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(54) **AFTERMARKET HEAD UNIT INSTALLATION KIT FOR USE WITH SALVAGED ORIGINAL EQUIPMENT MANUFACTURER (OEM) VEHICLE CONTROLS**

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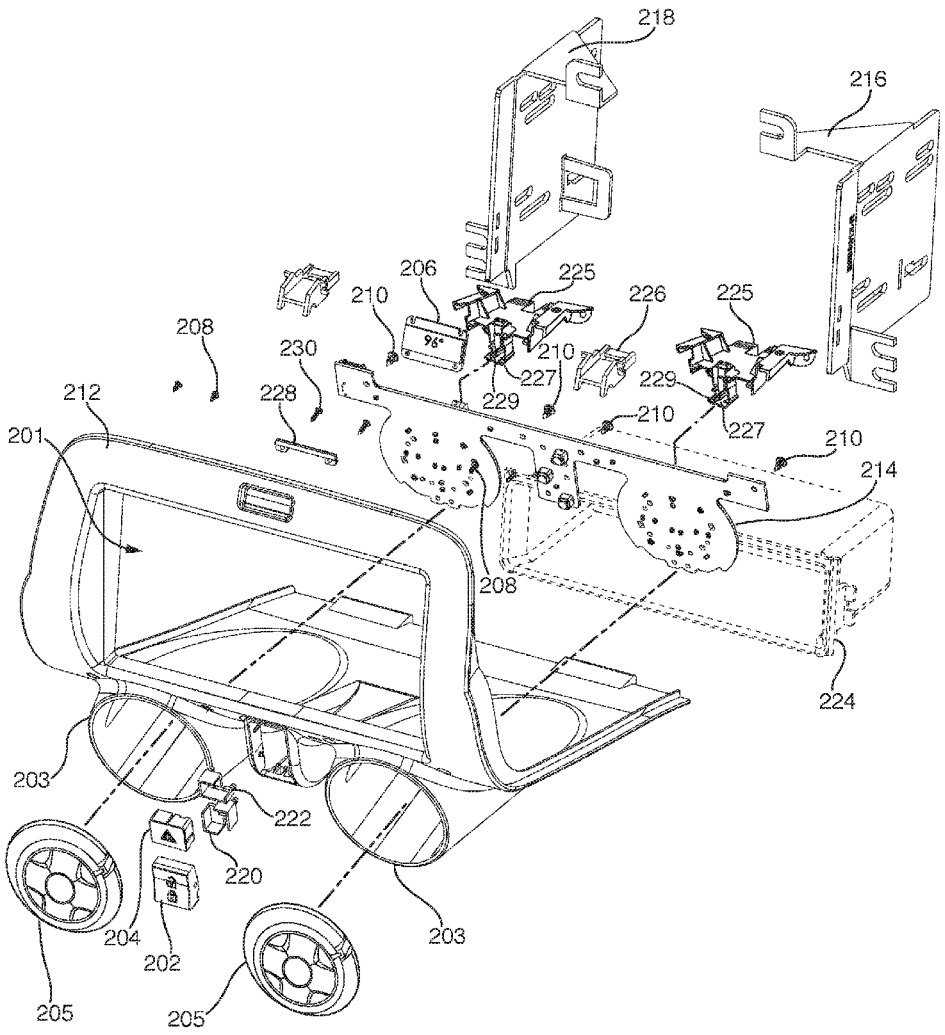
(52) **U.S. Cl.**
CPC ***H04B 1/3822*** (2013.01); *G06F 3/0362* (2013.01)

(57) **ABSTRACT**

Aspects of the disclosure relate to an aftermarket autosound head unit installation kit for enabling installation of an aftermarket radio in a vehicle. The kit may include a panel. The panel may include a plurality of apertures. The plurality of apertures may include a rectangular aperture. The rectangular aperture may have a roughly rectangular shape. The rectangular aperture may be configured for receiving and engaging a display associated with the aftermarket autosound head unit. The panel may further include two, or more, circular apertures. Each the two, or more, circular apertures may include a roughly circular shape. Each of the two circular apertures for receiving and engaging one of two OEM knob assemblies.



