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### **SYSTEMS, METHODS, AND DEVICES FOR LOCKING A CONNECTOR OF A BATTERY**

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#### **Abstract**

Methods, systems, and devices for a lock out device for locking a battery connector. The lock out device may include a plug having a plug end configured to engage the battery connector to prevent another connector from being connected to the battery connector. The plug may further include a lock end opposite of the plug end defining a length of the plug, the lock end having a first ring configured to receive a lock shackle. The lock out device may further include a sliding device movably coupled to the plug and having a second ring configured to receive the lock shackle. The sliding device may be configured to rotate about an axis perpendicular to the length of the plug and to slide in a direction perpendicular to the length of the plug to prevent the plug from being removed from the battery connector.

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## Background/Summary

### BACKGROUND

#### 1. Field

[0001] The present disclosure relates to a system, method, and/or device for locking a connector of a battery and, more particularly, for locking a connector of a battery of a hybrid electric vehicle (HEV) and/or an electric vehicle (EV).

#### 2. Description of the Related Art

[0002] When an HEV and/or an EV battery is being stored before installation in a vehicle, and/or while the vehicle is being serviced or repaired such that the battery is unplugged from the vehicle, a high voltage connector of the battery may present an electrical hazard. To mitigate the electrical hazard, existing devices and/or methods include placing red tape over the high voltage connector or placing a dummy connector (or safety plug) into the high voltage connector while the battery is being stored and/or the vehicle is being serviced or repaired. However, with either of the existing methods, any individual can remove the red tape and/or the dummy connector prematurely thereby presenting the electrical hazard.

[0003] Accordingly, it is desirable to provide systems, methods, and devices for locking a connector of a battery of an HEV and/or an EV.

### SUMMARY

[0004] In general, one aspect of the subject matter described in this disclosure may be embodied in a lock out device for locking a battery connector. The lock out device may include a plug having a plug end configured to engage the battery connector to prevent another connector from being connected to the battery connector. The plug may further include a lock end opposite of the plug end defining a length of the plug, the lock end having a first ring configured to receive a lock shackle. The lock out device may further include a sliding device movably coupled to the plug and having a second ring configured to receive the lock shackle. The sliding device may be configured to rotate about an axis perpendicular to the length of the plug and to slide in a direction perpendicular to the length of the plug to prevent the plug from being removed from the battery connector.

[0005] In another aspect, the subject matter may be embodied in a lock out device for locking a connector of a vehicle battery. The lock out device may include a plug configured to engage the connector of the vehicle battery to prevent another connector from being connected to the connector of the vehicle battery. The plug may include a first ring configured to receive a shackle of a lock. The plug may further include a left side protrusion. The plug may further include a right side protrusion opposite of the left side protrusion defining a width of the plug. The lock out device may further include a sliding device movably coupled to the plug and having a second ring configured to receive the shackle. The sliding device may be configured to rotate about the left side protrusion and the right side protrusion and to slide toward the plug to align the first ring and the second ring such that the first ring and the second ring may receive the shackle to prevent the plug from being removed from the connector of the vehicle battery.

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## Description

## BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Other systems, methods, features, and advantages of the present disclosure will be apparent to one skilled in the art upon examination of the following figures and detailed description.

Component parts shown in the drawings are not necessarily to scale and may be exaggerated to better illustrate the important features of the present disclosure. In the drawings, like reference numerals designate like parts throughout the different views.

[0007] FIG. **1** is a schematic of an example vehicle with which an example battery lock out device may be implemented according to an aspect of the disclosure.

[0008] FIG. **2** is a perspective view of an example battery lock out device according to an aspect of the disclosure.

[0009] FIG. **3** is a perspective view of the example battery lock out device of FIG. **2** according to an aspect of the disclosure.

[0010] FIG. **4** is a perspective view of the example battery lock out device of FIG. **2** according to an aspect of the disclosure.

[0011] FIGS. **5A-5D** illustrate different positions (or states) of the example battery lock out device of FIG. **2** according to an aspect of the disclosure.

[0012] FIG. **6** is a flow diagram of an example method for locking a connector of a battery using the example battery lock out device of FIG. **2** according to an aspect of the disclosure.

