door handle in accordance with an exemplary aspect of the disclosure. In particular, a door handle 100 includes a first body member 110, which faces away from a vehicle body, and a second body member 120, which faces a vehicle body. The second body member 120 can also be understood as being located on the "working" side of the door handle, as the second body member 120 is typically grasped by a vehicle passenger to actuate the handle.

Figures 2A and 2B illustrate exploded views the door handle in accordance with an exemplary aspect of the disclosure. As shown in Figures 2A and 2B, the door handle 100 includes a smart antenna 200, which is used as part of a smart entry system. The door handle 100 further includes an LED board 310 that includes a plurality of LEDs 320. The LEDs may all transmit the same color, or each may transmit different colors from each other. The light emitted from the LEDs 320 is transmitted through the top and bottom surfaces the first body member 110 via the transmission elements 130 and 140. The transmission elements 130 and 140 can be clear resin elements that are made of, for example, acrylic or polycarbonate. As shown in Figures 2A and 2B, the transmission elements 130 and 140 are each long, continuous members that extend lengthwise along the door handle 100. Thus, unlike a configuration in which single LEDs are provided to provide single points of light, the transmission elements 130 and 140 are able to provide an uninterrupted, continuous band of light along the length of both the upper and lower portions of the door handle 100.
[0018] Figure 3A illustrates a side cut-away view of the door handle 100, and Figure 3B illustrates a top cut-away view of the door handle 100. As shown in Figure 3B, the door handle 110 is able to accommodate a wire harness 330 and an electronic circuit board 340. As discussed in greater detail below, the inclusion of the wire harness 330 and the electronic circuit board 340 in a single package with the smart antenna 200 allows the door handle to perform various lighting operations.

[0019] Figures 4A-4F illustrate cross sectional views along a cross-section of the door handle in accordance with several exemplary aspects of the disclosure. The door handles illustrated in Figures 4A-4F are designed such that the first and second transmission elements and the first and second body members of the door handle can be assembled in a watertight manner without any gaps.

[0020] Figure 4A shows a cross-sectional view of the door handle 100 taken along the line A-A in Figure 1A. The transmission element 130 is exposed to a top surface of the door handle 100, and the transmission element 140 is exposed to a bottom surface of the door handle 140. Each of the transmission elements 130 and 140 are in direct contact with both the first body member 110 and the second body member 120. As shown in Figure 4A, the LED board 310 acts as a locater that locates the transmission elements 130 and 140 within the door handle 100. In particular, the transmission member 130 is pushed up into place within the first body member 110 by a top portion of the LED board 310. Likewise, the transmission member 140 is pushed down into the first body member 110 by a bottom portion of the LED board 310. In this manner, the LED Board 310 causes the transmission elements 130 and 140 as well as the first and second body members 110 and 120 to fit together in a snug fashion without gaps. Thus, in this example, the LED Board 130 has the dual functions of supporting the LEDs 320 and also locating the transmission members 130 and 140 in the door handle 100.
[0021] Figure 4B shows a cross-section of a door handle 100a that includes a first body member 110a, a second body member 120a, a smart antenna 200a, an LED board 310a, at least one LED 320a, a transmission element 130a and a transmission element 140a. The embodiment in Figure 4B differs from the embodiment in Figure 4A in that the transmission elements 130a and 140a do not make direct contact with the second body member 120a. In this configuration, the location of the transmission elements 130a and 140a is handled by the location and size of the LED board 310, and is not affected by the location of the second body member 120a. Therefore, existing manufacturing techniques, which do not incorporate the transmission elements 130a and 140a, can be used so as to locate the first and second body members 110 and 120 relative to each other in a gap-free manner. In other words, the incorporation of the transmission elements 130a and 140a does not become a source of error in the manufacturing process with respect to the location of the first and second body members 110 and 120. Thus, the number of parts that must be manufactured with tight tolerances can be reduced. As a result, it is easier to control the overall tolerances during manufacture of the 100a, which can reduce the appearance of a gap between the first body member 110a and the second body member 120a.

[0022] Figure 4C shows a cross-section of a door handle 100b that includes a first body member 110b, a second body member 120b, a smart antenna 200b, an LED board 310b, at least one LED 320b, a transmission element 130b and a transmission element 140b. The embodiment in Figure 4C differs from the previous embodiments in that the transmission elements 130b and 140b are secured to the first body member 110b by ultrasonic welding at locations 132b and 142b. This configuration further reduces the need for tight tolerances in manufacturing, as neither of the second body member or the LED board 310b are used to locate the transmission elements 130b and 140b.
Figure 4D shows a cross-section of a door handle 100c that includes a first body member 110c, a second body member 120c, a smart antenna 200c, an LED board 310c, at least one LED 320c, a transmission element 130c and a transmission element 140c. The embodiment in Figure 4D differs from the previous embodiments in that the transmission elements 130b and 140b are secured to each of the first body member 110c, the second body member 120c, and the circuit board 210c of the smart antenna 200c, but are not in direct contact with the LED board 310c. In particular, the circuit board 210c includes stops 212c that locate the transmission elements 130b and 140b within the door handle 100c. This configuration allows for more flexibility in the placement of the LED board 310c within the door handle 100c.

