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(71) Applicants:
- **Moffet, Richard**
  H18 X231 County Monaghan (IE)
- **Moffet, Josh**
  H18 X231 County Monaghan (IE)

(72) Inventors:
- **Moffet, Richard**
  H18 X231 County Monaghan (IE)
- **Moffet, Josh**
  H18 X231 County Monaghan (IE)

(74) Representative: **FRKelly**
27 Clyde Road
Dublin D04 F838 (IE)

(54) CAR STACKING DEVICE

(57) The present disclosure relates to a car stacking device for stacking a car above a car park space comprising a base, a platform having a frame member at each end wherein a car can be driven through each frame member onto and off the platform, a lifting apparatus having two arms, each comprising a hinged connection with the base at one end and a hinged connection with a respective one of the frame members at the other end, and hydraulic means for raising and lowering the two arms of the lifting apparatus with the platform connected thereto.

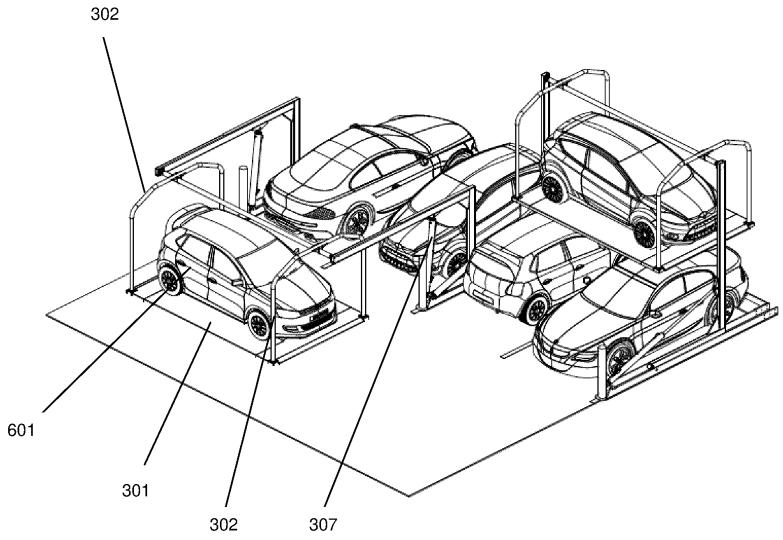

Figure 6

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Description

Field

[0001] The present application relates to a car stacking device and in particular a car stacking device that can be installed in existing car parks to increase capacity.

Background Of The Invention

[0002] A car park needs a fairly large amount of space, around 12 square meters, per parking spot. This means that car parks can often need more land area than for corresponding buildings if most employees or visitors arrive by car. In places where space is limited, car park stacking systems may be used. These are mechanical systems designed to minimize the area and/or volume required for parking cars. In particular, these systems provide parking for cars stacked vertically to maximize the number of parking spaces while minimizing land usage.

[0003] There are a number of such car park stacking systems and devices available. CN202731356 discloses a double-layer vehicle three-dimensional parking device. The device comprises of an upper layer platform and a lower layer platform. The upper layer platform consists of double four-bar linkage mechanism having moving rods, vertical support columns and vertical supporting rods. The upper layer platform is moved with the help of moving rods from the upper vehicle parking platform mount to the grounded position. The moving rods are operated by two hydraulic cylinders.

[0004] https://www.youtube.com/watch?v=xZx9zYI-Xjc discloses a car stacker system. The system comprises of a hinging arms which supports the upper parking platform. The hinging arms are operated by pneumatic/hydraulic cylinder/s in order to move the upper platform to grounded position. The car underneath does not have to be moved in order to stack/park the car on top.

[0005] CN108571200 discloses a three-dimensional parking device. The three-dimensional parking device comprises a base, a lifting part, an upper platform and a vehicle carrying platform, wherein the lifting part is arranged between the base and the upper platform, and the bottom end of the lifting part is rotatably connected with the base; the top end of the lifting part is rotatably connected with the upper platform, the lifting part is move together with the base and the upper platform, the upper platform is arranged between the lifting part and the vehicle carrying platform and is in rotary connection with the vehicle carrying platform; the vehicle carrying platform is arranged at the top end of the lifting part and is rotatably connected with the upper platform. Under the drive of the lifting part, the three-dimensional double-layer placing and parking is realized, and under the driving of the upper platform, the vehicle-carrying platform can rotate with respect to the upper platform, and the vehicle position of the upper layer is adjusted, so that the upper-layer vehicle is convenient to access the garage, and the occupied space of the parking device is reduced.

[0006] CN109339520 shows another example of a three-dimensional parking device.

[0007] However, all of these prior art systems and devices rely on a plurality of interconnected linkages in order to stack cars on top of already parked cars. This leads to greater manufacturing expensive and the need for regular maintenance once installed. There can also be reliably issues in that the number of linkages increases the chances of one of these linkages failing.