## DETAILED DESCRIPTION

[0013] Disclosed herein are systems, methods, devices, and/or vehicles for implementing a battery lock out device for locking a connector of a battery. Particular embodiments of the subject matter described in this disclosure may be implemented to realize one or more of the following advantages. The battery lock out device may control power flow from a battery when the battery contains a level of charge and is being stored before installation into a vehicle and/or when the vehicle is being serviced, repaired, or anytime the electrical hazard of the battery must be minimized. The battery lock out device controls the power flow from the battery and renders the battery effectively inert by locking a disconnected connector of the battery with a physical lock such that the battery connector cannot be plugged into the vehicle. This prevents an individual from plugging the battery into the vehicle and energizing various systems of the vehicle prematurely and when it would not be safe to do so (e.g., when the vehicle is not done being serviced and mechanics must still handle vehicle components that are energized when the battery is plugged in).

[0014] Moreover, because the battery lock out device enables the battery connector to be locked with the physical lock, it is possible to control an amount of individuals who possess (or have access to) a key that can unlock the physical lock thereby improving the safety of hybrid electric vehicle (HEV) and/or electric vehicle (EV) manufacturing, servicing, and/or repair. Thus, an individual who has the training to know when it is safe to plug the battery into the vehicle may possess the key and control when the battery is plugged in.

[0015] FIG. **1** illustrates an example vehicle **102** in which an example battery (or connector or battery connector) lock out device **100** may be implemented. The battery lock out device **100** may be retro-fitted, coupled to, include or be included within the vehicle **102** or separate from the vehicle **102**. The vehicle **102** may be a conveyance capable of transporting a person, an object, or a permanently or temporarily affixed apparatus. The vehicle **102** may be a self-propelled wheeled conveyance, such as a car, a sports utility vehicle, a truck, a bus, a van or other motor, battery or fuel cell driven vehicle. For example, the vehicle **102** may be an EV, a HEV, a hydrogen fuel cell vehicle, a plug-in hybrid vehicle or any other type of vehicle that has a battery, a motor, an engine, and/or a generator. Other examples of vehicles include bicycles, trains, planes, or boats, and any other form of conveyance that is capable of transportation. The vehicle **102** may be semi-autonomous or autonomous. That is, the vehicle **102** may be self-maneuvering and navigate without human input. An autonomous vehicle may have and use one or more sensors and/or a

navigation unit to drive autonomously.

[0016] The vehicle **102** may include a motor and/or generator **132** and/or a battery **134**. The motor and/or generator **132** may be located within an engine bay of the vehicle **102**. In examples, the motor and/or generator **132** may be located at and/or adjacent to at least one axle of the vehicle **102** such that the vehicle **102** includes a plurality of motors and/or generators **132**. The motor and/or generator **132** may be an internal combustion engine (ICE). In this regard, the motor and/or generator **132** may combust an air and fuel mixture to provide power to the vehicle **102** and/or components of the vehicle **102**. Accordingly, the motor and/or generator **132** can cause the vehicle **102** to accelerate, decelerate, or maintain a desired velocity. It should be understood that the motor and/or generator **132** may include combinations of an ICE and an electric motor, such as for HEV applications for example. In examples, the motor and/or generator **132** may be an electric motor. In this regard, the motor and/or generator **132** may be an electric motor and an electric generator that converts electrical energy into mechanical power, such as torque, and converts mechanical power into electrical energy. The motor and/or generator **132** may be electrically connected to the battery **134**. The motor and/or generator **132** may convert energy from the battery **134** into mechanical power, and may provide energy back to the battery **134**, for example, via regenerative braking.

[0017] The battery **134** may be retrofitted, coupled to, include or be included within the vehicle **102** (e.g., a complete HEV and/or EV) or separate from the vehicle **102** (e.g., during manufacturing when the battery **134** is being stored before installation into the vehicle **102**). The battery **134** may be electrically connected to the motor and/or generator **132** and/or other components of the vehicle **102** through a battery connector **106**. The battery **134** may store chemical energy for later conversion to electrical energy. The battery **134** may provide the electrical energy to and/or receive electrical energy from the motor and/or generator **132** and/or other components of the vehicle **102**. The battery **134** may be a battery pack that includes one or more battery modules, a cooling system, and/or a battery management system (BMS). The one or more battery modules may each include one or more cells and a frame to hold and protect the one or more cells. The one or more cells may be cylindrical cells, prismatic cells, and/or pouch cells (in examples, other types of cells may be used). A chemistry of the one or more cells may be lithium ion (Li-Ion), nickel manganese cobalt (NMC), nickel metal hydride (Ni-MH), lithium sulfur (Li-S), and/or lead-acid (in examples, other chemistries may be used).

