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ACCESSORY MANAGEMENT FOR A VEHICLE

Abstract

A vehicle includes a center console that includes an interface. At least one accessory is configured for installation to the center console via the interface and including an identifier. A detection circuit is configured to detect a user approaching the vehicle. An identification circuit is configured to determine the identifier in response to a scanning command. A display indicates instructions for the installation of the at least accessory in response to an indication signal. Control circuitry is in communication with the detection circuit, the identification circuit, and the display, and is configured to communicate the scanning command in response to detection of the user approaching the vehicle and communicate the indication signal based on detection of the identifier.

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Background/Summary

FIELD OF THE DISCLOSURE

[0001] The present disclosure generally relates to accessory management for a vehicle and, more particularly, to an accessory management system that identifies different types of accessories to selectively allow connection with a center console of the vehicle.

BACKGROUND OF THE DISCLOSURE

[0002] Conventional storage management arrangements for a vehicle can have limited adaptability.

SUMMARY OF THE DISCLOSURE

[0003] According to a first aspect of the present disclosure, a vehicle includes a center console that includes an interface. At least one accessory is configured for installation to the center console via the interface and including an identifier. A detection circuit is configured to detect a user approaching the vehicle. An identification circuit is configured to determine the identifier in response to a scanning command. A display indicates instructions for the installation of the at least one accessory in response to an indication signal. Control circuitry is in communication with the detection circuit, the identification circuit, and the display, and is configured to communicate the scanning command in response to detection of the user approaching the vehicle and communicate the indication signal based on detection of the identifier.

[0004] Embodiments of the first aspect of the present disclosure can include any one or a combination of the following features: [0005] wherein the control circuitry is configured to compare the identifier to identification information corresponding to compatible accessories and classify the at least one accessory as compatible or incompatible based on the comparison; [0006] wherein the control circuitry is configured to communicate the indication signal further in response to classification of the at least one accessory as compatible; [0007] a light configured to illuminate an area proximate to the console assembly that receives the at least one accessory in response to classification of the at least one accessory as compatible; [0008] a sensing circuit that detects alignment of the at least one accessory with the interface, wherein the interface includes a mechanical interface configured to lock the at least one accessory to the center console in response to alignment of the at least one accessory with the interface and classification of the at least one accessory as compatible; [0009] wherein the control circuitry is configured to limit activation of the mechanical interface in response to alignment of the at least one accessory with the interface and classification of the at least one accessory as incompatible; [0010] wherein the interface includes an electrical interface that electrically couples at least one accessory with the control circuitry, wherein the control circuitry is configured to control an electrical component of the accessory when the at least one accessory is locked with the interface; [0011] wherein the display is configured to indicate incompatibility in response to classification of the at least one accessory as incompatible; [0012] wherein the control circuitry is in communication with a server remote from the vehicle that determines software update availability in response to an update request, wherein the control circuitry is configured to communicate the update request in response to classification of the at least one accessory as compatible; [0013] wherein the control circuitry is configured to determine an incompatibility source as outdated or unknown and communicate the update request in response to determination of the incompatibility source as outdated; and [0014] a climate control system, wherein the interface includes a port in fluid communication with the climate control system and configured to provide climate-controlled air into the at least one accessory when the at least one accessory is connected to the interface.

[0015] According to a second aspect of the present disclosure, a vehicle includes a center console that includes an interface, at least one accessory configured for installation to the center console via the interface and including an identifier, a detection circuit configured to detect a user approaching

the vehicle, an identification circuit configured to determine the identifier in response to a scanning command, a display that indicates instructions for the installation of the at least accessory in response to an indication signal, and control circuitry in communication with the detection circuit, the identification circuit, and the display. The control circuitry is configured to communicate the scanning command in response to detection of the user approaching the vehicle, communicate the indication signal based on detection of the identifier, compare the identifier to identification information corresponding to compatible accessories, classify the at least one accessory as compatible or incompatible based on the comparison.