Figure 4E shows a cross-section of a door handle 100d that includes a first body member 110d, a second body member 120d, a smart antenna 200d, an LED board 310d, at least one LED 320d, a transmission element 130d and a transmission element 140d. The embodiment in Figure 4E differs from the previous embodiments in that the transmission elements 130d and 140d are secured to the first body member 110d by snap-fit at locations 132d and 142d. This configuration further reduces the need for tight tolerances in manufacturing, as neither of the second body member 120d or the LED board 310d are used to locate the transmission elements 130d and 140d.

Figure 4F shows a cross-section of a door handle 100e that includes a first body member 110e, a second body member 120e, a smart antenna 200e, an LED board 310e, at least one LED 320e, a transmission element 130e and a transmission element 140e. The embodiment in Figure 4F differs from the previous embodiments in that the transmission elements 130e and 140e are secured to the second body member 120e by a slant stopper at locations 132e and 142e. The slant angle of the slant stoppers creates stabilizing forces in
both two directions, and thereby reduces the need for tight tolerances in manufacturing, as the LED board 310e is not used to locate the transmission elements 130e and 140e.

[0026] Figures 5A-5D illustrate cross sectional views of further embodiments of the present disclosure. The examples shown in Figures 5A-5D include waterproof configurations, in which the smart antenna 200 is encased in a cover so as to become a waterproof antenna assembly 200'. Likewise, the LEDs and LED boards depicted in Figures 5A-5D are configured to be waterproof in a manner that will be readily apparent to those having skill in the art. Figure 5A shows a cross-section of a door handle 100g that includes a first body member 110g, a second body member 120g, a waterproof smart antenna assembly 200', an LED board 310g, at least one LED 320g, and a single transmission element 150g. The embodiment in Figure 5A differs from the previous embodiments in that plural transmission elements are replaced by a single transmission element 150g that is sandwiched between the first body member 110g and the second body member 120g.

[0027] Figure 5B shows a cross-section of a door handle 100h that includes a first body member 110h, a second body member 120h, a waterproof smart antenna assembly 200', an LED board 310h, at least one LED 320h, a transmission element 130h and a transmission element 140h. The example in Figure 5B is the same as that shown in Figure 4A, with the exception that the smart antenna 200 is replaced with a waterproof smart antenna assembly 200'. In particular, the LED Board 310h has the dual functions of supporting the LEDs 320h and also locating the transmission members 130h and 140h in the door handle 100h.

[0028] Figure 5C shows a cross-section of a door handle 100j that includes a first body member 110j, a second body member 120j, a smart antenna 200, an LED board 310j, at least one LED 320j, a transmission element 130j and a transmission element 140j. The embodiment in Figure 5C differs from the previous embodiments in that the LED board 10j and the LED 320j are integrated with the waterproof smart antenna assembly 200'. In this
example, the waterproof smart antenna assembly 200' includes stops 212'j that locate the
transmission elements 130j and 140j within the door handle 100j.

[0029] Figure 5D shows a cross-section of a door handle 100i that includes a first body
member 110i, a second body member 120i, an LED board 310i, at least one LED 320i, a
transmission element 130i and a transmission element 140i. The embodiment in Figure 5D
differs from the previous embodiments in that the door handle 100i does not include a smart
antenna 200.

II. System Operation.

[0030] As noted above, the door handle described herein can include LEDs that transmit
several different colors. This configuration allows a vehicle passenger to gain valuable
information as they approach a vehicle with a key fob that communicates with a smart
antenna 200. For example a door handle can show a welcome status with a white light, a lock
status with a red light, and unlock status with a green light. When all of the doors include the
handles disclosed herein passengers easily understand which door is locked or unlocked.

[0031] Basically, lighting control is achieved based on a "smart entry system" such as
lighting duration. For example, in an initial state, there is no lighting. As a vehicle owner
approaches a vehicle, and comes within a predetermined area such that a key fob carried by
the vehicle owner is detected by a smart antenna in the handle, a white light is transmitted
from the handle. Once the vehicle owner touches a smart sensor, all of the vehicle doors
unlock, and the handle lights up green. Once the vehicle owner and the vehicle passengers
get into the vehicle, the handle lighting turns off.

[0032] In another example, as a vehicle owner approaches a vehicle, and comes within a
predetermined area such that a key fob carried by the vehicle owner is detected by a smart
antenna in the handle, a white light is transmitted from the handle. Once the vehicle owner
touches a smart sensor, all of the vehicle doors unlock, and the handle lights up green. In this
example, if the owner does not get into the vehicle after a predetermined period of time, all of the doors lock, and the vehicle handle lights red.

[0033] In another example, when the vehicle owner exits the vehicle, the vehicle handle lights up white. Once all of the doors are locked, the door handle lights up red. When the vehicle owner passes a predetermined distance away from the vehicle, such that the smart antenna no longer detects a key fob carried by the vehicle owner, the handle light turns off.