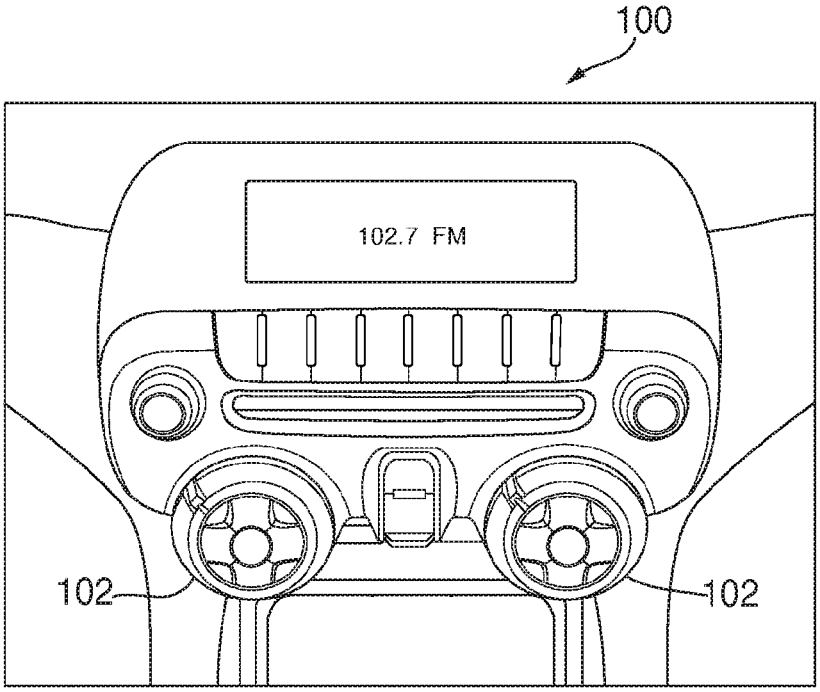


FIG. 1A
Prior Art

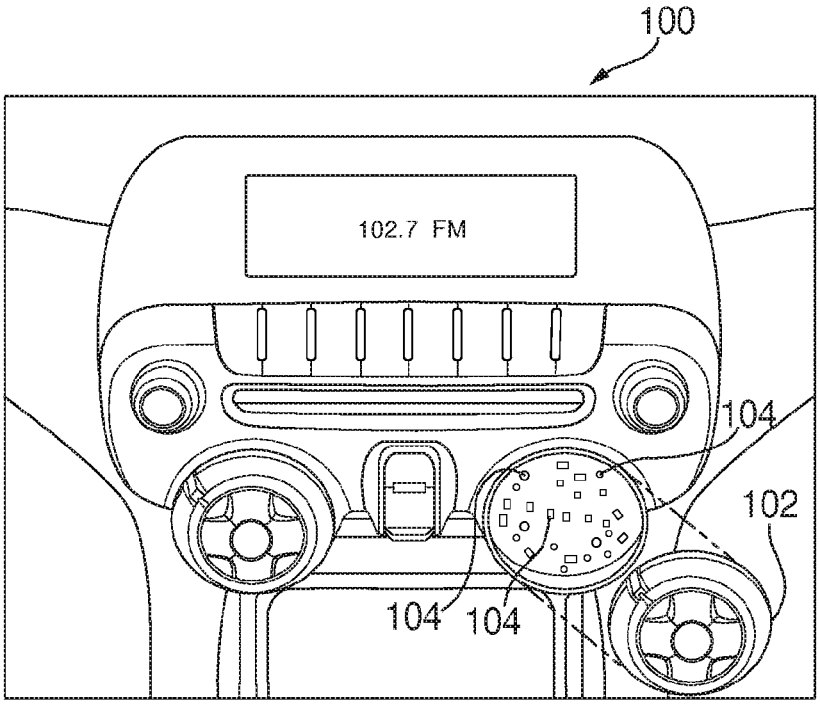