[0018] Referring briefly to FIG. 5A and FIG. 1, the battery connector **106** may electrically connect the battery **134** to one or more components of the vehicle **102**. The battery connector **106** may include a receiving connector **108a** and/or a plug connector **108b**. The receiving connector **108a** may connect (or mate) with the plug connector **108b** to establish an electrical connection between the battery **134** and the one or more components of the vehicle **102** and may disconnect from the plug connector **108b** to terminate the electrical connection. The receiving connector **108a** may include a power port **506** that houses high voltage terminals of the receiving connector **108a**. In examples, the receiving connector **108a** may further include a data plug (or data connector) **504** configured to enable communication between the vehicle **102** and the BMS of the battery **134**. The receiving connector **108a** may further include one or more tabs **502** configured to interface with the plug connector **108b** when the receiving connector **108a** and the plug connector **108b** are connected. The receiving connector **108a** may be coupled to the battery **134** and/or to wires **508** that are coupled to the battery **134**. The plug connector **108b** may be coupled to the one or more components of the vehicle **102** (e.g., a junction box) and/or to wires that are coupled to the one or more components of the vehicle **102**. In examples, locations of the receiving connector **108a** and the plug connector **108b** may be reversed.

[0019] FIGS. 2-4 illustrate the example battery lock out device **100** of FIG. 1 from various perspective views. Some reference numerals are not shown in every figure of FIGS. 2-4 to better illustrate certain features of the example battery lock out device **100**. With combined reference to FIGS. 2-4, the battery lock out device **100** may include a plug (or plug device) **200** and a sliding

device **210** movably coupled to the plug **200**. The plug **200** may include a plug end portion **202** and a lock end portion **204** opposite of the plug end portion **202** defining a length of the plug **200**. The plug end portion **202** may be configured to plug (or slide) into a disconnected (i.e., not connected to the plug connector **108b**) receiving connector **108a** such that the high voltage terminals of the receiving connector **108a** are covered. The lock end portion **204** may include a ring **206a**. The lock end portion **204** and/or the ring **206a** may be configured to receive a shackle of a lock. The plug **200** may further include a left side **201** and a right side **203** defining a width **205** of the plug **200**. [0020] The plug **200** may further include one or more side protrusions, including a left side protrusion **208a** coupled to the left side **201** of the plug **200** and a right side protrusion **208b** coupled to the right side **203** of the plug **200**. The left side protrusion **208a** may be opposite of the right side protrusion **208b** defining the width **205** of the plug **200**. The one or more side protrusions **208a** and **208b** may each slide within one or more channels **218** of the sliding device **210** and may movably couple the sliding device **210** to the plug **200**. In examples, the left side protrusion **208a** and the right side protrusion **208b** may be positioned along an axis perpendicular to the length of the plug **200**.

[0021] The sliding device **210** may be substantially U-shaped and may include a connecting portion (or connecting bridge) **213** coupled to one or more legs of the sliding device **210**, including a left leg **212a** and/or a right leg **212b**. The one or more legs **212a** and **212b** may each be configured to contact and/or slide within the one or more tabs **502** of the receiving connector **108a** (as shown by FIGS. 5B-5D). The left leg **212a** may include a proximal (or first) end portion **214** and a distal (or second) end portion **215** opposite of the proximal end portion **214** defining a length **230** of the left leg **212a**. The distal end portion **215** of the left leg **212a** may have a sloped (or cutout) portion **240** to facilitate rotation of the sliding device **210** around the plug **200** when the plug **200** is mated with the receiving connector **108a** (as shown by FIGS. 5A-5B). The right leg **212b** may include a proximal (or first) end portion **216** and a distal (or second) end portion **217** opposite of the proximal end portion **216** defining a length **231** of the right leg **212b**. The distal end portion **217** of the right leg **212b** may have a sloped (or cutaway) portion **241**.

[0022] The connecting portion **213** may be coupled to the proximal end portion **214** of the left leg **212a** and the proximal end portion **216** of the right leg **212b** such that the connecting portion **213** may be located substantially between the left leg **212a** and the right leg **212b** and may separate the left leg **212a** and the right leg **212b** by a length **232** (as shown in FIG. 4). The length **232** of the connecting portion **213** may be substantially perpendicular to the length **230** of the left leg **212a** and the length **231** of the right leg **212b**. The length **232** of the connecting portion **213** may be equal to or greater than the width **205** of the plug **200** to enable the plug **200** to be located between the left leg **212a** and the right leg **212b**.

