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(54) Title: SLIDING CHARGING INLET COVER

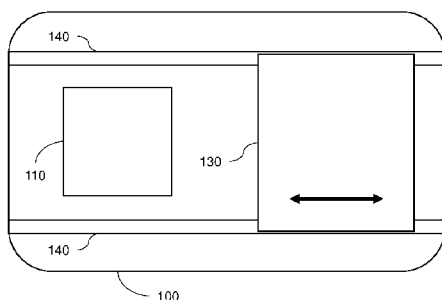


Fig. 1a

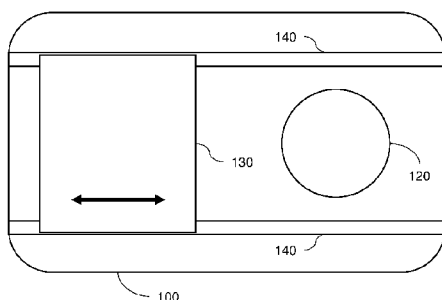


Fig. 1b

(57) Abstract: A connector unit (100) for a vehicle is provided. The connector unit (100) comprises a first connector (110), second connector (120), a bracket (150) surrounding the first and second connectors (110, 120), and a sliding door (130). The sliding door (130) is supported by the bracket (150) and movable relative thereto between a first position for covering only the first connector (110) and a second position for covering only the second connector (120).

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Sliding charging inlet cover

TECHNICAL FIELD

5 The present disclosure relates to a connector unit for a vehicle. The present disclosure further relates to a vehicle comprising such a connector unit.

BACKGROUND

10 The batteries of most electric vehicles and plug-in hybrid vehicles can be charged using AC power, directly from the power grid, or with DC power, typically from a road-side rapid charging unit. AC and DC charging points use different connectors for connecting to the charging port of the vehicle. Many, e.g., European and American vehicles have combined charging ports that are able to connect to at least one common type of AC connector as well as to one type of common DC connector. To avoid damage to the battery and the charging electronics, this
15 charging port needs to be properly sealed against water ingress. Typically, a proper seal is obtained by an outer door that is flush with the bodywork when closed.

In some markets, e.g. in Japan and China, the vehicles are equipped with separate charging inlets for AC and DC charging. The two charging inlets are arranged side to side behind the
20 same outer door that seals both inlets against incoming water when closed. While charging, however, the charger connector blocks the open door. The outer door can therefore not be closed and only the connected inlet is shielded against incoming water. To protect the charging inlet against, e.g., incoming rain or snow while the vehicle battery is charged using the other charging inlet, additional plastic covers may be provided in addition to the outer door.

25 Such additional plastic covers are not very practical or stylish. The user has to open them before connecting the charger connector and close them after removing the connector. If the user forgets or fails to close the cover, one of the charging inlets may not be properly sealed during charging. This could lead to damage and unsafe situations.

30 It is an aim of the present invention to address one or more of the disadvantages associated with prior art.

35 SUMMARY OF THE INVENTION

Aspects and embodiments of the invention provide a connector unit for a vehicle. The present disclosure further relates to a vehicle comprising such a connector unit.

According to an aspect of the present invention a connector unit for a vehicle is provided. The connector unit comprises a first connector, a second connector, a bracket surrounding the first and second connectors, and a sliding door. The sliding door is supported by the bracket and movable relative thereto between a first position for covering only the first connector and a second position for covering only the second connector.

The first and second connector will typically be two electric connectors or charging inlets for the battery of an electric or hybrid vehicle. The two connectors may have different shapes or a different layout of their connector electrodes. In an alternative embodiment, the connector unit may be configured for use in a hybrid vehicle, with one of the connectors being a fuel connector leading to the fuel connector and the other connector an AC and/or DC connector for charging the battery.

The sliding door ensures that when the outer door is opened because one of the connectors is being used for charging (or fuelling) the vehicle, the other connector will always and automatically be covered and thus protected against, e.g., incoming rain. Additionally, it will make it easier for the user to charge the vehicle. If the right connector is already exposed when opening the outer door, no further action is required before connecting the charger. When the charging is done and the charger connector is removed, no additional cover needs to be closed before closing the outer door again.

