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(54) **CAR LIFT SYSTEM AND ITS OPERATING METHOD**

(57) A car lift system (1) comprising a cabin (2) coupled with handling means controlled by a control unit (100) and configured to transport said system automatically between at least one raised position and a lowered position, the cabin (2) comprising a platform (3) configured to support a car (4), a covering roof (6) and a plurality of uprights (5) coupled with the platform (3) and configured to support the roof (6), and at least two, preferably three, side walls (7) constrained to at least said uprights (5), the roof (6) - when the cabin (2) is in the lowered position - constituting a walkable surface flush with the ground (8) in a garden, courtyard, or garage, the system comprising a floor door (9) which - upon opening or closing upon a command issued by the control unit (100) - allows or prevents access to said cabin (2) when said cabin (2) in the lowered position, at least one pair of perimeter sensors (S1, S2) interfaced with the control unit (100) and configured to automatically monitor a perimeter area (P1, P2) with respect to the roof (6) at least when the cabin (2) is in the lowered position, and a camera (10) positioned so as to monitor the roof (6) and said perimeter area (P1, P2) at least when the cabin (2) is in the lowered position.

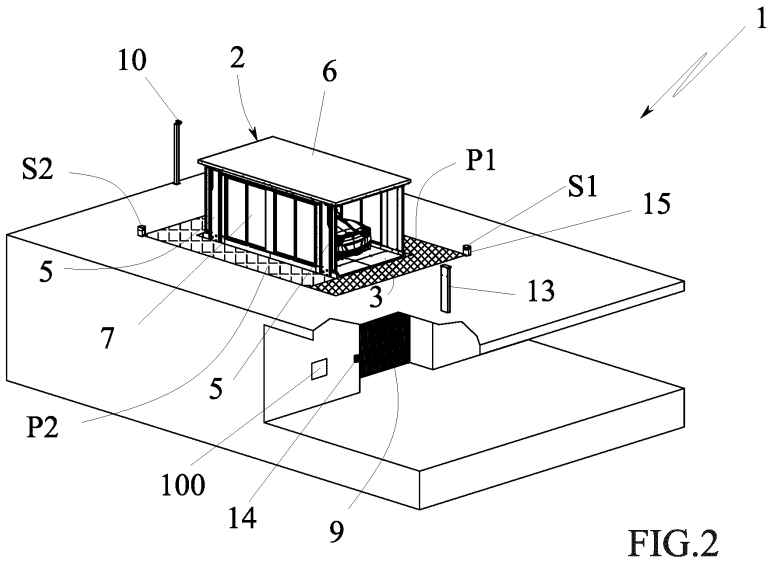

FIG.2

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a car lift system.
[0002] In particular, it refers to an automatic lift system of retractable kind produced in accordance with the Machinery Directive.

STATE OF THE ART

[0003] At present, car lift systems are used in multi-storey car parks, but they are inconvenient because, in order to operate the car lifting or lowering system, it is necessary to press and hold a button (or activate a suitable drive mechanism) all the while the lift is moving from one level to another.
[0004] Said systems are therefore problematic and difficult to use by inexperienced and untrained personnel.

SUMMARY OF THE INVENTION

[0005] A object of the present invention is to provide a car lift system which is improved compared to the prior art.
[0006] A further object of the invention is to provide a car lift system that is simpler and more convenient to use than commonly known ones.
[0007] This and other objects are achieved by a car lift system produced according to the technical teachings of the claims annexed hereto.
[0008] Advantageously, the invention allows the car movement among different levels in a totally automatic manner.
[0009] Even more advantageously, such a movement is made possible with an operator driver being present therein, by providing a single pulse or movement command.
[0010] Furthermore, advantageously, the invention complies with the Machinery Directive.

BRIEF DESCRIPTION OF THE FIGURES

[0011] Further characteristics and advantages of the innovation will become apparent from the description of a preferred but not exclusive embodiment of the device, illustrated - by way of a non-limiting example - in the drawings appended hereto, wherein:

Figure 1 is a simplified perspective view of the invention wherein a cabin in the car lift system is located in the lowered position, with a car waiting therefor on a ground floor;

Figure 2 is a simplified perspective view of the invention wherein the cabin in the car lift system is located in the raised position, with a car inside the cabin;

Figure 3 shows a detail of the cabin in the system shown in Figure 1;

Figure 4 is the perspective view of Figure 1, in a different use condition, i.e. with a car waiting therefor on an underground floor; and

Figure 5 is the perspective view of Figure 4, with the car inside the cabin, with the latter in a lowered position.