[0008] The present invention seeks to alleviate the disadvantages associated with known car park stacking devices and systems.

Summary

[0009] The present teachings relate to a car stacking device for stacking a car above a car park space. The car stacking device comprising a base, a platform having a frame member at each end wherein a car can be driven through each frame member onto and off the platform, a lifting apparatus having two arms, each comprising a hinged connection with the base at one end and a hinged connection with a respective one of the frame members at the other end, and hydraulic means for raising and lowering the two arms of the lifting apparatus with the platform connected thereto.

[0010] Each arm may be connected to the top of the respective frame member.

[0011] The top of each frame member may be connected by an axle running in the same direction as the platform.

[0012] The axle may be hinged with respect to each frame member. Alternatively, the axle is hinged with respect to each arm.

[0013] The arms may be L shaped or C shaped or any suitable configuration.

[0014] The hydraulic means may comprise a hydraulic cylinder for each arm and the cylinder is connected to the base at a point spaced away from the hinged connection of the arm with the base.

[0015] The hydraulic cylinder may connect to the arm at a point towards the hinged connection of the arm with the frame member.

[0016] Each frame member may be configured to have an inverted U shape, be connected to the platform at two points and hinged at an apex of the inverted U shape.

[0017] Each frame member may be provided at a longitudinal end of the platform.

[0018] The base of the car stacking device may be U shaped and configured to surround two car park spaces such that after the platform is raised it is held elevated above two car spaces and perpendicular to the direction of the two car park spaces.

[0019] The car stacking device may be modular and configured to be attached to the floor of an existing car park such that cars can be stacked above existing car

park spaces.

[0020] Furthermore, the base of the car stacking device is provided with sufficient weight that it does not need to be anchored to the floor in order to raise or lower the platform having a vehicle parked thereon.

Brief Description Of The Drawings

[0021] The present application will now be described with reference to the accompanying drawings in which:

Figure 1 shows a perspective view of an existing car park in which the car stacking device or system of the present invention may be installed;

Figure 2 shows the car park of figure 1 with the car stacking device or system of the present invention installed;

Figure 3 shows the car stacking device of the present teachings wherein the platform of the device is in a lowered position;

Figure 4 shows a perspective view of the car stacking device of the present teachings in more detail;

Figure 5 shows the car stacking device of figure 4 wherein the platform of the device is semi-lowered; and

Figure 6 is shows the car stacking device of figure 4 wherein the platform of the device is in a lowered position.

Detailed Description Of The Drawings

[0022] The present teaching will now be described with reference to the drawings.

[0023] Figure 1 shows a standard surface car park 100 in which a car stacking device in accordance with the present teachings can be installed. As explained in more detail hereinafter, the car stacking device is modular and configured to be attached to the floor of an existing car park such that cars can be stacked above existing car park spaces or cars 101.

[0024] Figure 2 shows the car park 100 of figure 1 with a plurality of the car stacking devices 200 of the present teachings installed in order to create a car stacking system for the car park 100. It will be appreciated that any number of the stacking devices 200, which stack a single car above two car park spaces, may be fitted to the car park 100.

[0025] As can be seen from figure 2, with the maximum number of car stacking devices 200 fitted, there is a 50% increase in the number of car spaces in the car park 100. While the configuration of figure 2 is shown with two car park spaces beneath the stacked car and the two car park spaces are perpendicular to the direction of the stacked car, the car stacking device 200 is not limited to this. Rather, a single car park space may be provided under the stacked car and the car in this space can be parked lengthways i.e., in the same direction as the car stacked directly above it.

[0026] It should be appreciated by the person skilled in the art that no foundation is required in order to install the car stacking device 200 in the car park 100. That is, the floor of the car park 100 does not have to be excavated in order to provide a secure footing for the car stacking device. Many prior art systems require a concrete foundation to ensure the device does not topple over when stacking or lifting a car. The car stacking device in accordance with the present teachings only requires fixtures to stop it from sliding on the floor. The base 201 of the device is provided with sufficient counterweight to ensure it is capable of stably and securing lifting a car without any chance of it toppling.

[0027] Figure 3 shows the car stacking device 200 in accordance with the present teachings in a lowered position. In this position a user can access their car. Although not described in detail herein, a control system is provided and used to control when the car stacking device 200 should be raised and lowered. For example once a user has paid for theire parking the control system can instruct the car stacking device 200 to move to the lowered position. Each car stacking device 200 may be fitted with sensors to ensure that space in front of the car stacking device 200 is free of any obstruction. This ensures that the car stacking device can be lowered safely.