Preferably, the sliding door is biased to move away from an intermediate position between the first position and the second position, towards either the first or the second position. This avoids the sliding door being in a position where neither of the two connectors would be available without first moving the sliding door. Optionally, for example if the second connector is used more often than the first connector, the sliding door is biased to return to the first position, thereby further reducing the actions the user must perform for charging the battery.

To releasably hold the sliding door in place when in the first position, the connector unit the bracket may comprise a first latch, configured to engage with a cooperating feature of the sliding door. The latch may be spring biased, such that some spring force may need to be overcome for releasing the sliding door from its first position. Additionally, the bracket may comprise a second latch, configured to engage with a cooperating feature of the sliding door to releasably hold the sliding door in place when in the second position. The second latch may be spring biased too.

An actuator may be mechanically coupled to the sliding door and arranged to move the sliding door between the first position and the second position. Possibly, the actuator is configured such that the movement of the sliding door is triggered by pushing against the door in a direction perpendicular to the movement.

The actuator may use spring forces that can be released by a user or by an electronic control system operating a switch. For example, the actuator may comprise a first spring, connected between the sliding door and a first side of the bracket, adjacent the first position, and a second spring, connected between the sliding door and a second side of the bracket, adjacent the second position. When released, the first or second spring moves the sliding door to the other position, where it may be held by, e.g., a latch or a magnetic or electromagnetic force.

Alternatively, the actuator may comprise an electric motor. The electric motor may be user-operated by a simple electronic switch. Preferably, the electric motor is coupled to an electric controller. A control system may, e.g., operate the sliding door in dependence on GPS based location information, usage history, and/or external control signals provided by a nearby charger station.

The connector unit may comprise a first connector sensor, operatively coupled to the electronic controller, and configured to detect an external connector connecting the first connector, and wherein the electronic controller is configured to move the sliding door in dependence on a signal from the first connector sensor. A second connector sensor may be provided at the second connector. These sensors may, for example, be used to block movement of the sliding door when an external connector is inserted in one of the connectors or return the sliding door to a default position after the external connector has been removed.

According to a further aspect of the invention, a vehicle is provided comprising a connector unit as described above.

Within the scope of this application it is expressly intended that the various aspects, embodiments, examples and alternatives set out in the preceding paragraphs, in the claims and/or in the following description and drawings, and in particular the individual features thereof, may be taken independently or in any combination. That is, all embodiments and/or features of any embodiment can be combined in any way and/or combination, unless such features are incompatible. The applicant reserves the right to change any originally filed claim or file any new claim accordingly, including the right to amend any originally filed claim to

depend from and/or incorporate any feature of any other claim although not originally claimed in that manner.

5 BRIEF DESCRIPTION OF THE DRAWINGS

One or more embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1a show a first embodiment of a connector unit according to the invention.

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Figure 1b shows the connector unit of Figure 1b with another charging inlet covered by the sliding door.

Figure 2a shows a front view of a second embodiment of a connector unit according to the invention.

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Figure 2b shows a rear view of the connector unit of Figure 2a.

Figure 3 shows a top view of the connector unit of Figure 2a and 2b.

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DETAILED DESCRIPTION

A control system for a vehicle in accordance with an embodiment of the present invention is described herein with reference to the accompanying figures.

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Figure 1a show a first embodiment of a connector unit 100 according to the invention. The connector unit 100 has a first charging inlet 110. A sliding door 130 is movable through rails 140. The sliding of the door may, e.g., be actuated by the user or by an electronically controlled actuator. When sliding the sliding door 130 in Figure 1a to the left, the first connector is covered by the door 130 and a second and different connector 120 is revealed. Figure 1b shows the connector unit of Figure 1b with the first charging inlet 110 covered by the sliding door 130 and the second connector 120 available for use.

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The first and second connector 110, 120 will typically be two electric connectors or charging inlets for the battery of an electric or hybrid vehicle. The two connectors 110, 120 may have different shapes or a different layout of their connector electrodes. For example, the first connector 110 is a DC connector and the second connector 120 is an AC connector. In another

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example, both connectors 110, 120 are combined AC/DC connectors, but with a different geometry or electrode configuration. In an alternative embodiment, the connector unit may be configured for use in a hybrid vehicle, with one of the connectors being a fuel connector leading to the fuel connector and the other connector an AC and/or DC connector for charging the battery.