DETAILED DESCRIPTION OF THE INVENTION

[0012] With reference to the cited figures, reference number 1 is used to denote a car lift system as a whole.
[0013] This is a car lift system, i.e. a car lift of the so-called "retractable" kind, as equipped with a roof, for example operating man-on-board or operating no man-on-board, to be installed in dead-end private properties.
[0014] The system falls under the Machinery Directive (and not instead the Lift Directive) as it allows the user to move the lift with a single pulse command, i.e. without holding down the operating button, even remotely, therefore without a man on board.
[0015] Said "Machinery Directive", i.e. the Directive 2006/42/EC, is a product directive ruling the manufacture, placing on the market, and commissioning of machinery.
[0016] As will be better explained below, the system may comprise:

- an exterior pushbutton panel or panel 13 on the ground floor (authentication with coded key)
- an on-board pushbutton panel or panel 11 in the cabin 2 (authentication with access code)
- a radio control unit for ground floor call (only possible within a defined area D1)

[0017] With reference to Figure 2, the car lift system 1 comprises a cabin 2 coupled with movement means controlled by a control unit 100 (shown solely by way of example in the drawings, which is usually housed in the machinery space) and configured to transport said lift automatically between at least one raised position (as shown in Figure 1) and a lowered position (as shown in Figure 2), therefore between at least two levels.
[0018] More specifically, the cabin 2 comprises a platform 3 configured to support a car 4, a roof 6 and a plurality of uprights 5 coupled with the platform 3 and configured to support the roof 6, and at least two, preferably three, side walls 7 which are constrained to at least said uprights 5.
[0019] When the cabin 2 is in the lowered position (as shown in Figure 1), the roof 6 constitutes a walkable surface which is flush with the ground 8 of a garden, courtyard, or garage, or in any case in dead-end private

properties.

[0020] The system then comprises a floor door 9 which, when opened or closed, as controlled by the control unit 100, allows or prevents access to said cabin 2 when the latter is in the lowered position.

[0021] On the ground floor, there is at least one pair of perimeter sensors S1, S2 interfaced with the control unit 100 and configured to automatically monitor at least one perimeter area P1, P2 with respect to the roof 6, at least when the cabin 2 is in the lowered position.

[0022] Advantageously, the perimeter sensors S1 and S2 can be configured to monitor both the perimeter areas P1, P2 and the roof 6 zone (with cabin 2 lowered), as denoted by diagonal lines in Figure 1.

[0023] The system can feature a clear area measuring 120 cm around all four sides of the car lift on the ground floor (as shown in Figure 1), which is monitored by said perimeter sensors S1, S2. However, other configurations can be envisaged, with fixed guards, in accordance with standard UNI EN ISO 13857.

[0024] The perimeter sensors S1, S2 can be of the laser scanner kind with multiple configurable areas.

[0025] The system also features a camera 10 positioned so as to monitor at least the roof 6 and optionally said perimeter areas P1, P2 at least when cabin 2 is in the lowered position (therefore with the roof 6 flush with the ground, with the roof 6 forming a walkable surface).

[0026] In the cabin 2, there may be an on-board panel 11 (with a dedicated pushbutton panel, see Figure 3) interfaced with the control unit 100 and configured to control automatic cabin 2 movement.

[0027] The on-board panel 11 is preferably coupled with a screen 12 configured to display the image of said camera 10. The screen may be integrated into the panel 11, may also be placed in another area of the cabin, or may simply be displayed on a mobile device (e.g. smartphone) held by the user.

[0028] As shown in Figure 1, the system can feature an external panel 13 (pushbutton panel) positioned near the ground 8 in said garden, courtyard, or garage, and configured to control, also via the control unit 100, automatic movement of said cabin 2.

[0029] There may also be a floor panel 14 (pushbutton panel) near said floor door 9 which is configured to control, also via the control unit 100, floor door opening or closing.

[0030] In said garden or courtyard 4, therefore on the ground floor, there may be a presence sensor 15, configured to detect the presence of a car 4 near said roof 6 or said cabin 2. In practice, the presence sensor 15 is configured to detect a car near the system 1.