[0016] Embodiments of the second aspect of the present disclosure can include any one or a combination of the following features: [0017] wherein the control circuitry is configured to communicate the indication signal further in response to classification of the at least one accessory as compatible; [0018] a light configured to illuminate an area proximate to the console assembly that receives the at least one accessory in response to classification of the at least one accessory as compatible; [0019] a sensing circuit that detects alignment of the at least one accessory with the interface, wherein the interface includes a mechanical interface configured to lock the at least one accessory to the center console in response to alignment of the at least one accessory with the interface and classification of the at least one accessory as compatible; [0020] the control circuitry is configured to limit activation of the mechanical interface in response to alignment of the at least one accessory with the interface and classification of the at least one accessory as incompatible; [0021] the interface includes an electrical interface that electrically couples at least one accessory with the control circuitry, wherein the control circuitry is configured to control an electrical component of the accessory when the at least one accessory is locked with the interface; and [0022] the display is configured to indicate incompatibility in response to classification of the at least one accessory as incompatible.

[0023] According to a third aspect of the present disclosure, a vehicle includes a center console that includes an interface, at least one accessory configured for installation to the center console via the interface and including an identifier, an identification circuit configured to determine the identifier in response to a scanning command, a display that indicates instructions for the installation of the at least accessory in response to an indication signal, and control circuitry in communication with the identification circuit and the display. The control circuitry is configured to communicate the scanning command, compare the identifier to identification information corresponding to compatible accessories, classify the at least one accessory as compatible or incompatible based on the comparison, and communicate the indication signal based on detection of the identifier.

[0024] Embodiments of the third aspect of the present disclosure can include any one or a combination of the following features: [0025] wherein the control circuitry is in communication with a server remote from the vehicle that determines software update availability in response to an update request, wherein the control circuitry is configured to communicate the update request in response to classification of the at least one accessory as compatible.

[0026] These and other features, advantages, and objects of the present disclosure will be further understood and appreciated by those skilled in the art by reference to the following specification, claims, and appended drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] In the drawings:

[0028] FIG. 1 is a perspective view of a user approaching a vehicle holding an accessory configured to interact with a center console of the vehicle;

[0029] FIG. 2 is a functional block diagram of an accessory management system for a vehicle;

[0030] FIG. 3 is a side plan view of a center console configured to receive at least one accessory that includes a striker feature interacting with a portion of the center console;
[0031] FIG. 4 is an exemplary image of a display configured to guide a user to install at least one accessory into the center console according to one example;
[0032] FIG. 5 is a perspective view of a center console configured to receive at least one accessory and including an interface for interacting with do you at least one accessory;
[0033] FIG. 6 is a flow diagram of an exemplary process for managing accessory operability with a vehicle; and
[0034] FIG. 7 is a flow diagram of an exemplary process for managing an accessory coupled to the center console of a vehicle.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0035] Reference will now be made in detail to the present preferred embodiments of the disclosure, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numerals will be used throughout the drawings to refer to the same or like parts. In the drawings, the depicted structural elements are not to scale and certain components are enlarged relative to the other components for purposes of emphasis and understanding.

[0036] As required, detailed embodiments of the present disclosure are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the disclosure that may be embodied in various and alternative forms. The figures are not necessarily to a detailed design; some schematics may be exaggerated or minimized to show function overview. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a representative basis for teaching one skilled in the art to variously employ the present disclosure.

[0037] For purposes of description herein, the terms “upper,” “lower,” “right,” “left,” “rear,” “front,” “vertical,” “horizontal,” and derivatives thereof shall relate to the concepts as oriented in FIG. 1. However, it is to be understood that the concepts may assume various alternative orientations, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification are simply exemplary embodiments of the inventive concepts defined in the appended claims. Hence, 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.

[0038] The present illustrated embodiments reside primarily in combinations of method steps and apparatus components related accessory management for a vehicle. Accordingly, the apparatus components and method steps have been represented, where appropriate, by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the present disclosure so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein. Further, like numerals in the description and drawings represent like elements.

[0039] Generally referring to the figures, the present systems and methods provide for dynamic docking of various removable devices in a vehicle environment. Further, the present disclosure provides for enhanced operability management of the removable devices and connections thereto. The present disclosure also provides for electrical, mechanical, and/or fluid communication between to the removable device when the removable device is installed. Lastly, the present disclosure provides for software management for controlling interaction between the removable device and the vehicle environment.

[0040] Referring generally to FIGS. 1-7, a vehicle **10** includes a center console **12** that includes an interface **14**. At least one accessory **16** is configured for installation to the center console **12** via the interface **14** and includes an identifier **18**. A detection circuit **20** is configured to detect a user **22** approaching the vehicle **10**. An identification circuit **24** is configured to determine the identifier **18** in response to a scanning command. A display **26** indicates instructions for the installation of the at

least one accessory **16** in response to an indication signal. The vehicle **10** includes control circuitry **28** in communication with the detection circuit **20**, the identification circuit **24**, and the display **26**. The control circuitry **28** is configured to communicate the scanning command in response to detection of the user **22** approaching the vehicle **10**. The control circuitry **28** is also configured to communicate the indication signal based on detection of the identifier **18**.