The connector unit 100 will typically be hidden behind an outer door in the vehicle body work and can be accessed by opening the outer door. The sliding door 130 ensures that when the outer door is opened because one of the connectors 110, 120 is being used for charging (or fuelling) the vehicle, the other connector 110, 120 will always and automatically be covered and thus protected against, e.g., incoming rain. Additionally, it will make it easier for the user to charge the vehicle. If the right connector 110, 120 is already exposed when opening the outer door, no further action is required before connecting the charger. When the charging is done and the charger connector is removed, no additional cover needs to be closed before closing the outer door again.

Figure 2a shows a front view of a second embodiment of a connector unit 150 according to the invention. It is noted that in this schematic drawing, only the sliding door mechanism is shown, not the connectors 110, 120. The sliding door 130 of this connector unit 100 is embedded in a bracket 150 having a complementary shape to ensure a proper sealing of the hidden connector 110, 120. Charging indicators 154 are integrated with the bracket for indicating a current state of charge of the battery and, possibly, to visualise an ongoing charging process. A button 152 is provided that may, e.g., function as a switch for initiating a sliding movement of the door 130. The button 152 may represent more than one function. E.g., pressing the button 152 for a number of seconds, or pressing it twice in a short time span may trigger different functions. Additional user interface elements may be integrated with the bracket 150.

Figure 2b shows a rear view of the connector unit 100 of Figure 2a. Visible in this drawing is a sliding door mechanism 200 that serves to keep the sliding door 130 in its first or second position when needed, but also moves the door 130 to the other position when activated by the user. A top view of this sliding door mechanism 200 is shown in Figure 3. In Figure 2b, the sliding door mechanism 200 is shown to be provided at the top and the bottom of the connection unit 100. However, the sliding door mechanism 200 would work too with only the top or bottom part of it. In that event, a simple rail may be provided at the other end to guide the movement of the sliding door 130.

The sliding door mechanism 200 comprises a first spring 211 and a second spring 221. The first spring 211 is provided between a first side of the sliding door 130 and the corresponding first side of the bracket 150. The second spring 221 is provided between a second side of the sliding door 130 and the corresponding second side of the bracket 150. First and second
5 pivotable latches 212, 222 that engage with respective first and second notches 231, 232 in the sliding door (see Figure 3b) hold the sliding 130 door in position when it is in its first or second position. The latches 212, 222 are spring biased by latch springs 213, 223.

In Figure 3b, the sliding door 130 is shown in its second position. When the user pushes on
10 the sliding door 130 in the direction of the arrow 300, the latch 222 is pushed out of its notch 232 and the compressed second spring 221 will extend and push the sliding 130 in the direction of the first position. Simultaneously, the extended first spring 211 will pull on the sliding door 130 in the same direction. Due to its velocity, the sliding door 130 move past the
15 the centre of the bracket 150 and push the first latch 212 into the first notch 231 when reaching the first position. The first latch spring 213 will then ensure that the sliding door will be kept in place until the use presses on the door again to release the first latch 212 and let the door 130 return to the second position.

In alternative versions of the sliding door mechanism, the latches 212, 222 may, e.g., be
20 biased using magnetic or electromagnetic forces. As a further alternative, the combination of spring biased latches 212, 222 and notches 231, 232 may be replaced by electromagnetic locks that are used for selectively locking and releasing the sliding door 130 in the first and second position.

In an entirely different embodiment, an electric motor may move the sliding door 130 between
25 the first and second positions. The electric motor may be user-operated by a simple electronic switch, e.g. coupled to the button 152. Optionally, the sliding door 130 itself functions as a switch for controlling the electric motor when pushed or touched. Preferably, the electric motor is coupled to an electric controller. A control system may, e.g., operate the sliding door 130 in
30 dependence on GPS based location information, usage history, and/or external control signals provided by a nearby charger station.

The connector unit 100 may comprise a first connector sensor, operatively coupled to the electronic controller, and configured to detect an external connector connecting the first
35 connector 110, and wherein the electronic controller is configured to move the sliding door 130 in dependence on a signal from the first connector sensor. A second connector sensor may be provided at the second connector 120. These sensors may, for example, be used to

block movement of the sliding door 130 when an external connector is inserted in one of the connectors 110, 120 or return the sliding door 130 to a default position after the external connector has been removed.