[0028] It will be appreciated by the person skilled in the art that the control system can be configured in a number of different ways to ensure optimised performance of the car parking system in accordance with the present teachings. For example in an assigned parking space configuration, a user could be provided with a (wireless) user device for raising and lowering an individual car stacking device 200.

[0029] Turning to figure 4, this shows the car stacking device 200 in accordance with the present teachings in more detail. As previously mentioned, the device 200 comprises a base 201. In the exemplary embodiment, the base is generally U shaped (or three sides of a square shape) and configured to surround two car park spaces on the ground level. The car stacking device 200 also includes a platform 301 onto which a car can be driven and parked while the platform is in a lowered position as shown in figure 3.

[0030] A frame member 302 is provided at each (longitudinal) end of the platform 301 wherein a car can be driven through each frame member 302 onto and off the platform. In the exemplary embodiment, each frame member 302 has an inverted U shape and is connected to the platform 301 at two points. The frame member 302 could be any shape sufficient to allow a car to driven through it or within the area enclosed by the frame member. As will be explained in more detail herein after, the frame member is hinged at an apex of the inverted U shape.

[0031] The car stacking device 200 is further provided with a lifting apparatus having two arms 303. Each arm 303 has a hinged connection 304 with the base 201 at one end and a hinged connection 305 with a respective

frame member 302 at the other end. In the exemplary embodiment, the arms are L shaped. However, they could also be C shaped or any other shape that still allows the arms to raise and lower the platform 301 as explained in more detail hereinafter.

[0032] As shown in figure 4, each arm 303 is connected to the top of the respective frame member 302. This allows the platform 301 to essentially hang from the arms 303. The device 200 is also provided with an axle 306 to which each arm 303 is connected. That is, the axle runs in the same direction as the platform 301 and connects the two (distal) ends of the arms 303. The central axle 306 may be fixedly attached to each arm 303 and hinged (hinged connection 305) with respect to each frame member 302.

[0033] In an alternative configuration, the axle 306 is fixedly attached to each frame member 302 and hinged with respect to each arm 303. Regardless of which configuration is used, the same operational principal applies in that the platform 301 can hang from the arms and rotate with respect to the arms as the platform is raised and lowered. This ensures that the platform remains level through the entire raising and lowering procedure.

[0034] The car stacking device 200 is further provided with hydraulic means for raising and lowering the two arms 303 of the lifting apparatus with the platform 301 connected thereto. In the exemplary embodiment, the hydraulic means comprises two hydraulic cylinder 307 - a hydraulic cylinder 307 for each arm 303. Each cylinder is connected to the base 201 at a point 308 spaced away from the hinged connection 304 of the arm with the base. That is, the cylinder 307 is hinged at one end at a point 308 away from the arm 303 but collinear with arm. The other end of the hydraulic cylinder connects to the arm at a point towards to the hinged connection 305 of the arm with the frame member.

[0035] In the exemplary embodiment, each L shaped arm 303 may be considered to have a first (base) section and a second (upright) section. The first section is coplanar with the base 201 and the second section is upright or vertical when the platform is fully raised. The cylinder 307 is hinged on the same plane as the first section of the arm 303 and connects to a point on the second (upright). The positioning of the cylinder 307, the first section and the second section creates a triangle when the platform 301 is fully raised.

[0036] One of the hydraulic cylinders 307 may be bigger in diameter than the other and the cylinders linked in series to give Master/Slave effect for synchronisation. However, the person skilled in the art can choose an appropriate cylinder configuration.

[0037] The operation of the car stacking device will now be explained in more detail with respect to figures 5 and 6.

[0038] In figure 5, it can be seen that the hydraulic cylinders 307 have begun to retract. This pulls the upright section of the corresponding arm 303 towards the cylinder (or towards the hinged connection 308 of the cylinder 307 with the base 201). This in turn causes the arm 303 to pivot around the hinged connection 304 of the arm with the base 201. As the arms 303 pivot, the platform 301 is lowered. Furthermore, as the platform is lowered, the frame members 302 pivot with respect to the axle 306. That is, the frame members 302 are free to rotate about hinged connections 305 and gravity ensures that the platform 301 remains level as the platform 301 is lowered.

[0039] In figure 6, the car stacking device 200 is shown in a fully lowered position wherein the cylinders 307 have full retracted and the platform 301 is resting on the ground. The car 601 parked on the platform 301 is now free to drive (forwards or backwards) off of the platform through the space encircles by the frame members 302. It will be appreciated that since the platform 301 rests on the ground in the same direction as the traffic lane of the car park the car 601 does not have to be rotated or turned and can be driven straight on or off of the platform 301.

[0040] It will be further appreciated that the platform may be long enough to allow a car 601 to be parallel parked. In some circumstances where the car stacking device 200 is fitted in a confined space, this may be preferable.

[0041] The procedure outlined with respect to figures 5 and 6 is reversed in order to stack or park a car 601 on top of the ground level car park spaces.