[0041] Referring now to FIG. **1**, a management system **30** for one or more accessories **16** is demonstrated in a vehicle environment. The vehicle environment includes a vehicle **10** and a region **32** external to the vehicle **10** that may be scanned or otherwise monitored by one or more detectors **34**, such as cameras **36**, proximity sensors **38**, radio frequency antennas, or any other wireless detection device that is configured to detect a user **22** approaching the vehicle **10** in the region **32** external to the vehicle **10**. For example, the user **22** may carry or equip an electronic device, such as a mobile device **40** (e.g., a smartphone), a key for the vehicle **10** having wireless communication features (e.g., Bluetooth®, Zigbee®, Z-wave®, etc.), or any other electronic device that may be detected by the detector. In this way, the user **22** may be detected as approaching the vehicle **10**. In response to detection of the user **22** approaching the vehicle **10**, various functions may be carried out automatically, such as unlocking the vehicle **10**. In one example that will be described herein, the management system **30** may initiate a wake-up sequence for actively sensing or detecting one or more accessories **16** for installation into the vehicle **10**. The mobile device **40** may be communicatively coupled with the vehicle **10** via one or more network(s), which may communicate via one or more wireless connection(s), and/or may connect with the vehicle **10** directly using Near Field Communication (NFC) protocols, Bluetooth® protocols, Wi-Fi, Ultra-Wide Band (UWB), and other possible data connection and sharing techniques.

[0042] It is contemplated that, while the accessory **16** shown and described herein is a container **42** (e.g., a portable cooler), the accessory **16** may include any other accessory **16** for interaction with the center console **12** that may be selectively removed from the center console **12**. For example, charging devices, coolers, removable warming compartments, audio devices, or any other device that can interact with the center console **12** may be managed by the present management system **30**.

[0043] Referring now to FIG. **2**, the management system **30** includes an accessory management circuit **44** that includes a detection circuit **20**, an identification circuit **24**, a sensing circuit **46**, and control circuitry **28** local to the vehicle **10** and in communication with a server **48** remote from the vehicle **10**. For example, the communication circuitry may be communicatively coupled with a network **50**, such as a wireless network **50**, that allows for data transfer for updating various portions of the management system **30**. By way of example, the server **48** may be configured to push updates to the control circuitry **28** based on software revisions and/or software levels of the control circuitry **28**, the detection circuit **20**, the identification circuit **24**, or any other software-based circuitry of the management system **30**. Accordingly, the server **48** may be operable to update detection, identification, or control of the management system **30** to optimally manage interaction with the accessory **16**.

[0044] As previously described, one or more detectors may be configured to detect the user **22** approaching the vehicle **10**. Accordingly, the detection system may include the detectors and circuitry configured to process signals from the detectors to determine a user **22** approaching the vehicle **10**. For example, an image processor **56** may be provided for processing images captured by a camera that monitors the region **32** external to the vehicle **10** and classifies objects (e.g., the user **22**, the accessory **16**).

[0045] With continued reference to FIG. **2**, the identification circuit **24** includes wireless communication features that are configured to detect and/or identify the accessory **16** in response to activation by the control circuitry **28**. The identification circuit **24** can include any wireless communication protocol but, in an exemplary embodiment, includes radio frequency identification (RFID) and is configured to identify the accessory **16** based on unique signal identifiers exchanged between the accessory **16** and the identification circuit **24**. For example, an RFID tag **52** or other

RFID circuitry may be operably coupled with the accessory **16** to allow the identification circuit **24** to identify a make, model, type, or any other identifiable features of the accessory **16**. By way of example, each accessory **16** may be equipped with identifying information such as identifiers **18** indicating available types of connections (electrical, mechanical, fluid). Information regarding the shapes and/or sizes of the accessories **16** may also be encoded in signals between the accessory **16** and the identification circuit **24**. Based on the information communicated, the control circuitry **28** can determine compatibility, incompatibility, operability, inoperability, false designation of origin, true designation of origin, or the like. In this way, the management system **30** may automatically detect and control different types of accessories **16**.