- 5 It will be appreciated that various changes and modifications can be made to the present invention without departing from the scope of the present application.

CLAIMS

1. A connector unit for a vehicle, the connector unit comprising:
a first connector,
5 a second connector,
a bracket surrounding the first and second connectors, and
a sliding door, supported by the bracket and movable relative thereto between a first position for covering only the first connector and a second position for covering only the second connector.
- 10 2. A connector unit according to claim 1, wherein the sliding door is biased to move away from an intermediate position between the first position and the second position, towards either the first or the second position.
- 15 3. A connector unit according to claim 1, wherein the sliding door is biased to return to the first position.
4. A connector unit according to any preceding claim, wherein the bracket comprises a first latch, configured to engage with a cooperating feature of the sliding door to releasably
20 hold the sliding door in place when in the first position; optionally the first latch is spring biased.
5. A connector unit according to claim 4, wherein the bracket comprises a second latch, configured to engage with a cooperating feature of the sliding door to releasably hold the sliding door in place when in the second position; optionally the second latch is spring biased.
- 25 6. A connector unit according to any preceding claim, comprising an actuator, mechanically coupled to the sliding door and arranged to move the sliding door between the first position and the second position.
- 30 7. A connector unit according to claim 6, wherein the sliding door and the actuator are configured such that the movement of the sliding door is triggered by pushing against the door in a direction perpendicular to the movement.
8. A connector unit according to claim 6 or 7, wherein the actuator comprises a first
35 spring, connected between the sliding door and a first side of the bracket, adjacent the first position, and a second spring, connected between the sliding door and a second side of the bracket, adjacent the second position.

9. A connector unit according to claim 6 or 7, wherein the actuator comprises an electric motor.
- 5 10. A connector unit according to claim 9, comprising an electric controller, operatively coupled to the electric motor, and configured to instruct the electric motor to move the sliding door.
- 10 11. A connector unit according to claim 10, comprising a first connector sensor, operatively coupled to the electronic controller, and configured to detect an external connector connecting the first connector, and wherein the electronic controller is configured to move the sliding door in dependence on a signal from the first connector sensor.
- 15 12. A connector unit according to claim 11, comprising a second connector sensor, operatively coupled to the electronic controller, and configured to detect an external connector connecting the second connector, and wherein the electronic controller is configured to move the sliding door in dependence on a signal from the second connector sensor.
- 20 13. A connector unit according to any of the preceding claims, wherein the first connector is an AC connector and the second connector is a DC connector.
14. A vehicle comprising a connector unit according to any of the preceding claims.

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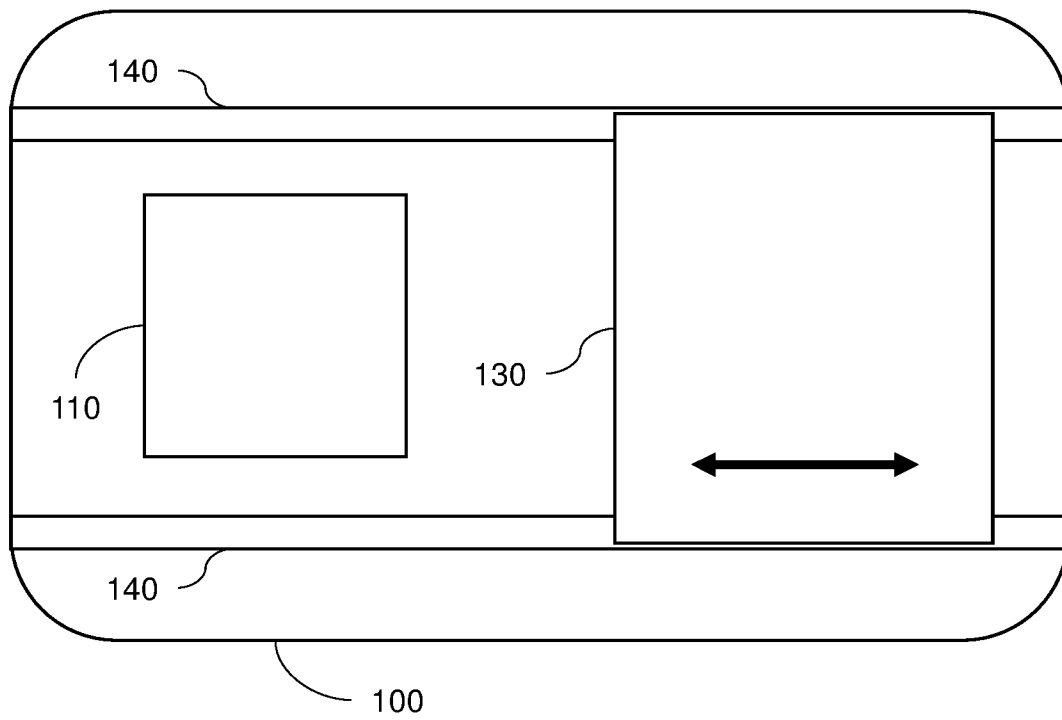