[0031] The presence sensor 15 may be of the laser scanner kind.

[0032] The presence sensor 15 can enable a radio system allowing the call only when the area D1 is occupied by the car.

[0033] The system described herein can operate according to a method that comprises at least one step wherein the control unit 100 - before moving the cabin 2 from a lowered position (Fig. 5) to a raised one (Fig. 2) - displays the image seen by the camera 10 on the screen 12 and requests authorisation from a user present in the cabin 2.

[0034] The image produced by the camera 10 will show the roof 6 and possibly a perimeter area around the roof, which forms the walkable surface. Said image is displayed to enable a user (in the cabin and therefore at a lower level) to see if there are any risks upon activating the system 1.

[0035] Preliminarily to the movement of the cabin 2, the control unit 100 can automatically verify, via at least one pair of perimeter sensors S1, S2, that at least the perimeter area P1, P2 is clear. Via the perimeter sensors S1, S2, the control unit can also verify that the roof area 6 is also clear. This operation can also be performed preliminarily to the request for authorisation from the user present in the cabin.

[0036] In any case, the control unit can monitor the perimeter area P1, P2 during the entire movement phase of cabin 2, immediately interrupting said movement in the event that the perimeter area P1, P2 is not clear (for example because there is a person or an object in said area on the ground floor).

[0037] Advantageously, when the cabin 2 is in said raised position without a car inside, the control unit 100 automatically returns said cabin 2 to the lowered position.

[0038] This operation can always only take place, again, following automatic checks that the perimeter area P1, P2 is clear and the floor door 9 is closed.

[0039] In more detail, the system can operate as described below.

[0040] ENTRY, Fig. 1: the user arrives home by car, enters the property and positions the car in front of the car lift 1. The user calls the lift with a single pulse command, for example via the appropriate panel 13 or the appropriate radio control (which, it is worth reminding, can only work in a very close proximity of the car lift 1 area D1). The system (via the control unit 100) performs a perimeter safety check and, if everything is correct, starts the automatic ascent manoeuvre, positioning the cabin 2 on the ground floor ready for the car to enter.

[0041] In this phase, authorisation can be requested to the user who, as being positioned in front of the roof 6 (walking surface), can directly verify that there are no impediments to or risks upon raising the cabin 2. The authorization can coincide with the 'call' of the cabin on the ground floor, which, as explained, can take place via the button panel 13 on the ground floor, via a 'radio' signal that can only be received in the vicinity of the car lift 1 (therefore when the view of the roof 6 is permitted), or via smartphone after checking that the user is positioned in the vicinity of the car lift 1.

[0042] DESCENT (Fig. 1): the user drives the car 4 onto the platform (in cabin 2), positioning correctly and following the instructions on panel 11 (or monitor 12) on board cabin 2. After the appropriate authentication via

access code and, for example, pressing the manoeuvre button (which can be done manually on the on-board panel 11 in cabin 2), the system begins the automatic descent to the basement, automatically opening the floor door 9 to access the underground garage.

[0043] EXIT (fig. 4): the user opens the floor door 9 on the garage side using the appropriate panel 14 (or other system, such as said remote control, etc.). Once the floor door 9 is open, the user drives (Fig. 5) the car onto the platform in cabin 2, positioning correctly and following the instructions on the panel 11 or the monitor 12. After the appropriate authentication, for example via an access code, the user instructs the closure of the floor door 9. Once the door 9 is closed, the user is called to check the monitor 12 (or other device) which provides a full view of the ground floor area above, and specifically of the roof 6 and possibly the surrounding area, via the camera 10. After the appropriate check, the user must confirm that the area above is clear (authorisation to ascend) and proceed with the ascent, for example by pressing the appropriate button on panel 11 or via another method as stated above. The monitoring system performs a further automatic check of the ground floor before enabling the manoeuvre, for example via sensors S1, S2. If all the checks are positive, the system automatically starts the ascent and continues until it reaches the upper level (Fig. 2), ready to exit the cabin 2.

[0044] INACTIVITY: after the car exits the ground floor, the control unit 100 checks the status of cabin 2 (for example via a weight sensor or other suitable device, to check that it is clear, i.e. no cars or people), the perimeter (via perimeter sensors S1, S2), and floor door 9 closure, and, if each expected condition is met, the system performs an automatic descent manoeuvre in order to automatically return to the lowered position, bringing itself back to the starting condition, waiting for a new request for use.