[0046] It is contemplated that other wireless protocols may be employed for identification of the accessory **16**, such as Bluetooth®, Bluetooth-low-energy (BLE), ZigBee®, Z-wave®, or any other wireless communication protocol. In some examples, the wireless communication protocol is a low power feature that is “woken up” when a user **22** is detected approaching the vehicle **10**. In response to the wake-up signal, the RFID detection (or other wireless identification method) algorithm may be executed by the identification circuit **24**. In this way, power consumption of the management system **30** may be limited and/or optimized.

[0047] Still referring to FIG. 2, the control circuitry **28** includes a controller **54** having a processor **56** and a memory **58**. The memory **58** is configured to store instructions that, when executed by the processor **56**, cause the controller **54** to interact with the detection circuit **20**, the identification circuit **24**, and other circuitry of the management system **30** to optimally manage the accessory **16** and/or connection between the center console **12** and the accessory **16**. For example, as previously described, the center console **12** can include an interface **14** that can mechanically, electrically, and/or fluidly connect with the accessory **16** and serve to dock the accessory **16** to the center console **12**. The sensing circuit **46** is provided for detecting alignment of the accessory **16** with the interface **14**. The sensing circuit **46** can include a position sensor **60**, such as an electrical switch, that electrically closes in response to mechanical interaction and/or alignment of the accessory **16** with the interface **14**.

[0048] The management system **30** can also include lights **62**, the display **26**, and a climate control system **64** for the vehicle **10** or local to the center console **12**. Accordingly, the climate control system **64** may be a local climate control system **64** or a vehicle **10**-wide climate control system **64** having one or more heating/cooling circuits for heating/cooling the accessory **16** when the accessory **16** is operably coupled with the interface **14**. The lights **62**, which may include light-emitting diodes or any other lighting device, may be arranged in a target area **66** proximate to the center console **12** for illuminating a target area **66** for installing the accessory **16**, as will be described in the foregoing figures. Accordingly, the control circuitry **28** may process information from the detection circuit **20**, the identification circuit **24**, and the server **48**, and control one or more of the devices, such as the lights **62**, the display **26**, and/or the climate control circuitry **28**. The interface **14** can include both inputs and outputs, as will be described further herein.

[0049] Referring now to FIGS. 3-5, the center console **12** is demonstrated defining a receptacle **68** configured to receive the accessory **16**. The console includes a central support **70** operably coupled with a floor **72** of the vehicle **10** via a base **74**. The central support **70** supports an upper portion **76** of the center console **12** that may support arms of the user **22** (e.g., a driver and/or a passenger), cup holders **78**, phone holders, compartments for storage, or the like. In some examples, a charging port may be provided, such as a universal serial bus (USB) report that may provide power and/or data connectivity between the mobile device **40** and the vehicle **10**.

[0050] The interface **14** of the center console **12** may be disposed adjacent to the receptacle **68** and provide for mechanical, electrical, and/or fluid communication with the accessory **16**. For example, the accessory **16** may include a striker **80** feature along a lower portion **82** of the accessory **16** that is configured to interact with a catch **84** to mechanically secure the accessory **16** with the vehicle **10**. Other connections may be provided, as will be described with respect to FIG. 5. With continued

reference to FIG. 3, the accessory management circuit **44** may be in wireless communication with the accessory **16**. For example, the previously described identification circuit **24** may be actively identifying the accessory **16**, and the accessory management circuit **44** may present instructions, or indications, for installation of the accessory **16** via the display **26**.

[0051] Referring now to FIG. 4, an exemplary user interface (UI **86**) demonstrates an instruction for the accessory **16** to be installed with the center console **12**. Accordingly, various pictographic representations, words, or other communication may be indicated at the UI **86** to indicate to the user **22** how to install the specific accessory **16** identified by the identification circuit **24**. For example, while one accessory **16** is demonstrated throughout the figures, various accessories **16** having different shapes, models, manufacturers, or other properties may be configured to interact with the interface **14** and install with the console. Thus, the memory **58** of the control circuitry **28** may store various images and/or instructions demonstrating installation of a plurality of the accessories **16**. In this way, a detailed guide of how to install a target accessory **16** identified by the identification circuit **24** may be presented at the display **26**.