FIG. 1B
Prior Art

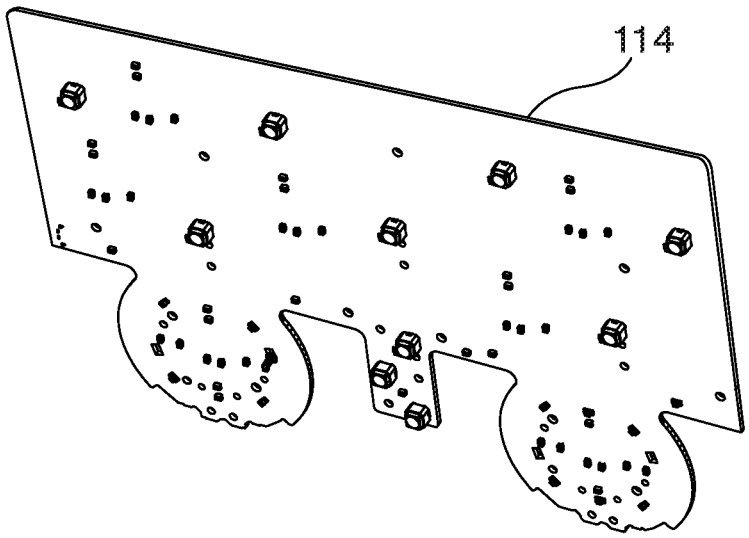
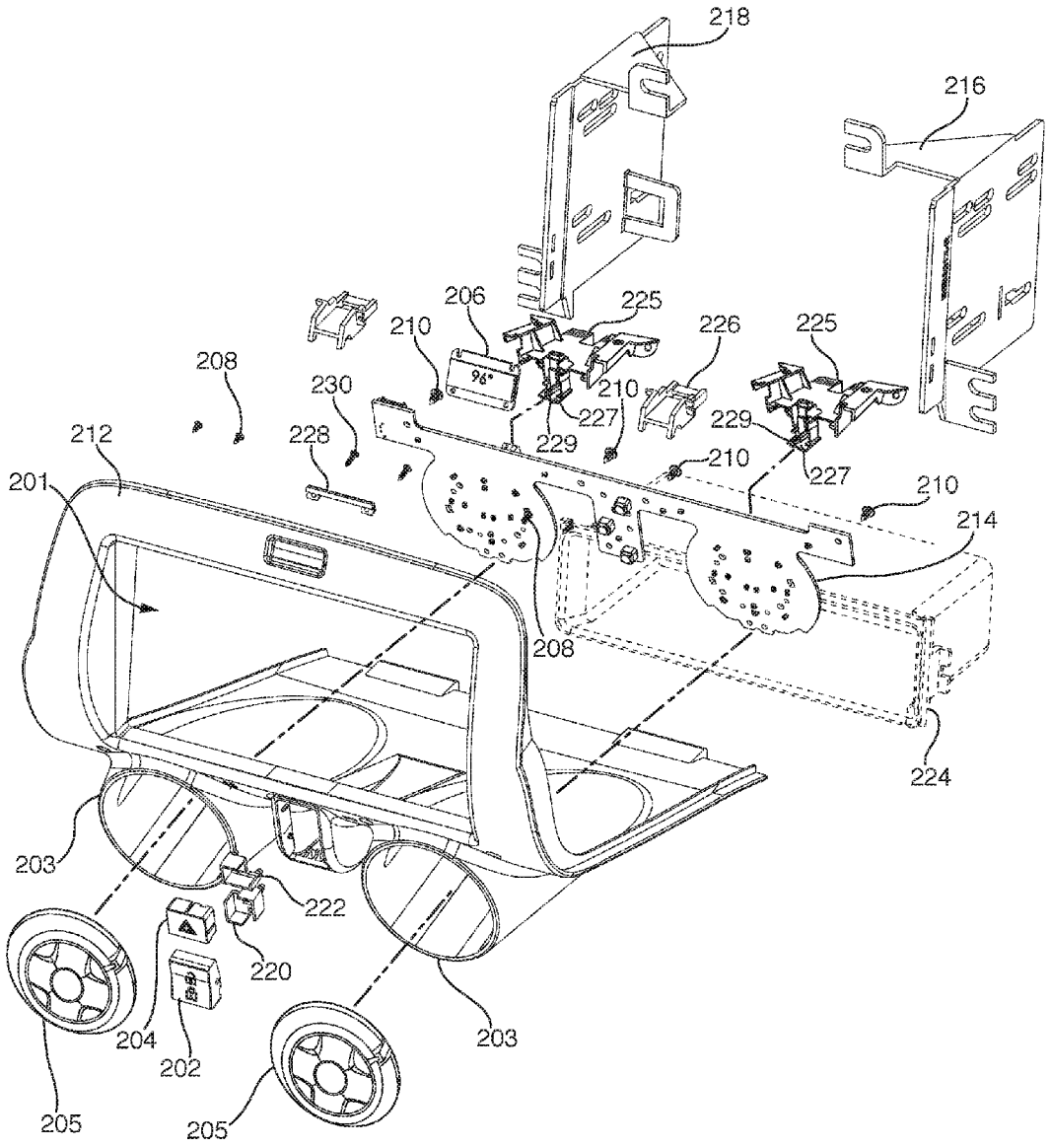