[0034] In another example, in an initial state, there is no lighting. As a vehicle owner approaches a vehicle, and comes within a predetermined area such that a key fob carried by the vehicle owner is detected by a smart antenna in the handle, a white light is transmitted from the handle. Once the vehicle owner touches a smart sensor, all of the vehicle doors unlock, and the handle lights up green. After a predetermined period of time (i.e. five seconds) the handle light turns white. Once the vehicle owner and the vehicle passengers get into the vehicle, the handle lighting turns off.

[0035] In another example, in an initial state, there is no lighting. As a vehicle owner approaches a vehicle, and comes within a predetermined area such that a key fob carried by the vehicle owner is detected by a smart antenna in the handle, a white light is transmitted from the handle. Once the vehicle owner touches a smart sensor, only the driver's door is unlocked, the driver's handle lights up green, and all of the other vehicle doors light up with a white light. Once the vehicle owner gets into the vehicle, the handle lighting turns off.

[0036] Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.
CLAIMS:

1. A door handle apparatus for a vehicle comprising:

   a door handle body that is configured to be disposed at a door of the vehicle;
   a light source mounted inside the door handle body;
   a light-transmitting member located between the light source and the door handle body,
   wherein the light-transmitting member is partially exposed to an exterior of the door handle body.

2. The door handle apparatus according to Claim 1, further comprising a keyless entry control circuit,
   wherein, the light source is configured separately from the keyless entry control circuit.

3. The door handle apparatus according to Claim 1, further comprising a keyless entry control circuit,
   wherein, the light source and the keyless entry control circuit is configured in an integrated manner.

4. The door handle apparatus according to Claim 1, wherein the light source is sandwiched between the door handle body for fixing.

5. The door handle apparatus according to Claim 1, wherein the light source is configured without a keyless entry control circuit.
6. The door handle apparatus according to Claim 1, wherein the light source is mounted to the light-transmitting member by a stopper.

7. The door handle apparatus according to Claim 1, wherein the light-transmitting member is mounted to the first body member by an ultrasonic welding.

8. The door handle apparatus according to Claim 1, wherein the light-transmitting member is mounted to the first body member by a snap-fit fixation.

9. The door handle apparatus according to Claim 1, wherein the light-transmitting member is mounted to the second body member by a slant stopper.

10. A door handle for a vehicle that includes an intelligent lighting system that provides continuous lighting, the door handle comprising:
    a door handle body, the door handle body including a first body member and a second body member, the first body member and a second body member being assembled together so as to define an interior space within the door handle;
    a light source disposed within the interior space of the door handle body; and
    at least one light transmission member that extends from the interior space of the door handle to an exterior surface of the door handle body so as to provide a continuous band of light along each of an upper and lower surface of the door handle.

11. The door handle according to Claim 10, wherein the at least one light transmission member includes a first transmission element and a second transmission element, the first transmission element extends from the interior space of the door handle to a
top exterior surface of the door handle body so as to provide a continuous band of light along the upper surface of the door handle, and the second transmission element extends from the interior space of the door handle to a bottom exterior surface of the door handle body so as to provide a continuous band of light along the lower surface of the door handle.

12. The door handle according to Claim 11, further comprising a light source circuit board that supports the light source, wherein the light source circuit board is positioned within the interior space of the door handle so as to make direct contact with the first and second transmission elements and thereby locate the first and second transmission elements within the first body member.

13. The door handle according to Claim 12, wherein each of the first and second transmission elements are in direct contact with each of the first and second body members.

14. The door handle according to Claim 12, wherein each of the first and second transmission elements are in direct contact with the first body member, and each of the first and second transmission elements are not in direct contact with the second body member.

15. The door handle according to Claim 11, further comprising:

a light source circuit board that supports the light source; and

a keyless entry circuit board that supports a keyless entry antenna, the keyless entry circuit board including stoppers that make direct contact with the first and second transmission elements so as to locate the first and second transmission elements within the first body member.
16. The door handle apparatus according to Claim 10, wherein the light-transmitting member is mounted to the first body member by an ultrasonic welding.

17. The door handle apparatus according to Claim 10, wherein the light-transmitting member is mounted to the first body member by a snap-fit fixation.

18. The door handle apparatus according to Claim 10, wherein the light-transmitting member is mounted to the second body member by a slant stopper.

19. A method for providing door lock status information via an intelligent lighting system that provides continuous lighting from a door handle, the method comprising:

   transmitting a first light signal having a first color from a door handle when a user approaches a vehicle and comes within a predetermined area such that a key fob carried by the vehicle owner is detected by a smart antenna in the handle;

   transmitting a second light signal having a second color from the door handle and causing all of the vehicle doors to unlock when the user touches a smart sensor; and

   transmitting a third light signal having a third color from the door handle and causing all of the doors lock if the user does not get into the vehicle after a predetermined period of time.