[0042] It will be appreciated by those skilled in the art that the car stacking device in accordance with the present teachings is advantageous with respect to the prior art. The simplicity of the design is in clear contract to the prior art devices having compared to multiple hinges, linkages and powered units. This has the advantages of low maintenance, less wearing components, less expensive to manufacture and maintain.

[0043] Although the car stacking device has been described with respect to cars, any vehicle may be stacked using this device with the appropriate modifications with respect to size and weight.

[0044] The words comprises/comprising when used in this specification are to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers , steps, components or groups thereof.

[0045] It will of course be understood that the invention is not limited to the specific details described herein, which are given by way of example only, and that various modifications and alterations are possible within the scope of the invention as defined in the appended claims.

Claims

1. A car stacking device for stacking a car above a car park space comprising:
   a base:

      a platform having a frame member at each end wherein a car can be driven through each frame member onto and off the platform;

a lifting apparatus having two arms, each comprising a hinged connection with the base at one end and a hinged connection with a respective one of the frame members at the other end; and hydraulic means for raising and lowering the two arms of the lifting apparatus with the platform connected thereto.

2. The car stacking device of claim 1 wherein each arm is connected to the top of the respective frame member.

3. The car stacking device of claim 1 or 2 wherein the top of each frame member is connected by an axle running in the same direction as the platform.

4. The car stacking device of claim 3 wherein the axle is hinged with respect to each frame member.

5. The car stacking device of claim 3 wherein the axle is hinged with respect to each arm.

6. The car stacking device of any one of claims 1 to 5 wherein the arms are L shaped or C shaped.

7. The car stacking device of any one of claims 1 to 6 wherein the hydraulic means comprises a hydraulic cylinder for each arm and the cylinder is connected to the base at a point spaced away from the hinged connection of the arm with the base.

8. The car stacking device of claim 7 wherein the hydraulic cylinder connects to the arm at a point towards the hinged connection of the arm with the frame member.

9. The car stacking device of any one of claims 1 to 8 wherein each frame member is configured to have an inverted U shape, is connected to the platform at two points and is hinged at an apex of the inverted U shape.

10. The car stacking device of any one of claims 1 to 9 wherein each frame member is at a longitudinal end of the platform.

11. The car stacking device of any one of claims 1 to 10 where the base is U shaped and configured to surround two car park spaces such that after the platform is raised it is held elevated above two car spaces and perpendicular to the direction of the two car park spaces.

12. The car stacking device of any one of claims 1 to 11 wherein the device is modular and configured to be attached to the floor of an existing car park such that cars can be stacked above existing car park spaces.

13. The car stacking device of any one of claims 1 to 11 wherein the base of the device is provided with sufficient weight that it does not need to be anchored to the floor in order to raise or lower the platform having a vehicle parked thereon.