FIG. 1C
Prior Art


218
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206
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212
228
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214
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FIG. 2

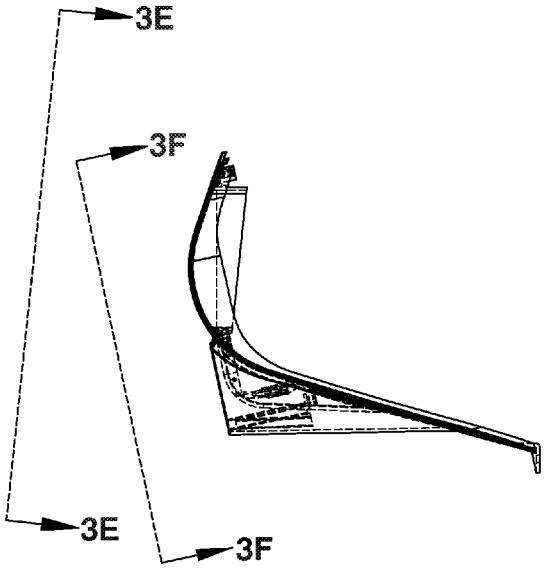

FIG. 3A

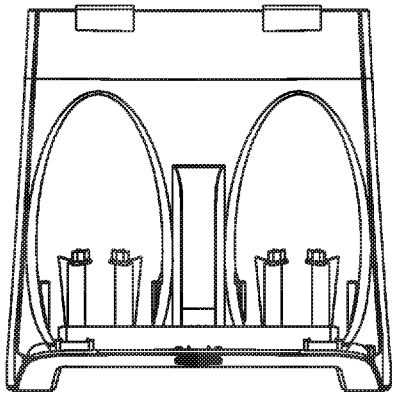

FIG. 3B

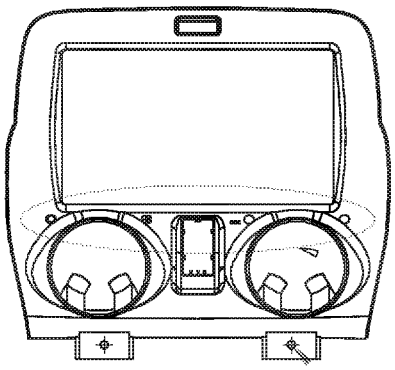

FIG. 3C

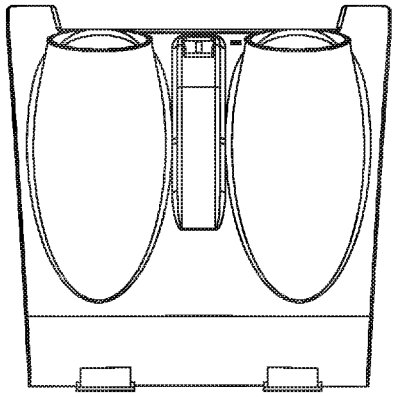

FIG. 3D

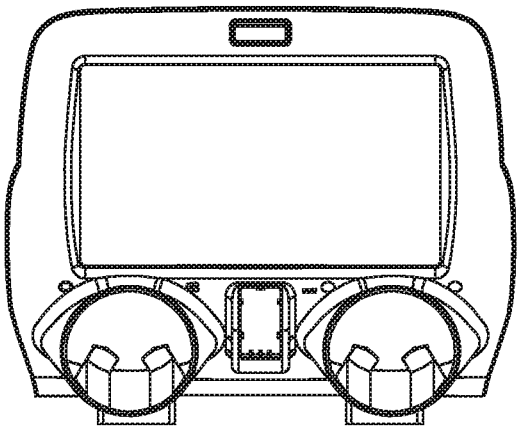

FIG. 3E

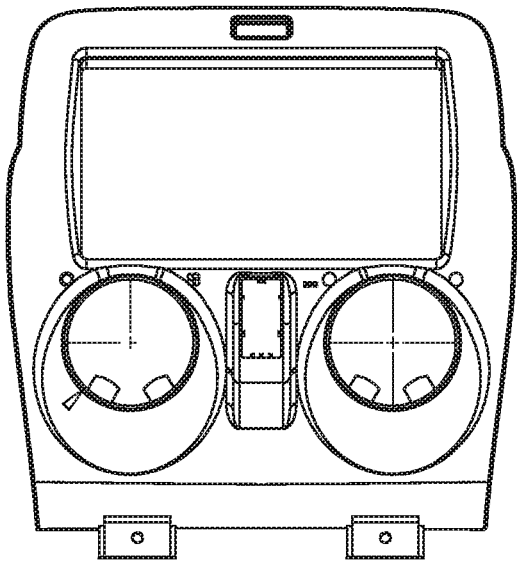

FIG. 3F

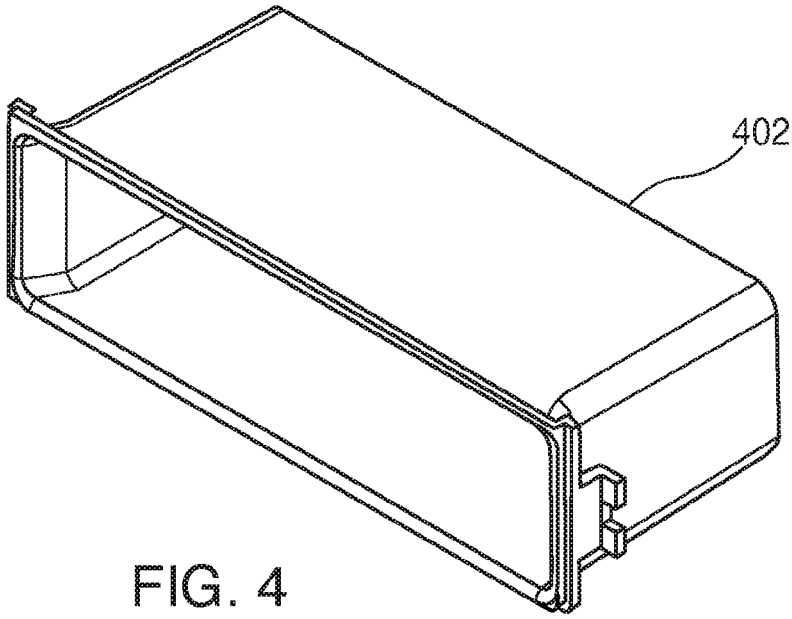

FIG. 4

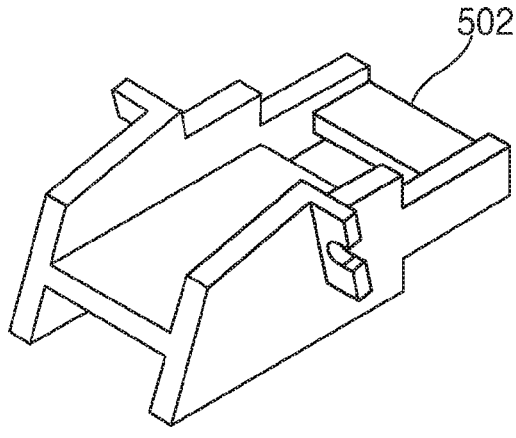

FIG. 5

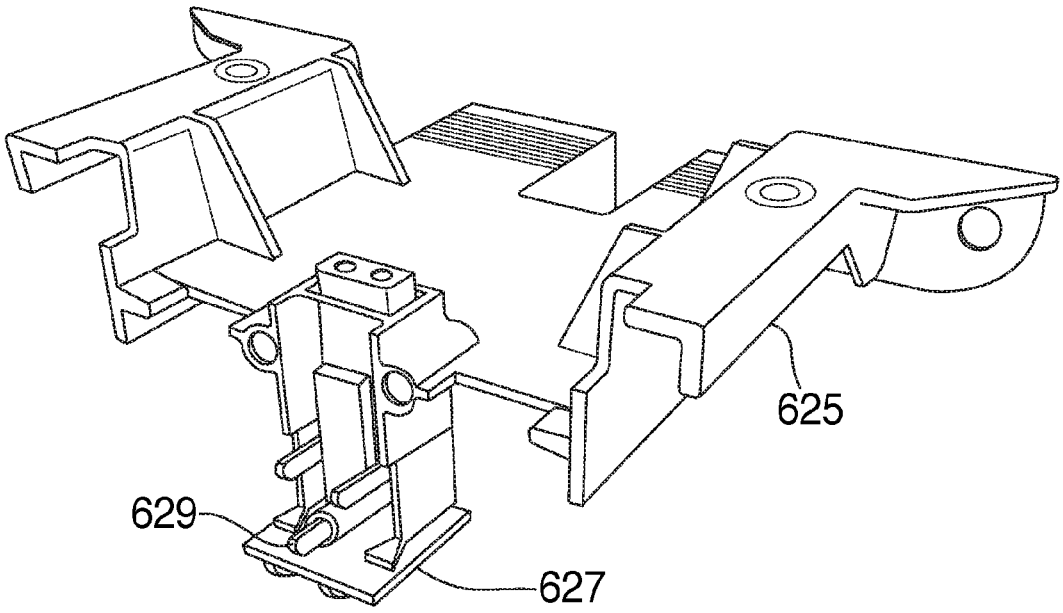

FIG. 6

AFTERMARKET HEAD UNIT INSTALLATION KIT FOR USE WITH SALVAGED ORIGINAL EQUIPMENT MANUFACTURER (OEM) VEHICLE CONTROLS

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application is a non-provisional application of U.S. Provisional Application No. 62/370,337 filed on Aug. 3, 2016, entitled "AFTERMARKET HEAD UNIT INSTALLATION KIT FOR USE WITH, INTER ALIA, LEGACY KNOB ASSEMBLIES, DETENTS AND DETENT RETAINERS".

FIELD OF TECHNOLOGY

[0002] Aspects of the disclosure relate to kits for adapting an automobile for replacement of an Original Equipment Manufacturer (OEM) car stereo (referred to, in the alternative herein, as a "head unit") with an aftermarket car stereo or head unit.

[0003] The term "OEM head unit" may be understood herein to refer to electronic devices capable of playing audio and/or displaying video media, and includes, without limitation, each of the foregoing components either individually or in combination that are produced by the Original Equipment Manufacturer. The term "aftermarket head unit" may be understood herein to refer to electronic devices capable of playing audio and/or displaying video media, and includes, without limitation, each of the foregoing components either individually or in combination that are produced by an aftermarket manufacturer.

BACKGROUND

[0004] Standard equipment on most cars includes an AM/FM radio tuner, tape deck, and/or compact disk (CD) player. Digital media players (e.g., mp3 players, DVD players, minidisk players), CD changers, satellite radio tuners, navigation systems and computers may also be purchased for an automobile as OEM or aftermarket parts.

[0005] As more and different aftermarket head unit components become available, people want the flexibility to customize and/or upgrade their existing head unit equipment to take advantage of the new innovations in car audio equipment.

[0006] This flexibility may be limited by the fact that many new vehicles have an OEM head unit integrated with one or more user interfaces, such as head unit knobs or other similar user interface equipment. Upon removal of the OEM head units, the user interfaces need to be removed as well.

[0007] Typically, because of size mismatches between the OEM head unit and the aftermarket head unit, installation kits have been provided for enabling installation of aftermarket head units.

[0008] These kits have typically needed to provide such replacement interfaces because the OEM user interfaces were integrally related with the removed OEM head units. As such, one of the requirements of legacy kits was that the kits provide aftermarket head unit user interfaces to replace the removed OEM user interfaces that formed a part of the OEM head units.