[0052] Referring now to FIG. 5, the target area **66** for the accessory **16** is demonstrated in the receptacle **68** defined by the base **74** of the center console **12** and generally aligned with the interface **14**. The lights **62** may surround or otherwise be configured to illuminate the target area **66** in response to a signal from the control circuit. For example, upon detection of a compatible accessory **16**, the controller **54** may activate the lights **62** with a flashing sequence to indicate placement of the accessory **16**. The interface **14** includes a mechanical interface **88** that locks the accessory **16** with the center console **12**, an electrical interface **90** that electrically couples the accessory **16** with the center console **12**, and a fluid interface **92** that fluidly couples the accessory **16** with the climate control system **64**. This configuration is merely exemplary and non-limiting. For example, in other configurations, only one or some of the mechanical interface **88**, the electrical interface **90**, and the fluid interface **92** is provided.

[0053] The mechanical interface **88** can include the catch **84** that interacts with the striker **80** or other mechanical features of the accessory **16** to secure the accessory **16** to the vehicle **10**. For example, a hook or other mechanism can move to a locked position in response to the catch **84** receiving the striker **80**. The catch **84** may be electronically controlled via the control circuitry **28**, which may activate the catch **84** in response to movement of the catch **84** or other mechanism of the catch **84**. Accordingly, the sensing circuit **46** may be operably coupled with the mechanical interface **88** to detect engagement/alignment of the accessory **16** with the mechanical interface **88**. For example, the striker **80** can include a bar **94** that engages the catch **84** and moves one or more parts of the catch **84** to cause a position sensor **60** to electrically close. The control circuitry **28** can detect closing of the position sensor **60** and, in response, communicate a signal to move the hook to secure the bar **94**. For example, a solenoid, a valve, a motor, or another electro-mechanical device can be energized to lock the accessory **16**.

[0054] The electrical interface **90** may include a power and/or data bus for powering and/or communicating with one or more components of the accessory **16** for example, in addition to the identifier **18** of the accessory **16**, a validation circuit may be provided in the accessory **16** that communicates an indication of identity over wired connection following coupling of the electrical interface **90**. For example, the electrical interface **90** may include a male part that receives a female part on the accessory **16**, or vice versa. Accordingly, the accessory **16** can plug into the electrical interface **90** to exchange data/or power.

[0055] In addition or as an alternative to validation over wired communication, the electrical interface **90** may provide power to one or more cooling or heating elements for cooling/heating the accessory **16**. For example, if the accessory **16** is a self-contained cooling device (active cooler), the accessory **16** may cool contents of the accessory **16** using electrical power from the electrical interface **90**.

[0056] Still referring to FIG. 5, a conduit **96** or other tubing may be provided within the center

console **12** for fluid communication with the climate control system **64**. For example, the conduit **96** may extend within a body of the center console **12** and into the floor **72** of the vehicle **10** to return to the climate control system **64**. The climate control system **64** can include one more baffles and/or heat exchangers for selectively providing heated or cooled air to the accessory **16** when the accessory **16** is connected with the interface **14**. For example, the fluid interface **92** can include a door **98** that opens in response to the accessory **16** engaging the interface **14**. For example, the door **98** may be a hinged door **98** that is biased toward a closed position that is pushed open by the accessory **16**. Accordingly, when the accessory **16** is connected with the interface **14**, an internal environment of the accessory **16** may be climate controlled.

[0057] In general, interaction between the accessory **16** and the interface **14** may be controlled by the accessory management circuit **44** previously described. For example, incompatible accessories **16** may be detected using the identification circuit **24** and one or more of the features of the interface **14** may be limited from completing connection with the vehicle **10**. For example, the control circuitry **28** may limit activation of the catch **84** to lock the accessory **16** with the vehicle **10** in response to detection of an incompatible accessory **16**. Further, or alternatively, other connections of the interface **14** may be limited from interfacing with the interface **14**. For example, in a spoofing scenario in which the identification circuit **24** detects a valid accessory **16**, upon electrical connection at the electrical interface **90** with the accessory **16**, the validation circuit may serve as a backup check to confirm compatibility of the accessory **16** with the interface **14**. By way of example, an unapproved manufacturer of the accessory **16** may manufacture an accessory **16** with a spoofed identifier **18** while being limited from spoofing the validation circuit which may be detected by the control circuitry **28** upon wired communication at via the electrical interface **90**.

[0058] As will be described further in reference to FIGS. **6** and **7**, in addition to anti-spoofing measures, the interface **14** may further provide for detection of out-of-date software and provide for automatic downloading and/or requesting for downloading of updated software to expand a list or database **74** of compatible devices. For example, the vehicle **10** incorporating the center console **12** and/or interface **14** may be manufactured at a first date, and future upfit accessories **16** may be manufactured at a second date later than the first date. Accordingly, a software update may be required for interfacing with the center console **12**. Thus, active tracking and updating of software revisions may be provided by access to the server **48** via the network **50**.