[0023] As previously discussed, the one or more side protrusions **208a** and **208b** of the plug **200** may each slide within one or more channels **218** of the sliding device **210**. The one or more channels **218** may each have a narrow portion having a width **221**. In examples, the one or more channels **218** may include one or more enlarged channel portions **219** each having a width **223** that is greater than the width **221** of the narrow portion. The one or more enlarged channel portions **219** may be configured to enable the one or more side protrusions **208a** and **208b** to rotate within the enlarged channel portions **219** such that the sliding device **210** may rotate around the plug **200**. In examples, the sliding device **210** may rotate about an axis perpendicular to the length of the plug **200** and to slide in a direction perpendicular to the length of the plug **200** to prevent the plug **200** from being removed from the receiving connector **108a**. In examples, the one or more enlarged channel portions **219** may be substantially circular to enable the one or more side protrusions **208a** and **208b** to rotate within the enlarged channel portions **219**. In examples, the sliding device **210** may not rotate around the plug **200** when the one or more side protrusions **208a** and **208b** are within the narrow portion of each channel of the one or more channels **218**.

[0024] To movably couple the plug **200** to the sliding device **210** to form the battery lock out

device **100**, the one or more side protrusions **208a** and **208b** may slide within sloped portions **250** of the sliding device **210** thereby guiding the one or more side protrusions **208a** and **208b** into the one or more channels **218**. For example, to movably couple the plug **200** to the sliding device **210**, the plug **200** may be placed between the left leg **212a** and the right leg **212b** of the sliding device **210** such that the one or more side protrusions **208a** and **208b** may slide into the sloped portions **250** of the sliding device **210**. The plug **200** may then be manipulated such that the one or more side protrusions **208a** and **208b** extend into and/or through the one or more enlarged channel portions **219**.

[0025] The sliding device **210** may further include a ring **206b** coupled to the left leg **212a**, the right leg **212b**, and/or the connecting portion **213** and configured to receive the shackle of the lock. The ring **206b** of the sliding device **210** may be located and/or configured to align and/or be adjacent to the ring **206a** of the plug **200** such that the shackle of the lock may be placed through both the rings **206a** and **206b**.

[0026] The sliding device **210** may further include a data (or other) connector cover **225** coupled to the left leg **212a**, the right leg **212b**, and/or the connecting portion **213** and configured to receive the data plug **504** of the receiving connector **108a** and to cover and/or protect the data plug **504** (as shown by FIG. 5C).

[0027] FIGS. 5A-5D illustrate different positions (or states) of the battery lock out device **100** when locking out the receiving connector **108a**. With combined reference to FIGS. 1-4 and 5A-5D, a first position (or an open unlocked state) **510** of the battery lock out device **100** may include the sliding device **210** being positioned such that the connecting portion **213** is adjacent with the ring **206a** of the plug **200**. The first position **510** enables the distal end portions **215** and **217** of the one or more legs **212a** and **212b** to pass under the one or more tabs **502** of the receiving connector **108a** to mate (or engage) the plug **200** with the power port **506** of the receiving connector **108a** (as shown by FIG. 5A).

[0028] A second position (or a partially closed unlocked state) **520** of the battery lock out device **100** may include the sliding device **210** being positioned such that the distal end portions **215** and **217** of the one or more legs **212a** and **212b** are in contact with the one or more tabs **502** of the receiving connector **108a** (as shown by FIG. 5B).

[0029] A third position (or a closed unlocked state) **530** of the battery lock out device **100** may include the sliding device **210** being positioned such that the one or more side protrusions **208a** and **208b** are adjacent to the proximal end portions **214** and **216** of the one or more legs **212a** and **212b**, respectively (as shown by FIG. 5C). In examples, the third position **530** may further include the data connector cover **225** of the sliding device **210** being mated with the data plug connector **504** of the receiving connector **108a**. In examples, the third position **530** may further include a retainer (or flexing arm) **262** coupled to the left leg **212a** and/or the right leg **212b** of the sliding device **210** interfacing with a retainer ramp **261** coupled to the lock end portion **204** of the plug **200** such that the sliding device **210** is retained in the third position **530** (e.g., through friction and/or tension between the retainer **262** and the retainer ramp **261**) and does not slide down into the second position **520** due to gravity.