[0009] Moreover, the OEM head units' interfaces have become more complex with time. As such, it has become more difficult to provide kits for use with aftermarket head units because of the level of complexity associated with the OEM user interfaces required to control the OEM head units.

[0010] As state above, often the user cannot remove the OEM head unit without replacing the OEM user interface mechanisms. In such circumstances, the replacement user interface mechanisms may be of a lesser quality and/or complexity than the OEM user interface mechanisms and, as such, reduce the quality of the user experience associated with the aftermarket head unit.

[0011] In addition, replacing, or substituting for, the highly-complex OEM user interface mechanisms may sharply increase the complexity, and cost, of kits for use with replacement OEM head units.

[0012] For these and other reasons, there exists a need for partial installation kits that allow aftermarket head units to be installed in vehicles, while keeping the complexity of manufacturing such kits to a minimum.

[0013] There exists a further need for providing installation kits that salvage user interfaces associated with OEM head units in order to reduce the complexity of fabricating the installation kits.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The objects and advantages of the invention will be apparent upon consideration of the following detailed description, taken in conjunction with the accompanying drawings, in which like reference characters refer to like parts throughout, and in which:

[0015] FIG. **1**A shows a front view of a prior art OEM head unit;

[0016] FIG. **1**B shows a front view of the prior art OEM head unit with a knob assembly removed;

[0017] FIG. **1**C shows an elevational view of a conventional, full-profile, OEM circuit board;

[0018] FIG. **2** shows an exploded view of a partial automotive head unit kit according to certain embodiments;

[0019] FIGS. **3**A-**3**F shows several views of an illustrative panel according to certain embodiments;

[0020] FIG. **4** shows an illustrative optional head unit pocket according to certain embodiments;

[0021] FIG. **5** shows an illustrative subdash clip according to certain embodiments; and

[0022] FIG. **6** shows an illustrative OEM knob detent retainer according to certain embodiments.

DETAILED DESCRIPTION OF THE DISCLOSURE

[0023] Apparatus and methods for an installation kit for an aftermarket head unit are provided.

[0024] An aftermarket autosound head unit installation kit may preferably enable installation of an aftermarket radio in a vehicle. The kit may include a panel.

[0025] The panel may include a plurality of apertures. The plurality of apertures may include a rectangular aperture having a roughly rectangular shape. The rectangular aperture may be configured for receiving and engaging a display associated with the aftermarket autosound head unit.

[0026] The plurality of apertures may also include two circular apertures. Each of the two circular apertures may include a roughly circular shape. Each of the two circular

apertures may be configured for receiving and engaging one of two (or more) OEM knob assemblies.