[0059] Referring now to FIG. **6**, a first method **600**, or process, carried out by the management system **30** includes a pre-connection stage via wireless communication. The first method includes sensing a user **22** approaching the vehicle **10** at step **602**. In response, the control circuitry **28** communicates a signal to the identification circuit **24** to wake up or initiate an identification algorithm executed by the identification circuit **24** at step **604**. At step **608**, the identification circuit **24** scans for the accessory **16** in order to detect the identifier **18** (e.g., an RFID identifier **18**, a response signal via Bluetooth). While BLE and RFID are presented at step **608** as possible communication methods, other communication protocols described herein may be implemented for scanning of the accessory **16**. At step **610**, the identification circuit **24** reads the identifier **18**. At step **612**, the control circuitry **28** searches the memory **58** and/or a database **74** at the server **48** to recognize the identifier **18**.

[0060] If the control circuitry **28** recognizes the identifier **18** and it is classified as a compatible device (step **614**), the control circuitry **28** nonetheless communicates, via the network **50**, to the remote server **48** to search for software updates for the management system **30** (step **616**).

Concurrently, or following the communication to the server **48**, the control circuitry **28** communicates an instruction to the display **26** to indicate installation of the accessory **16** to the interface **14** based on the particular ID (step **618**). For example, the control circuitry **28** can select between a plurality of different screens corresponding to different accessories **16** compatible with the vehicle **10**. The screens may include motion arrows and/or a sequence of images demonstrating a time lapse video indicating steps or instructions for installation of the given accessory **16**. The

control circuitry **28** may further activate the lights **62** during when the instructions are presented at the UI **86** to guide the user **22** to the area for to install the accessory **16**.

[0061] It is contemplated that other instructions may be presented at the display **26** relevant to the operation of the given accessory **16**. For example, based on the identity of the detected accessory **16**, electrical and/or fluid communication with the accessory **16** may be initiated. For example, the climate control system **64** may heat or cool the accessory **16** based on the identity of the accessory **16**. Further, other options specific to the accessory **16** identified may be presented at the display **26** for manual control over environmental conditions and/or electrical conditions for interaction with the accessory **16**.

[0062] If the control circuitry **28** does not recognize the identifier **18** of the accessory **16** (step **620**), the control circuitry **28** may run a system diagnostic to classify the incompatibility as due to unauthorized make or model, or legacy/newer model that is otherwise compatible (step **622**). If an unauthorized make or model is detected (step **624**), the method includes indicating at the display **26** that the given accessory **16** cannot connect (step **626**). Further, the locking of the accessory **16** with the center console **12** may be limited (e.g., the mechanical interface **88** may be limited) from controlling the catch **84** in either an automatic or manual operating mode. Stated differently, in some examples, classification of the incompatible accessory **16** as unauthorized may limit the user **22** from activating the catch **84** manually to override the unauthorized use.

[0063] If the control circuitry **28** categorizes the incompatibility as a result of legacy/outdated products or new/upfit products (step **628**), the control circuitry **28** may communicate with the server **48** to download software to allow interaction with outdated or updated makes/models that are otherwise authorized. The user **22** can be prompted for the software update at step **630**.

[0064] Referring now to FIG. 7, a second method, or process, carried out by the management system **30** includes the physical docking of the accessory **16** with the interface **14** and communication thereafter. At step **702**, the user **22** docks the accessory **16**. Add step **704**, following classification as a compatible device, the control circuitry **28** initiates physical connection with the interface **14** (e.g., the mechanical interface **88**). For example, the control circuitry **28** may communicate a signal to the catch **84** to move to a closed position to lock with the striker **80**. At step **706**, electrical connections with the electrical interface **90** and the accessory **16** are initialized via initialization signals between the control circuitry **28** and the accessory **16**. At step **708**, the control system searches for updates at the server **48** to provide optimal operational features for the accessory **16**. At step **710**, various diagnostics and/or checks for proper operation of the accessory **16** are communicated between the control circuitry **28** and the accessory **16** via the electrical interface **90**. For example, the validation circuit previously described may be in communication with the control circuitry **28** to validate compatibility and/or optimal operation.