Fig. 1a

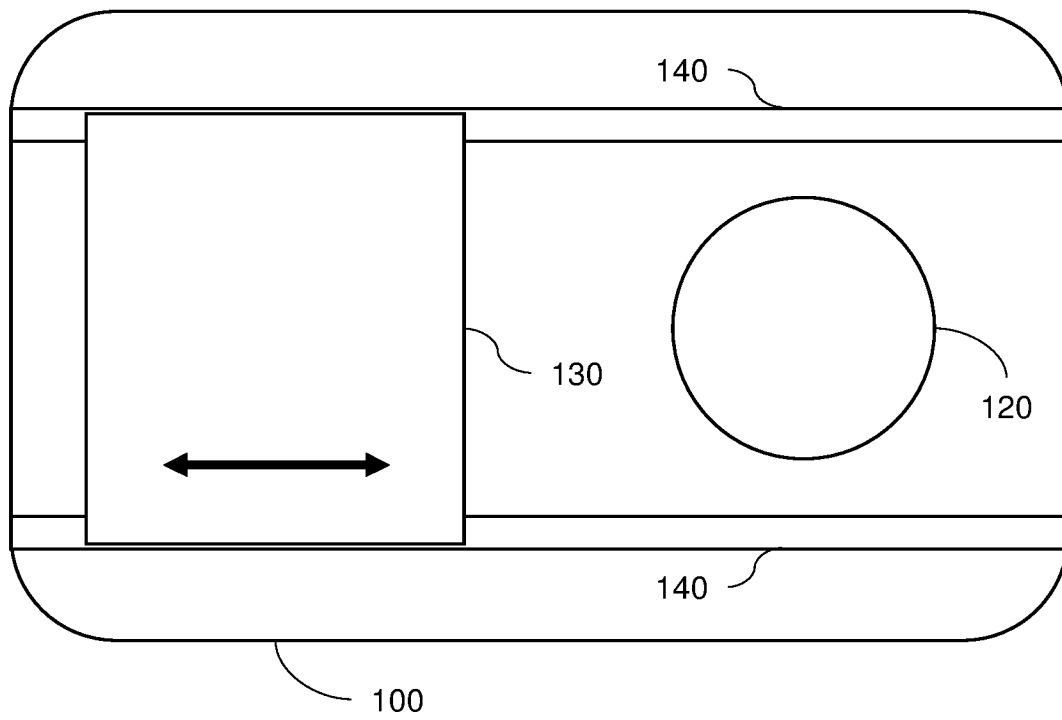


Fig. 1b

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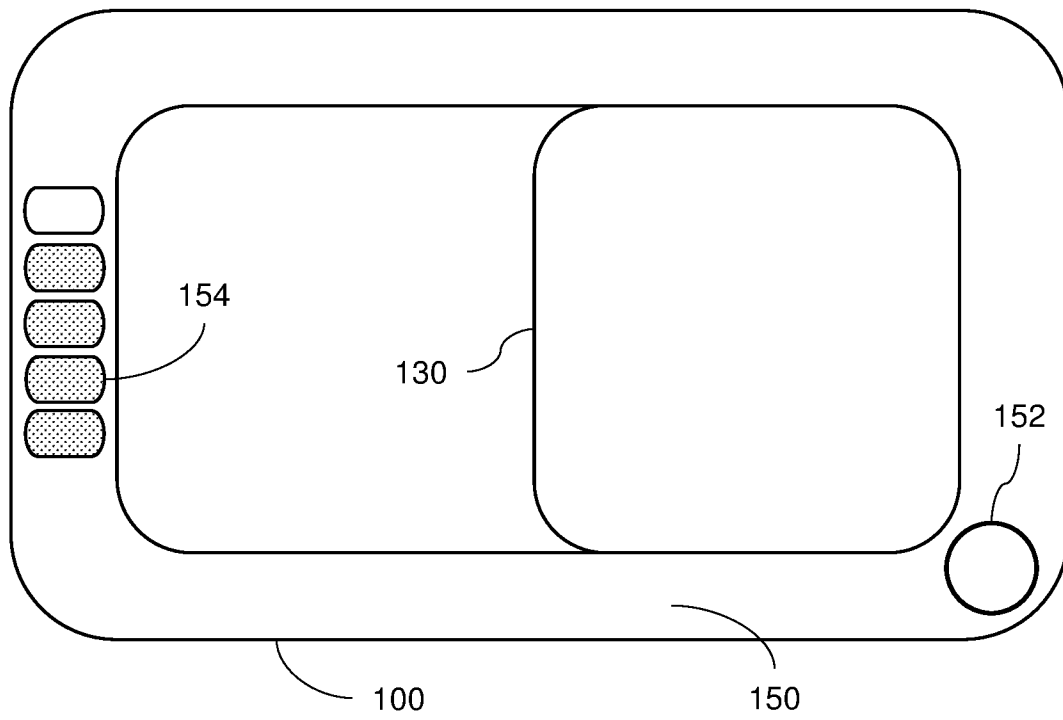