[0027] The kit may further include a plurality of detent retainer seats. Each of the detent retainer seats may be configured to receive and engage an OEM detent retainer.

[0028] The kit may further include a circuit board. The circuit board may preferably replicate the portions of an OEM circuit board that relate to receiving signals from each of the OEM knob assemblies. Upon installation of the kit, the circuit board may preferably be operationally coupled to each of the OEM knob assemblies. The circuit board may be configured to send signals to the vehicle, either via a data bus, a hardwired connection or wirelessly, in response to rotation.

[0029] The circuit board may be configured to send signals to the vehicle, either via a data bus, a hardwired connection or wirelessly, in response to actuation of the knobs or actuation of a portion of the knobs.

[0030] A method according to some embodiments of installing an aftermarket radio in a vehicle may include removing an OEM autosound head unit from the vehicle. The method may also include removing a plurality of OEM knob assemblies from the face of the removed OEM head unit and removing a plurality of detent retainers from the removed OEM head unit. It should be noted that, in certain vehicles, OEM knob assemblies may include one or more buttons on the face of the knob, or on one or more other locations of the knob assembly. For the purpose of this application, the term "knob assemblies" refers to knob assemblies with or without buttons located thereon.

[0031] Following removal of the OEM knob assemblies and plurality of detent retainers, the method may further include installing in the vehicle an aftermarket autosound head unit installation kit. The kit may preferably enable installation of an aftermarket head unit in the vehicle. The aftermarket head unit installation kit may include a plurality of apertures for receiving and engaging the plurality of OEM knob assemblies and a plurality of detent retainer seats for receiving and engaging the plurality of detent retainers. The method may further include installing each of a plurality of OEM knob assemblies in an individual one of the plurality of apertures and/or installing each of the plurality of detent retainers in an individual one of the plurality of detent retainer seats.

[0032] FIG. **1**A shows a front view of a prior art, installed, OEM head unit **100** as may be installed on certain late-model Chevrolet Camaro™ automobiles. OEM head unit **100** may include one or more than one knob assembly **102**. FIG. **1**B shows a front view of the OEM head unit **100** with knob assembly **102** removed from the head unit. In typical OEM head units, knob assembly **102** may be removed from OEM head unit **100** by removing OEM head unit **100** from the dashboard of the vehicle and then unscrewing a plurality of screws (not shown in FIGS. **1**A and **1**B) which, when deployed, serve to fixedly attach knob assembly **102** to OEM head unit **100**. The screws are installed (and removed) from the back of OEM head unit **100** and, therefore, would not be visible from the front view of OEM head unit **100**. It should be noted, however, that screw holes **104** show exemplary holes into which screws may be inserted for attaching knob assemblies **102** to OEM head unit **100**.

[0033] FIG. **1**C shows an elevational view of a conventional OEM circuit board **114**. Circuit board **114** includes a full-size front-on profile.

[0034] FIG. **2** shows an exploded view of a partial automotive head unit kit according to certain embodiments. FIG. **2** includes an installation kit **200** according to certain embodiments. Installation kit **200** may preferably enable installation of an aftermarket head unit in the location previously occupied by an OEM head unit. As is known in the art, installation kit **200** is preferably designed to make up for any volume and/or size mismatches between the volume occupied by the OEM head unit and the volume occupied by the aftermarket head unit.

[0035] Kit **200** preferably includes a door lock/unlock button **202** and a hazard light button **204**. It should be noted that door lock/unlock button **202** and hazard light button **204** are preferably provided in kit **200** because, in the OEM system, an door lock/unlock button and an hazard light button are preferably mounted in the console associated with the OEM head unit. As such, the functionality associated with the OEM door lock/unlock button and the OEM hazard light button may preferably be replicated in kit **200** in order to preserve the functionality associated with the OEM door lock/unlock button and OEM hazard light button. Such functionality may preferably be associated with lock/unlock button **202** and hazard light button **204**. Lock/unlock button **202** and hazard light button **204** may be mounted preferably in a center portion of printed circuit board **214**.

[0036] It should be noted that while kit **200** is shown to replicate the door lock/unlock button and the hazard light button functionality, it should be understood that kit **200** may also be used to support various other or additional functionality associated with the portion of the console associated with the OEM head unit, such as electronic window buttons, etc., or any other functionality, without departing from the scope of the invention.

[0037] LCD display **206** may preferably be used to show a temperature reading, a clock reading or other similar type of reading from the vehicle.

[0038] Screws **208** and **210** may be used for securing printed circuit board **214** to panel **212**. It should be noted that printed circuit board **214** may preferably replicate the operation of OEM circuit board **114** that is associated with the OEM knob assemblies (see FIG. **1**, element **114** and element **102**). It should be noted that circuit board **214** has a reduced-front-on-profile in comparison with the conventional circuit board **114** shown in FIG. **1**C.

[0039] It should be noted that in some kits, printed circuit board **214** may preferably incorporate an irregular shape **215** at the bottom of circuit board **214**. Irregular shape **215** preferably provides a pass-through for a portion of detent retainer **225**. Detent retainer **225**, which, in certain embodiments, may preferably be salvaged from the OEM head unit, provides a spring-loaded male member **229**. Spring-loaded male member **229** preferably is mounted on male member support structure **227**.

[0040] Male member **229** is configured to engage, typically one at a time when a knob is turned, a series of detents (not shown) on the back of OEM knob **205**. By engaging the detents on OEM knob **205** as knob **205** is turned, male member **229** preferably creates a clicking as the detent springs in and out of the detents on the back of the knob. In other words, the OEM knob rides on male member **229**. Male member **229** moves up and down on the detents of the knob as the knob rotates.