[0065] At step **712**, the display **26** is updated to indicate the corresponding accessory **16** throughout operation with the accessory **16**. For example, the control circuitry **28** may search for and select a plurality of screens for the UI **86** at the display **26** to show pictures and/or video of the given accessory **16** identified by the identification circuit **24**ry and/or the wired connection. Stated differently, the memory **58** can include various sets of images and/or video demonstrating installation and/or operations specific to this particular make/model of the accessory **16** identified. It is contemplated that the user interface may also, or alternatively, include audio instructions for guiding the user **22** for installation and operation of the accessory **16** to the interface **14**.

[0066] At step **714**, while the accessory **16** is installed and connected with the interface **14**, the UI **86** provides control by the user **22** over the accessory **16**. For example, climate control, such as temperature, humidity, or another climate feature may be controlled at the UI **86**. Because the interface **14** may be operable with a plurality of different accessories **16** with some having climate control and others lacking climate control, the set of screens selected by the control circuitry **28** may be specific to the make/model of the accessory **16** identified, and climate control may be limited to those models enabled with climate control. At step **716**, visual and/or audio indications

may be provided by the user interface to indicate an unloading sequence to disconnect the accessory **16** from the interface **14**. For example, upon a key-off scenario (ignition off/power off), the display **26** can update to an indication to remove the accessory **16** and provide instructions to do so.

[0067] In general, the present management system **30** may provide for a dynamic operation among a plurality of different accessories **16** that may be operable with a common interface **14** of the center console **12**. Further, the present management system **30** may provide for anti-spoofing measures and enhanced operation of the accessory **16** when installed with the center console **12**.

[0068] As used herein, the term “and/or,” when used in a list of two or more items, means that any one of the listed items can be employed by itself, or any combination of two or more of the listed items, can be employed. For example, if a composition is described as containing components A, B, and/or C, the composition can contain A alone; B alone; C alone; A and B in combination; A and C in combination; B and C in combination; or A, B, and C in combination.

[0069] In this document, relational terms, such as first and second, top and bottom, and the like, are used solely to distinguish one entity or action from another entity or action, without necessarily requiring or implying any actual such relationship or order between such entities or actions. The terms “comprises,” “comprising,” or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises a list of elements does not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element preceded by “comprises . . . a” does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus that comprises the element.

[0070] As used herein, the term “about” means that amounts, sizes, formulations, parameters, and other quantities and characteristics are not and need not be exact, but may be approximate and/or larger or smaller, as desired, reflecting tolerances, conversion factors, rounding off, measurement error and the like, and other factors known to those of skill in the art. When the term “about” is used in describing a value or an endpoint of a range, the disclosure should be understood to include the specific value or end-point referred to. Whether or not a numerical value or endpoint of a range in the specification recites “about,” the numerical value or end-point of a range is intended to include two embodiments: one modified by “about,” and one not modified by “about.” It will be further understood that the end-points of each of the ranges are significant both in relation to the other end-point, and independently of the other end-point.

[0071] The terms “substantial,” “substantially,” and variations thereof as used herein are intended to note that a described feature is equal or approximately equal to a value or description. For example, a “substantially planar” surface is intended to denote a surface that is planar or approximately planar. Moreover, “substantially” is intended to denote that two values are equal or approximately equal. In some embodiments, “substantially” may denote values within about 10% of each other, such as within about 5% of each other, or within about 2% of each other.

[0072] As used herein the terms “the,” “a,” or “an,” mean “at least one,” and should not be limited to “only one” unless explicitly indicated to the contrary. Thus, for example, reference to “a component” includes embodiments having two or more such components unless the context clearly indicates otherwise.

[0073] It is to be understood that variations and modifications can be made on the aforementioned structure without departing from the concepts of the present disclosure, and further, it is to be understood that such concepts are intended to be covered by the following claims unless these claims by their language expressly state otherwise.