[0030] A fourth position (or a closed locked state) **540** of the battery lock out device **100** may include a shackle **544** of a lock **542** placed through the rings **206a** and **206b** such that the battery lock out device **100** and the lock **542** is locked (as shown by FIG. 5D). Once the battery lock out device **100** is in the fourth position **540**, the lock **542** must be unlocked and the shackle **544** removed from the rings **206a** and **206b** before the battery lock out device **100** may return to previous positions **510**, **520**, and **530** and/or removed from the receiving connector **108a**.

[0031] FIG. 6 is a flow diagram of an example method **600** for locking out a receiving connector of a battery and/or a vehicle. A user and/or an appropriately programmed machine (e.g., an industrial robotic arm) may implement method **600**. For ease of description, the process **600** is described below with reference to FIGS. 1-4 and 5A-5D. The process **600** of the present disclosure, however,

is not limited to use of the exemplary battery lock out device **100** of FIGS. 1-4 and 5A-5D.

[0032] The method **600** may include rotating and/or positioning the sliding device **210** such that the connecting portion **213** is adjacent to the ring **206a** of the plug **200** (**602**). The sliding device **210** may be rotated around the plug **200** such that the battery lock out device **100** is in the first position **510** (i.e., the connecting portion **213** is adjacent to the ring **206a** of the plug **200**).

[0033] The method **600** may further include mating the plug **200** with the receiving connector **108a** (**604**). While in the first position **510**, the plug **200** may be inserted into the power port **506** of the receiving connector **108a** such that the plug **200** is mated with the receiving connector **108a**.

[0034] The method **600** may further include rotating (e.g., by about 90 degrees) the sliding device **210** such that the one or more legs **212a** and **212b** of the sliding device **210** come into contact with the one or more tabs **502** of the receiving connector **108a** (**606**). The sliding device **210** may be rotated down such that the battery lock out device **100** is in the second position **520** (i.e., the one or more legs **212a** and **212b** of the sliding device **210** are in contact with the one or more tabs **502** of the receiving connector **108a**).

[0035] The method **600** may further include sliding the sliding device **210** up such that the one or more protrusions **208a** and **208b** are adjacent to the proximal end portions **214** and **216** of the one or more legs **212a** and **212b** and the ring **206a** of the plug **200** aligns with and is adjacent to the ring **206b** of the sliding device **210** (**608**). The sliding device **210** may be slid up such that the battery lock out device **100** is in the third position **530** (i.e., the one or more protrusions **208a** and **208b** are adjacent to the proximal end portions **214** and **216** of the one or more legs **212a** and **212b**). In examples, the sliding device **210** may be configured to slide in a direction perpendicular to the length of the plug to align the first ring **206a** and the second ring **206b** such that the first ring **206a** and the second ring **206b** may receive the lock shackle **544** to lock a position of the sliding device **210** relative to the plug **200** to prevent the plug **200** from being removed from the receiving connector **108a**.

[0036] The method **600** may further include locking the battery lock out device **100** with the lock **542** (**610**). The shackle **544** of the lock **542** may be placed through the rings **206a** and **206b** of the plug **200** and the sliding device **210** and the lock **542** and the battery lock out device **100** may be locked such that the receiving connector **108a** may not be mated with any other connector without first unlocking the lock **542** and removing the battery lock out device **100** from the receiving connector **108a**.

[0037] Exemplary embodiments of the invention have been disclosed in an illustrative style. Accordingly, the terminology employed throughout should be read in a non-limiting manner. Although minor modifications to the teachings herein will occur to those well versed in the art, it shall be understood that what is intended to be circumscribed within the scope of the patent warranted hereon are all such embodiments that reasonably fall within the scope of the advancement to the art hereby contributed, and that that scope shall not be restricted, except in light of the appended claims and their equivalents.

## Claims

1. A lock out device for locking a battery connector comprising: a plug having: a plug end configured to engage the battery connector to prevent another connector from being connected to the battery connector, and a lock end opposite of the plug end defining a length of the plug, the lock end having a first ring configured to receive a lock shackle; and a sliding device movably coupled to the plug and having a second ring configured to receive the lock shackle, the sliding device being configured to rotate about an axis perpendicular to the length of the plug and to slide in a direction perpendicular to the length of the plug to prevent the plug from being removed from the battery connector.
2. The lock out device of claim 1, wherein the sliding device is further configured to slide in the

direction perpendicular to the length of the plug to align the first ring and the second ring such that the first ring and the second ring may receive the lock shackle to lock a position of the sliding device relative to the plug to prevent the plug from being removed from the battery connector.