[0041] Left bracket **216** and right bracket **218**, upon installation of kit **200**, may preferably lock kit **200** to side walls

of the cavity (not shown) in the vehicle dashboard previously occupied by the OEM head unit. Subdash clips **226** preferably couple the top portion of kit **200** to the lip of the cavity left in the automobile by removal of the OEM head unit.

[0042] Lock/unlock button **202** for and hazard light button **204** may preferably engage lock membrane **220** and hazard membrane **222**, respectively, when mounted in panel **212**.

[0043] Kit **200** includes a large roughly rectangular aperture **201** in panel **212**. This aperture is for mounting a screen of an aftermarket head unit. Such a screen may provide navigation functionality when the aftermarket head unit supports such functionality. In addition, or in the alternative, such a screen, when implemented as a touch screen, may preferably support stereo functionality such as pre-set radio station tuner knobs or any other suitable functionality associated with a touch screen. The reduced profile circuit board **214** enables the installation of a larger than OEM head unit—e.g., a double DIN head unit. This is because the height of the OEM circuit board has been reduced in order to accommodate a larger than OEM size head unit.

[0044] Kit **200** may also preferably include two substantially circular apertures **203** in the front face of panel **212**. Circular apertures **203** preferably are configured to receive and engage OEM knob assemblies **205** in such a way as to enable OEM knob assemblies **205** to electronically couple to circuit board **214**. As such, the functionality associated with OEM knob assemblies **205** may preferably be maintained following installation of kit **200**.

[0045] Kit **200** may also include optional pocket **224**. The size of pocket shown in FIG. **2** is what is known in the art as a single DIN size. When the aftermarket head unit that is replacing the OEM head unit is a single DIN size, then the aftermarket head unit only occupies approximately the top half of the rectangular aperture shown in the front of kit **200**. Accordingly, the bottom half of rectangular aperture **201** shown in the front face of kit **200** is not occupied. Optional pocket **224** may preferably be inserted into the other half of rectangular aperture **201** not occupied by the aftermarket head unit. Optional pocket is shown by itself as pocket **402** in FIG. **4**.

[0046] PCB leveler **228** may be used to level display **206** and may be affixed in place by screws **230**.

[0047] FIG. **3**A-**3**F shows various views of illustrative panel **300** for use according to certain embodiments. FIG. **3**A shows a side view, taken from a first angle, of illustrative panel **300** according to certain embodiments. FIG. **3**B shows a top view of the illustrative panel **300** according to certain embodiments. FIG. **3**C shows a front view of panel **300** according to certain embodiments. FIG. **3**D shows a bottom view of panel **300** according to certain embodiments. FIG. **3**E shows a front view, taken from a second angle of panel **300** (shown in FIG. **3**A), according to certain embodiments. FIG. **3**F shows a front view, taken from a third angle (shown in FIG. **3**A), of panel **300** according to certain embodiments.

[0048] It should be noted that the twin circular apertures **302** on the front of panel **300** are configured to accept the knob assemblies (see FIG. **1**B, element **102**) from the OEM head unit. As each of twin apertures **302** preferably have a diameter of about 2.4", or other suitable size, in order to accept the legacy OEM knob assemblies following removal of the knob assemblies (see FIG. **1**B, element **102**) from the OEM head unit.

[0049] Furthermore, panel **300** may include two or more plastic towers **306** and **308** (shown only in FIGS. **3**B and **3**C for simplicity) which are adapted to engage detent retainers **225** (shown in FIG. **2**). Detent retainers **225** provides a spring-loaded member such that turning the knob, each of the knobs that includes detents about the perimeter of the knob, momentarily clicks the spring-loaded mechanism. This clicking type of turning is place of providing a smooth turn. A clicking mechanism, which preferably allows the knobs to rotate in a stepwise fashion instead of a smooth turn, is more commonly found in automobiles and other moving vehicles in order to prevent accidental rotation of the knobs.

[0050] FIG. **4** shows an illustrative optional head unit pocket **424** for use according to certain embodiments. As mentioned above, optional head unit pocket **424** may preferably be used when the aftermarket head unit being installed is a single DIN head unit. However, when the aftermarket head unit being installed is a double DIN head unit (which occupies roughly twice the vertical height of a single DIN head unit), then the optional head unit pocket **424** cannot be used because the entire aperture on the front face of installation kit **200** (shown in FIG. **2**) is occupied by the double DIN aftermarket head unit. It should be noted that the front face of the double DIN aftermarket head unit may be implemented as a screen that is capable of displaying a navigation map as well as any other suitable features supported by the double DIN head unit.

[0051] FIG. **5** shows an illustrative subdash clips **526** for use according to certain embodiments. Subdash clips **526** may preferably be used to couple the top portion of kit **200** to the lip of the cavity left in the automobile by removal of the OEM head unit.

[0052] FIG. **6** shows an illustrative OEM knob detent retainer **625** according to certain embodiments. Such a detent retainer **625** may preferably be salvaged from the OEM head unit and placed on installation kit **200**, much the same way as OEM knob assemblies **205** may preferably be salvaged from the OEM head unit and placed on installation kit **200**. OEM knob detent retainer **625** preferably includes detent retainer support structure **627** and spring-loaded male member **629** (spring not shown). As discussed above, male member **629** preferably engages detents on the back of knob **205** as the knob **205** is turned, thereby creating clicking sounds—and preventing the knob from spinning unintentionally.