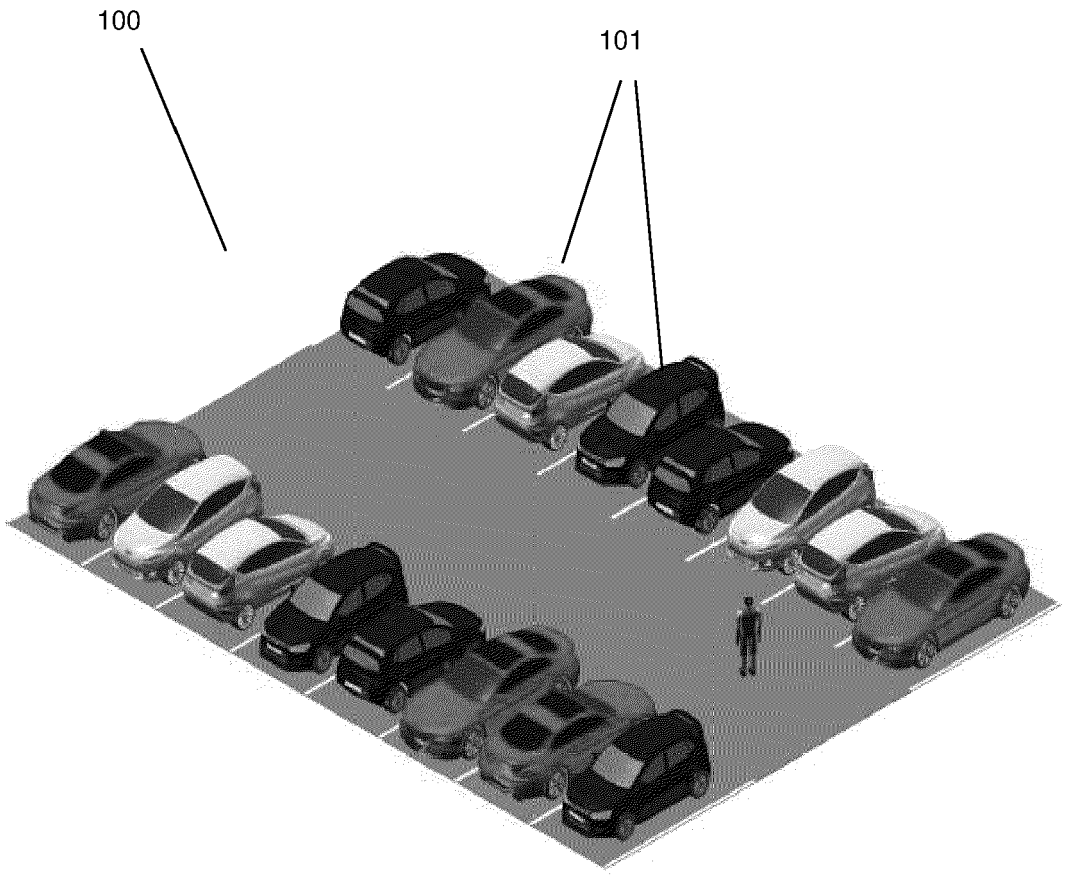

Figure 1

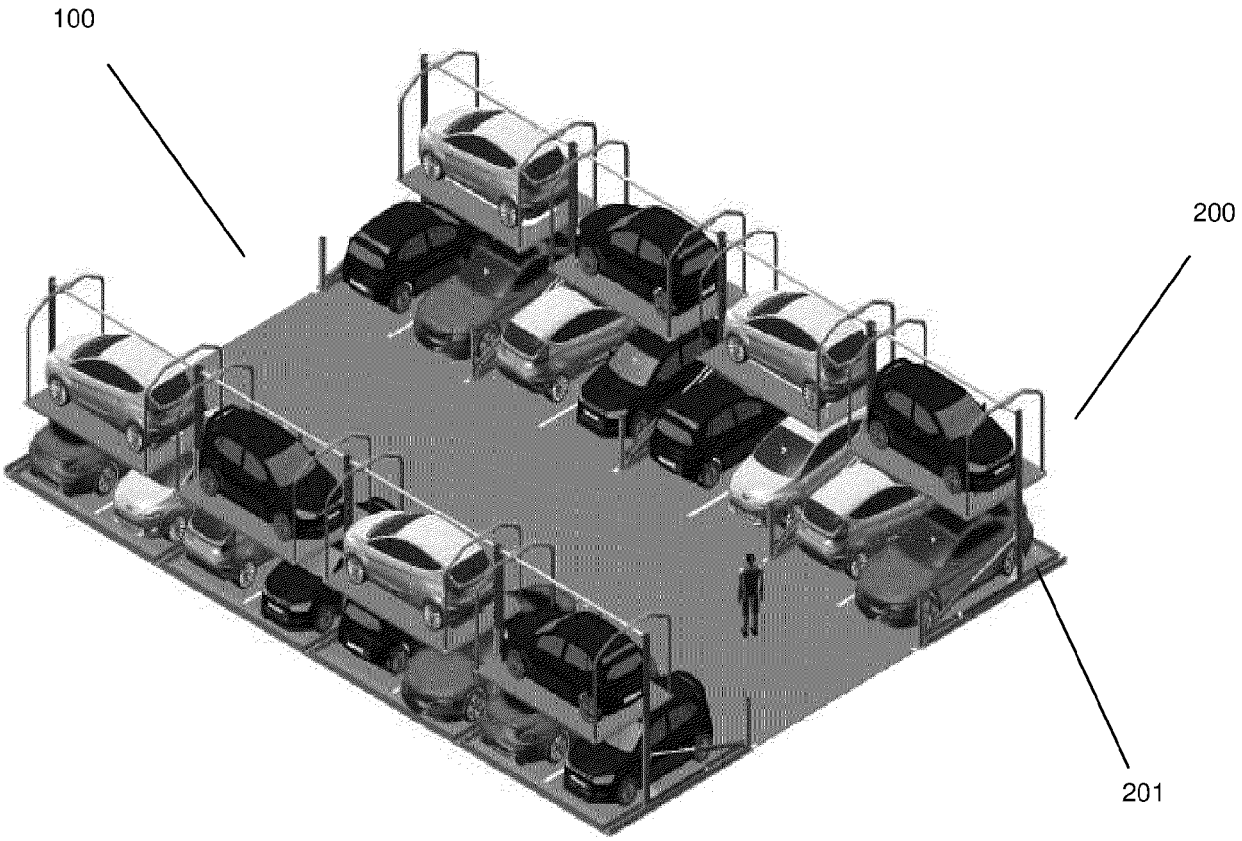

Figure 2

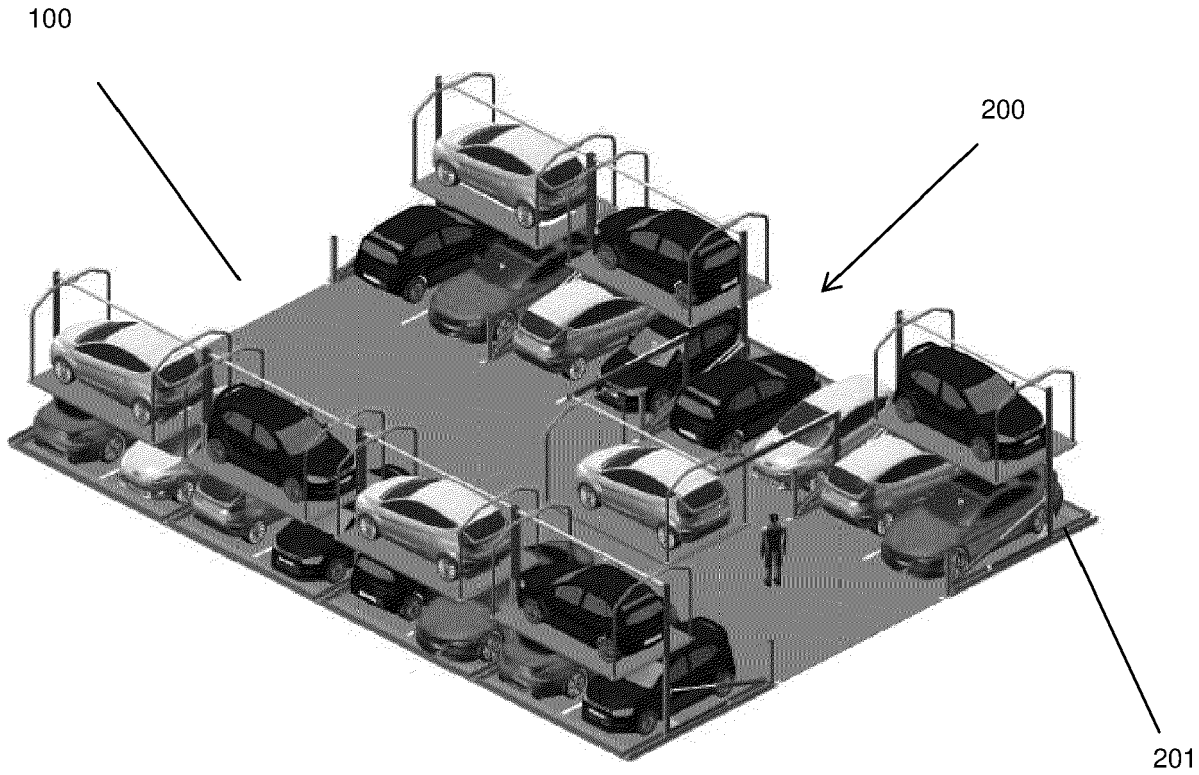

Figure 3

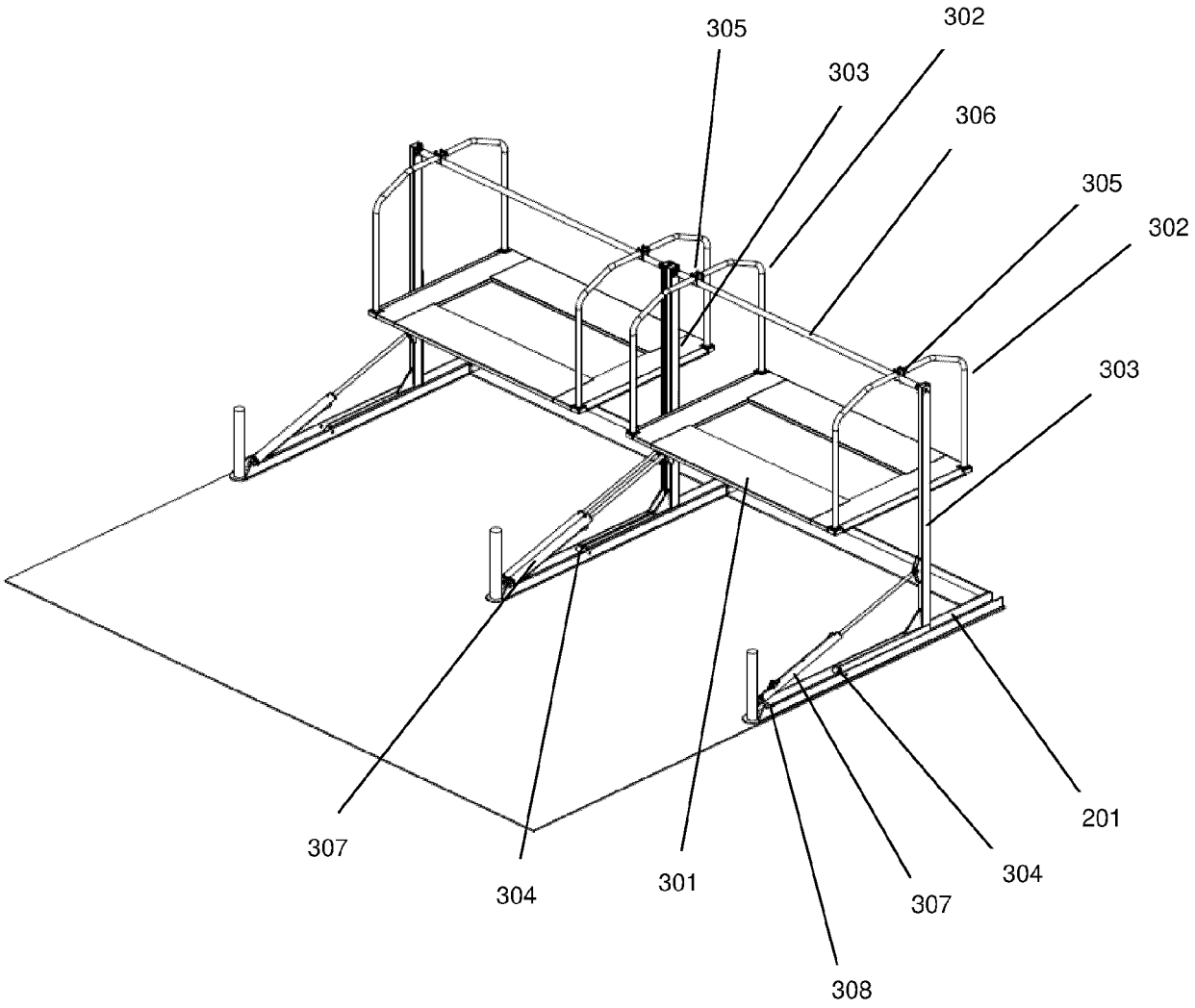

