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MINIMALLY INVASIVE LOADING ROBOT

Verena Schwaiger
Bertrandt Ingenieurbüro GmbH

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Technical task:
The task of this technical innovation is to simplify and increase the level of flexibility of charging electric cars, especially at home.

Initial situation:
The customer can currently have a charging interface installed in his garage at home, but must manually plug the charging cable into the charging socket on the vehicle. It is also possible to install an induction charging plate underneath the vehicle. Furthermore, there are already concepts for loading robots moving under the vehicle as well as loading robots anchored firmly in the garage with a robot arm (comparable to a small Kuka robot).

With inductive charging, only a fraction of the regular DC charging cable can be transmitted, which can lead to comparatively long charging times. The conductive loading robot under the vehicle requires a new conductive plug/charging socket in the wet area, which is still to be developed, and is also inferior to the regular DC charging in terms of transmission performance, at least in current architectures. Permanently installed loading robots require structural measures in the environment.

Solution:
By using the minimally invasive loading robot, the regular charging socket of the vehicle (DC charging) is used. A robot as shown in the schematic diagram can adapt individually to the parking situation of the vehicle and flexibly bridge the distance between the garage wall and the vehicle depending on the design. This is supported on the garage wall and the elevator side by appropriately designed rollers, "drives" vertically to the height of the vehicle charging socket, opens the loading flap and inserts the high-voltage cable. Instead of the garage wall, another parking vehicle can also be used for support.

In the schematic diagram, the robot is also designed as a hinge with three cardan shafts and four axles. The hinge moves apart like a horizontally arranged scissor lift until the distance between the garage wall and the vehicle is bridged. As soon as the roller on the vehicle and the roller on the garage wall (or the vehicle parked next door) have sufficient contact pressure, these two rollers move the loading robot synchronously vertically to the height of the loading can. The charging socket either opens automatically or must be opened by a separate actuator.
The high-voltage plug is mounted horizontally, must be easily adjustable in its horizontal position (e.g. via rails) and, as soon as it is in the correct position, inserts the plug into the charging socket. After the charging process has been completed, the plug is pulled out again, the loading robot moves back towards the garage floor in the usual manner, detaches itself from the vehicle, drives together to the maximum and either remains in place directly on the garage wall (between two parking vehicles) or can, if necessary, drive to a predefined parking space. Via the two central axles with a total of 4 rollers (for movement on the garage floor), the robot can also rotate on the spot and thus carry out more complex manoeuvres.

Advantages:
This allows a level of comfort comparable to a permanently installed robot arm to be achieved at maximum loading performance without having to make the structural changes, e.g. in a rental object. The robot could also be taken along without any problems when moving house. If a vehicle parked next door is used as a support instead of the garage wall, this is an interesting approach, especially for use in multi-storey car parks. A loading robot can also be used for several parallel charging processes of several parking vehicles as soon as the charging cable plug is not permanently connected to the robot, but is gripped.

Possible application:
Applicable for electrically rechargeable cars.

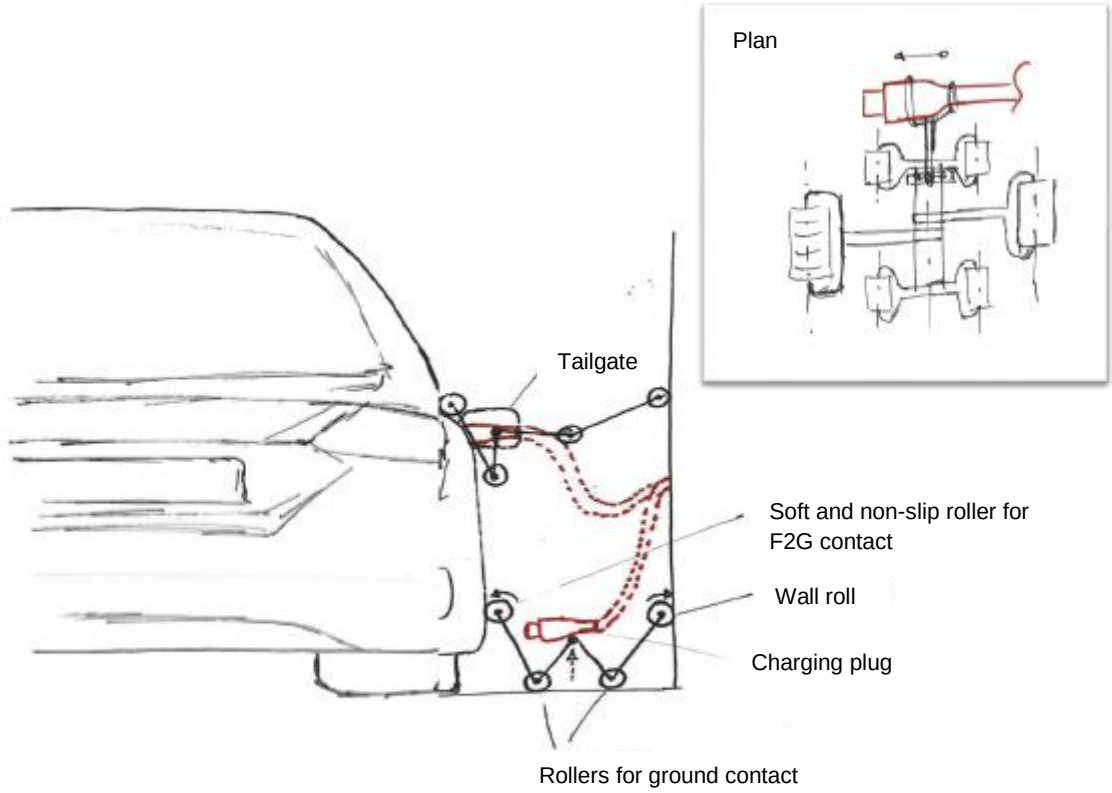

Figure 1: Schematic representation of minimally invasive loading robot