[0053] One of ordinary skill in the art will appreciate that the elements and steps shown and described herein may be utilized and/or performed in other than the recited system and/or order and that one or more elements illustrated may be optional. The methods of the above-referenced embodiments may involve the use of any suitable elements, elements, computer-executable instructions, or computer-readable data structures. In this regard, other embodiments are disclosed herein as well that can be partially or wholly implemented on a computer-readable medium, for example, by storing computer-executable instructions or modules or by utilizing computer-readable data structures.

[0054] Thus, systems and methods for providing an aftermarket head unit installation kit for use with salvaged original equipment manufacturer (OEM) vehicle controls have been provided. Persons skilled in the art will appreciate that the present invention can be practiced by other than the described embodiments, which are presented for purposes of

illustration rather than of limitation. The present invention is limited only by the claims that follow.

What is claimed is:

1. A method of installing an aftermarket radio in a vehicle, said method comprising:

removing an Original Equipment Manufacturer (OEM) autosound head unit from the vehicle;

removing a plurality of OEM knob assemblies from the face of the removed OEM head unit;

removing a plurality of detent retainers from the removed OEM head unit;

installing in the vehicle an aftermarket autosound head unit installation kit, said kit for enabling installation of an aftermarket head unit in the vehicle, said aftermarket head unit installation kit comprising a plurality of apertures for receiving and engaging the plurality of OEM knob assemblies and a plurality of detent retainer seats for receiving and engaging the plurality of detent retainers, said installing comprising:

installing each of the plurality of OEM knob assemblies in an individual one of the plurality of apertures; and

installing each of the plurality of detent retainers in an individual one of the plurality of single detent retainer seats.

2. A method of installing an aftermarket radio in a vehicle, said method comprising:

removing an Original Equipment Manufacturer (OEM) autosound head unit from the vehicle;

removing a plurality of OEM knob assemblies from the face of the removed OEM head unit;

installing in the vehicle an aftermarket autosound head unit installation kit, said kit for enabling installation of an aftermarket head unit in the vehicle, said aftermarket head unit installation kit comprising a plurality of apertures for receiving and engaging the plurality of OEM knob assemblies and a detent retainer seat for receiving and engaging the detent retainer, said installing the aftermarket head unit installation kit comprising:

installing each one of the plurality of OEM knob assemblies in a single one of the plurality of apertures.

3. The method of claim **2** further comprising removing a plurality of detent retainers from the removed OEM head unit.

4. The method of claim **3** further comprising installing each of the plurality of detent retainers in a detent retainer seat.

5. An aftermarket autosound head unit installation kit for enabling installation of an aftermarket radio in a vehicle, the kit comprising:

a panel, said panel comprising a plurality of apertures, said plurality of apertures comprising:

a rectangular aperture comprising a roughly rectangular shape, the rectangular aperture for receiving and engaging a display associated with the aftermarket autosound head unit; and

two circular apertures, each of the two circular apertures comprising a roughly circular shape, each of the two circular apertures for receiving and engaging one of two OEM knob assemblies; and

a reduced-profile circuit board, the circuit board configured to replicate functionality of an OEM circuit board, said functionality that relates to receiving signals from each of the OEM knob assemblies.

6. The kit of claim **5** further comprising a plurality of detent retainer seats, each of the detent retainer seats configured to receive and engage an OEM detent retainer.

7. The kit of claim **5** further comprising a circuit board, the circuit board configured to replicate portions of an OEM circuit board that relate to receiving signals from each of the OEM knob assemblies.

8. The kit of claim **7** wherein, upon engagement of the OEM knob assemblies to the panel, the circuit board is operationally coupled to each of the OEM knob assemblies.

9. The kit of claim **8** wherein, the circuit board is configured to send signals to the vehicle, either via a data bus, a hardwired connection or wirelessly, in response to rotation.

10. The kit of claim **8** wherein, the circuit board is configured to send signals to the vehicle, either via a data bus, a hardwired connection or wirelessly, in response to actuation of the knobs or actuation of a portion of the knobs.

11. An aftermarket autosound head unit installation kit for enabling installation of an aftermarket radio in a vehicle, the kit comprising:

a panel, said panel comprising a plurality of apertures, said plurality of apertures comprising:

a rectangular aperture comprising a roughly rectangular shape, the rectangular aperture for receiving and engaging a display associated with the aftermarket autosound head unit;

two circular apertures, each of the two circular apertures comprising a roughly circular shape, each of the two circular apertures for receiving and engaging one of two OEM knob assemblies; and

a reduced-profile circuit board, the circuit board configured to replicate portions of an OEM circuit board that relate to receiving signals from each of the OEM knob assemblies.

12. The kit of claim **11** further comprising a plurality of detent retainer seats, each of the detent retainer seats configured to receive and engage an OEM detent retainer.

13. The kit of claim **11** wherein upon engagement of the OEM knob assemblies to the panel, the circuit board is operationally coupled to each of the OEM knob assemblies.

14. The kit of claim **13** wherein the circuit board is configured to send signals to the vehicle, via at least one of a data bus, a hardwired connection or wirelessly, in response to rotation of each of the OEM knob assemblies.

15. The kit of claim **13** wherein the reduced-profile circuit board comprises a front-on profile that is less than 60% of the front-on profile of an OEM circuit adapted to perform the same functions as the reduced-profile circuit board.

16. The kit of claim **13** wherein, the circuit board is configured to send signals to the vehicle, either via a data bus, a hardwired connection or wirelessly, in response to actuation of each of the knob assemblies or actuation of a portion of each of the knob assemblies.

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