Claims

- 1.** A vehicle comprising: a center console that includes an interface; at least one accessory configured for installation to the center console via the interface and including an identifier; a detection circuit configured to detect a user approaching the vehicle; an identification circuit configured to determine the identifier in response to a scanning command; a display that indicates instructions for the installation of the at least one accessory in response to an indication signal; and control circuitry in communication with the detection circuit, the identification circuit, and the display, and configured to communicate the scanning command in response to detection of the user approaching the vehicle and communicate the indication signal based on detection of the identifier.
- 2.** The vehicle of claim 1, wherein the control circuitry is configured to compare the identifier to identification information corresponding to compatible accessories and classify the at least one accessory as compatible or incompatible based on the comparison.
- 3.** The vehicle of claim 2, wherein the control circuitry is configured to communicate the indication signal further in response to classification of the at least one accessory as compatible.
- 4.** The vehicle of claim 2, further comprising: a light configured to illuminate an area proximate to the console assembly that receives the at least one accessory in response to classification of the at least one accessory as compatible.
- 5.** The vehicle of claim 3, further comprising: a sensing circuit that detects alignment of the at least one accessory with the interface, wherein the interface includes a mechanical interface configured to lock the at least one accessory to the center console in response to alignment of the at least one accessory with the interface and classification of the at least one accessory as compatible.
- 6.** The vehicle of claim 5, wherein the control circuitry is configured to limit activation of the mechanical interface in response to alignment of the at least one accessory with the interface and classification of the at least one accessory as incompatible.
- 7.** The vehicle of claim 5, wherein the interface includes an electrical interface that electrically couples at least one accessory with the control circuitry, wherein the control circuitry is configured to control an electrical component of the accessory when the at least one accessory is locked with the interface.
- 8.** The vehicle of claim 2, wherein the display is configured to indicate incompatibility in response to classification of the at least one accessory as incompatible.
- 9.** The vehicle of claim 2, wherein the control circuitry is in communication with a server remote from the vehicle that determines software update availability in response to an update request, wherein the control circuitry is configured to communicate the update request in response to classification of the at least one accessory as compatible.
- 10.** The vehicle of claim 9, wherein the control circuitry is configured to determine an incompatibility source as outdated or unknown and communicate the update request in response to determination of the incompatibility source as outdated.
- 11.** The vehicle of claim 1, further comprising: a climate control system, wherein the interface includes a port in fluid communication with the climate control system and configured to provide climate-controlled air into the at least one accessory when the at least one accessory is connected to the interface.
- 12.** A vehicle comprising: a center console that includes an interface; at least one accessory configured for installation to the center console via the interface and including an identifier; a detection circuit configured to detect a user approaching the vehicle; an identification circuit configured to determine the identifier in response to a scanning command; a display that indicates instructions for the installation of the at least one accessory in response to an indication signal; and control circuitry in communication with the detection circuit, the identification circuit, and the display, and configured to: communicate the scanning command in response to detection of the user approaching the vehicle; communicate the indication signal based on detection of the identifier; compare the identifier to identification information corresponding to compatible

accessories; and classify the at least one accessory as compatible or incompatible based on the comparison.

13. The vehicle of claim 12, wherein the control circuitry is configured to communicate the indication signal further in response to classification of the at least one accessory as compatible.

14. The vehicle of claim 12, further comprising: a light configured to illuminate an area proximate to the console assembly that receives the at least one accessory in response to classification of the at least one accessory as compatible.

15. The vehicle of claim 13, further comprising: a sensing circuit that detects alignment of the at least one accessory with the interface, wherein the interface includes a mechanical interface configured to lock the at least one accessory to the center console in response to alignment of the at least one accessory with the interface and classification of the at least one accessory as compatible.

16. The vehicle of claim 15, wherein the control circuitry is configured to limit activation of the mechanical interface in response to alignment of the at least one accessory with the interface and classification of the at least one accessory as incompatible.

17. The vehicle of claim 15, wherein the interface includes an electrical interface that electrically couples at least one accessory with the control circuitry, wherein the control circuitry is configured to control an electrical component of the accessory when the at least one accessory is locked with the interface.

18. The vehicle of claim 12, wherein the display is configured to indicate incompatibility in response to classification of the at least one accessory as incompatible.

19. A vehicle comprising: a center console that includes an interface; at least one accessory configured for installation to the center console via the interface and including an identifier; an identification circuit configured to determine the identifier in response to a scanning command; a display that indicates instructions for the installation of the at least accessory in response to an indication signal; and control circuitry in communication with the identification circuit and the display and configured to: communicate the scanning command; compare the identifier to identification information corresponding to compatible accessories; classify the at least one accessory as compatible or incompatible based on the comparison; and communicate the indication signal based on detection of the identifier.

20. The vehicle of claim 19, wherein the control circuitry is in communication with a server remote from the vehicle that determines software update availability in response to an update request, wherein the control circuitry is configured to communicate the update request in response to classification of the at least one accessory as compatible.