Figure 4

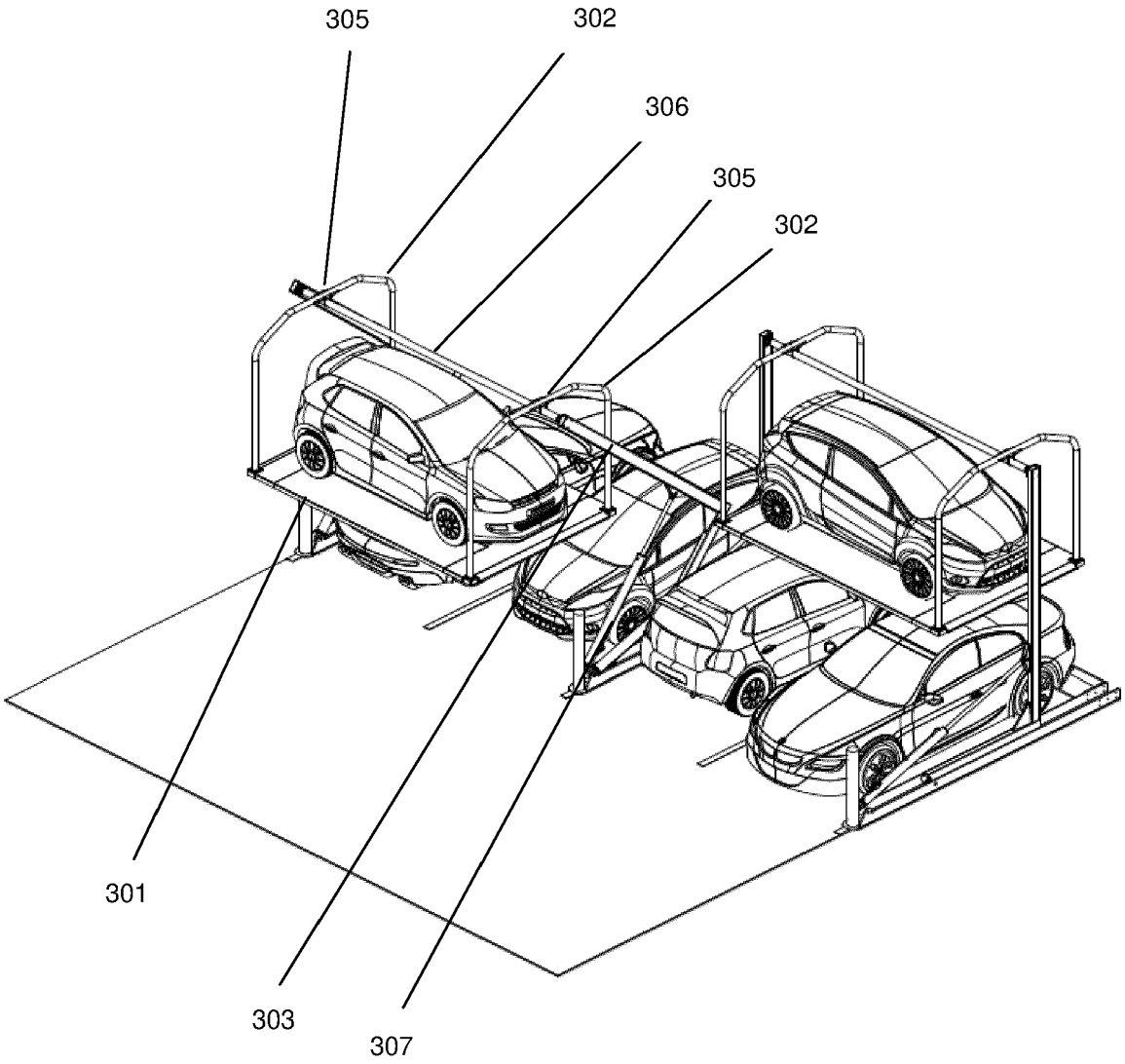

Figure 5

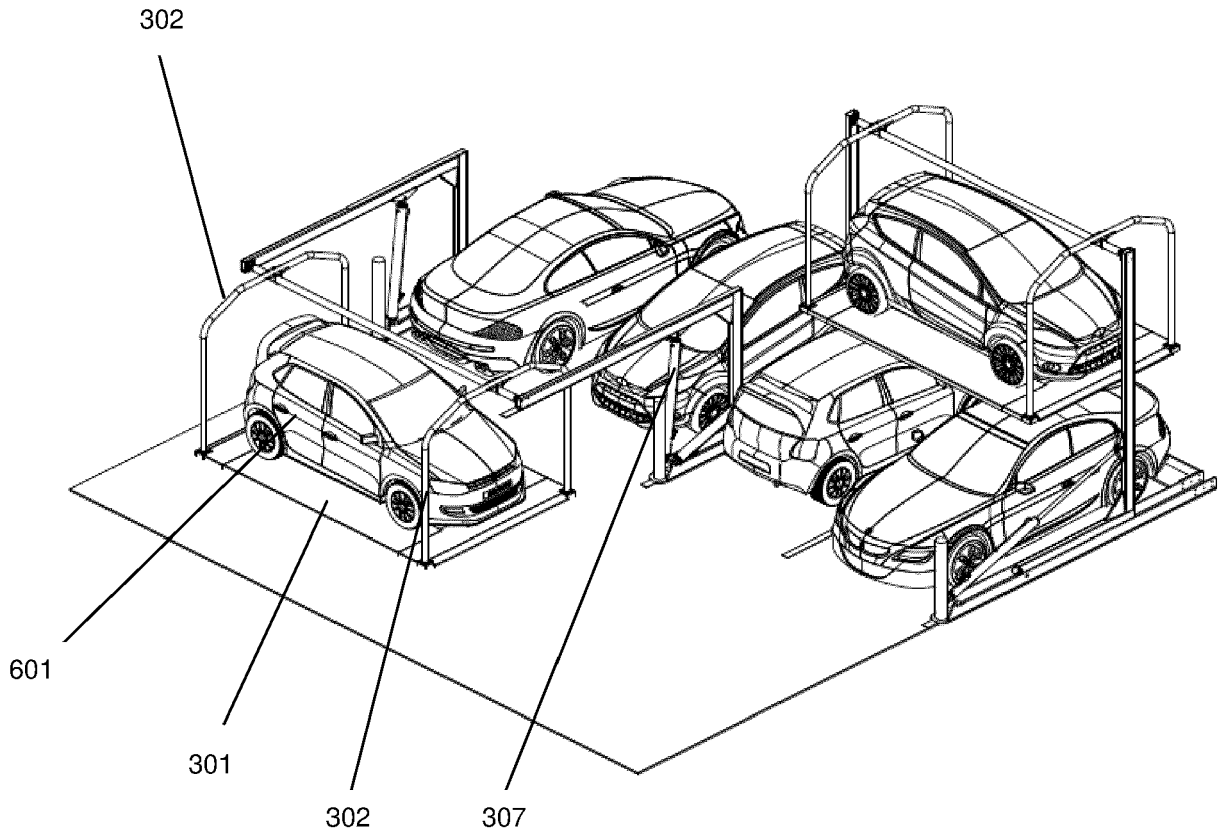

Figure 6

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EUROPEAN SEARCH REPORT

Application Number
EP 20 17 9165

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			E04H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 November 2020	Brucksch, Carola

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 17 9165

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19-11-2020

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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