**3.** The lock out device of claim 1, wherein the plug further includes one or more protrusions along the axis perpendicular to the length of the plug, the one or more protrusions being configured to movably couple the plug to the sliding device.

**4.** The lock out device of claim 3, wherein: the plug further includes a retainer ramp, and the sliding device further includes: one or more legs each having a channel configured to receive a protrusion of the one or more protrusions, and a retainer coupled to a leg of the one or more legs and configured to engage the retainer ramp.

**5.** The lock out device of claim 3, wherein the sliding device further includes one or more legs each having: a distal end and a proximal end opposite of the distal end, and a channel configured to receive a protrusion of the one or more protrusions.

**6.** The lock out device of claim 5, wherein the sliding device may rotate about the axis perpendicular to the length of the plug when at least one protrusion of the one or more protrusions is adjacent to the distal end of at least one leg of the one or more legs.

**7.** The lock out device of claim 6, wherein the first ring and the second ring will align if the sliding device is positioned such that at least one protrusion of the one or more protrusions is adjacent to the proximal end of at least one leg of the one or more legs.

**8.** The lock out device of claim 4, wherein: each channel of the one or more legs includes a narrow portion having a first width and an enlarged portion having a second width that is larger than the first width, and the sliding device may rotate about the axis perpendicular to the length of the plug when the one or more protrusions are within the enlarged portion of at least one leg of the one or more legs.

**9.** The lock out device of claim 1, wherein the sliding device further includes one or more legs configured to engage one or more tabs of the battery connector.

**10.** The lock out device of claim 9, wherein the sliding device further includes a data connector cover coupled to at least one leg of the one or more legs and configured to receive a data plug of the battery connector.

**11.** A lock out device for locking a connector of a vehicle battery comprising: a plug configured to engage the connector of the vehicle battery to prevent another connector from being connected to the connector of the vehicle battery and having: a first ring configured to receive a shackle of a lock, a left side protrusion, and a right side protrusion opposite of the left side protrusion defining a width of the plug; and a sliding device movably coupled to the plug and having a second ring configured to receive the shackle, the sliding device being configured to rotate about the left side protrusion and the right side protrusion and to slide toward the plug to align the first ring and the second ring such that the first ring and the second ring may receive the shackle to prevent the plug from being removed from the connector of the vehicle battery.

**12.** The lock out device of claim 11, wherein the sliding device further includes one or more legs each having: a distal end and a proximal end opposite of the distal end, and a channel configured to receive the left side protrusion or the right side protrusion.

**13.** The lock out device of claim 11, wherein: the plug further includes a retainer ramp, and the sliding device further includes: one or more legs each having a channel configured to receive the left side protrusion or the right side protrusion, and a retainer coupled to a leg of the one or more legs and configured to engage the retainer ramp to retain a position of the sliding device relative to the plug.

**14.** The lock out device of claim 13, wherein the one or more legs are configured to engage one or more tabs of the connector of the vehicle battery.

**15.** The lock out device of claim 13, wherein: each channel of the one or more legs includes a narrow portion having a first width and an enlarged portion having a second width that is larger



than the first width, and the sliding device may rotate about the left side protrusion and the right side protrusion when the left side protrusion or the right side protrusion is positioned within the enlarged portion of the channel of at least one leg of the one or more legs.

**16.** The lock out device of claim 13, wherein the sliding device is prevented from rotating about the left side protrusion and the right side protrusion when the left side protrusion or the right side protrusion is positioned within the narrow portion of the channel of the at least one leg.

**17.** The lock out device of claim 13, wherein the first ring and the second ring will align if the sliding device is positioned such that the left side protrusion or the right side protrusion is adjacent to the proximal end of at least one leg of the one or more legs.

**18.** The lock out device of claim 13, wherein the second ring is coupled to at least one leg of the one or more legs.

**19.** The lock out device of claim 13, wherein at least one leg of the one or more legs has a cutout portion at the distal end of the at least one leg.

**20.** The lock out device of claim 13, wherein the sliding device further includes a data connector cover coupled to at least one leg of the one or more legs and configured to receive a data plug of the connector of the vehicle battery.

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