Fig. 2a

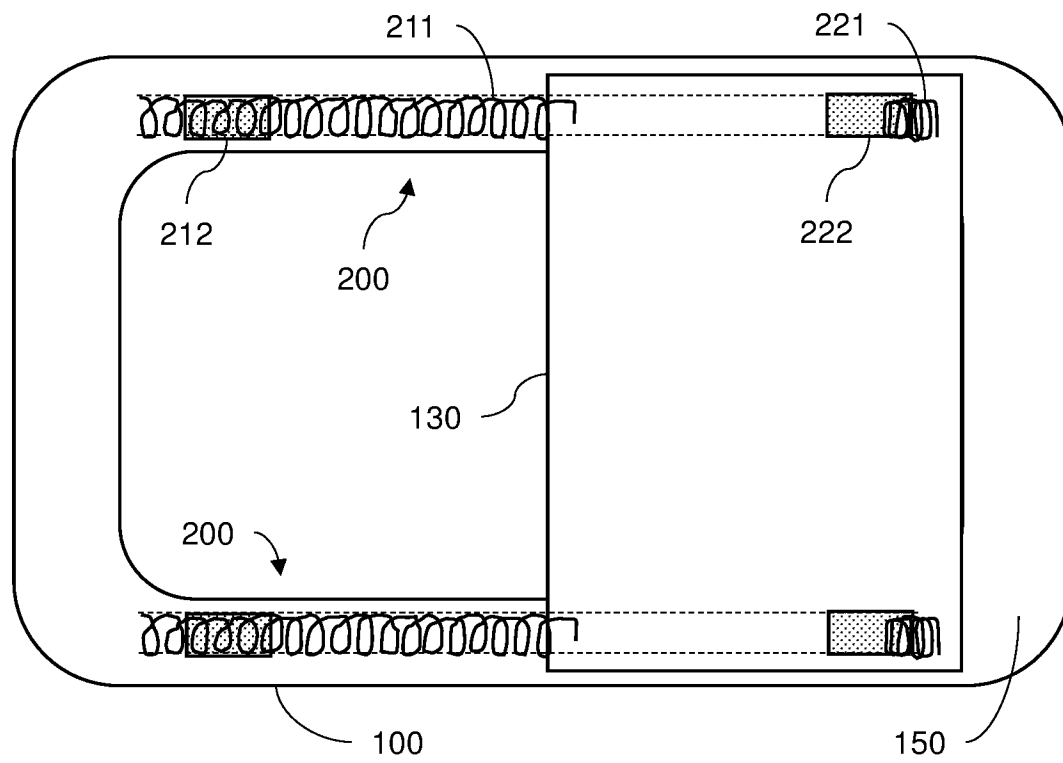


Fig. 2b

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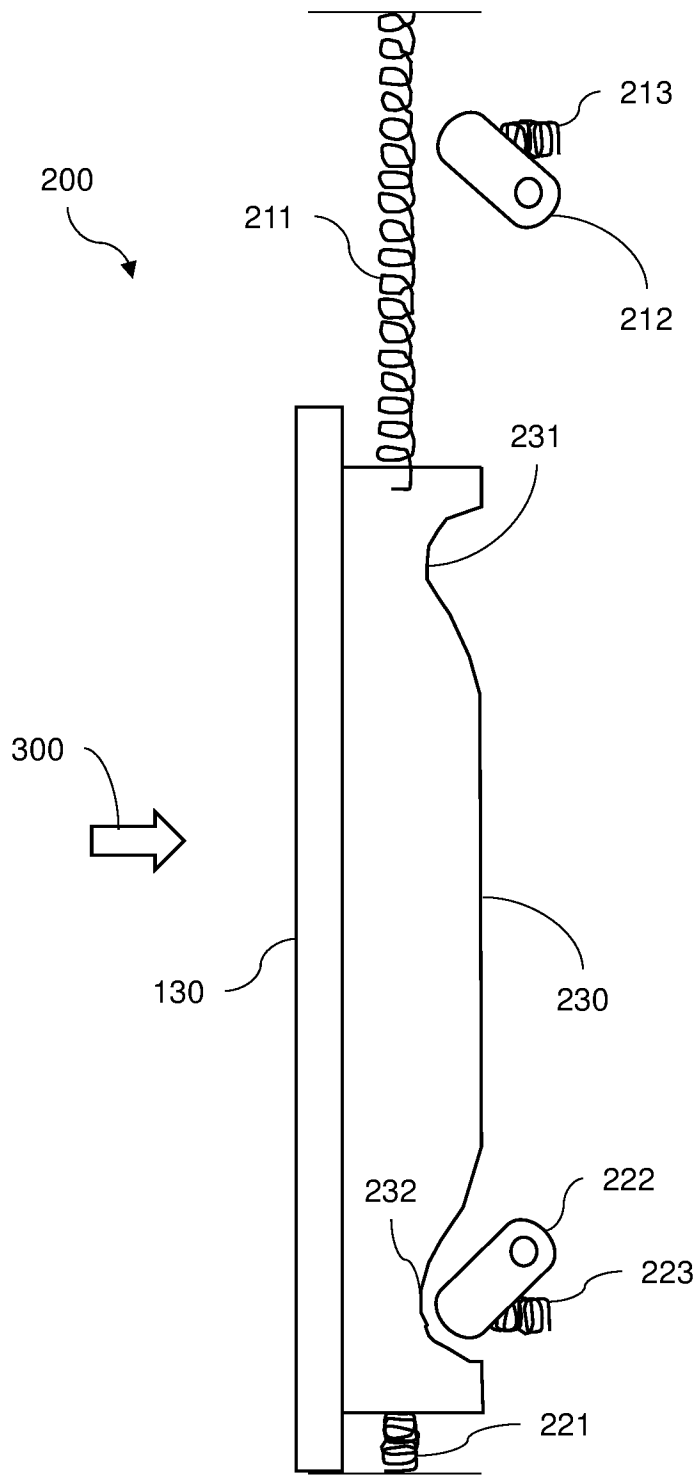


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2021/076664

A. CLASSIFICATION OF SUBJECT MATTER

INV. B60L53/14 B60L53/16 H01R13/447
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B60L H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10 2016 217961 A1 (BAYERISCHE MOTOREN WERKE AG [DE]) 22 March 2018 (2018-03-22) figures 1-6c -----	1-14
X	DE 10 2011 006633 A1 (KIEKERT AG [DE]) 15 March 2012 (2012-03-15) figure 5 -----	1-14

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2021/076664

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102016217961 A1	22-03-2018	NONE	

DE 102011006633 A1	15-03-2012	NONE	