[0045] As described, the system can be implemented in a dead-end private property; the critical area to check is the ground floor area corresponding to the roof 6 (floor level) and the surrounding area, given that there are no perimeter fences or parapets or other systems that prevent access to the roof 6 when the cabin 2 is in the lowered position. Everything is entrusted to advanced electronic perimeter monitoring via laser scanners (perimeter sensors S1, S2), validated by a visual check by the user (via camera 10 and monitor 12) and active confirmation by the user before starting the manoeuvre.

[0046] One or more of the following safety devices may also be present:

- fixed full-height side protections at the system's edge;
- full-height infrared barriers for the short sides of the entrance/exit to capture vehicle movement and check parking status;
- RFID safety sensors to detect floor door 9 closed condition;
- inductive safety sensors to enable the floor door depending on the platform position;
- RFID safety sensor to detect the roof closed condition;
- linear potentiometer to detect cabin position;
- failsafe PLC (control unit 100) including control logic and related safety devices;
- safety edge for anti-shearing system installed on the perimeter edge of the roof;
- double photocell system on board the cabin 2 to detect presence of the car 4;
- dual-technology presence detector (volumetric/ infrared) to prevent accidental trapping and automatic closure of the floor door in the event of people in the cabin 2;
- coded key authentication system on floor controls and with numeric code on cabin controls;
- visual/sound signals for system status in the cabin 2 available to the user in the event of anomalies or alarms during operation.

[0047] To conclude the description, it should be emphasized that figure 1 shows a system wherein no perimeter walls are provided and the roof 6 is located in a completely clear space. Evidently, however, other configurations may also be envisaged, depending on the case, featuring perimeter walls (for example on two sides only) in order to demarcate the roof 6 area but always allowing the roof 6 to be kept as a walkable surface.

[0048] The ground floor access area may also feature an additional covering for the roof 6, configured, for example, as a cantilever or free-standing carport supported by appropriate static poles.

[0049] Various embodiments of the innovation have been disclosed herein, but further embodiments may also be conceived using the same innovative concept.

Claims

1. A car lift system (1) comprising a cabin (2) associated with moving means controlled by a control unit (100) and configured to automatically transport the cabin (2) between at least one raised position and one lowered position, the cabin (2) comprising a platform (3) configured to support a passenger car (4), a roof (6) cover and a plurality of uprights (5) associated

with the platform (3) and configured to support the roof (6) cover, and at least two, preferably three, side walls (7) constrained to at least said uprights (5), the roof (6) cover, when the cabin (2) is in the lowered position, forming a walking surface flush with the floor (8) of a garden, courtyard or garage, the system comprising a floor door (9) which, opening or closing on command of the control unit (100), allows or prevents access to said cabin (2) when it is in the lowered position, at least one pair of perimeter sensors (S1, S2) interfaced to the control unit (100) and configured to automatically monitor a perimeter zone (P1, P2) with respect to the roof (6) at least when the cabin (2)is in the lowered position, and a camera (10) positioned to monitor the roof (6) and said perimeter zone (P1, P2) at least when the cabin (2)is in the lowered position.

2. System according to claim 1, wherein inside the cabin (2) there is an on-board panel (11) interfaced with the control unit (100) and configured to control an automatic movement of the cabin (3), the on-board panel (11) being associated with a screen (12) configured to display the image of said camera (10).

3. System according to claim 1, wherein there is an exterior panel (13) positioned near the floor (8) of said garden, yard or garage, and configured to control an automatic movement of said cabin (2), and/or a floor panel (14), proximate to said floor door (9) and configured to control the opening or closing of said floor door (9).

4. System according to claim 1, wherein there is a presence sensor (15), positioned in said garden, courtyard or garage, configured to detect the presence of a car (4) near said roof (6) or said cabin (2).

5. System according to claim 1, **characterized by** being classified in directive machinery.

6. Method of operation of a system according to claim 1, comprising at least the step in which the control unit (100), before moving the cabin (2) from a lowered position to a raised position, displays the camera image (10) on the screen (12) and requests an authorization from a user present in the cabin (2).

7. Method according to claim 6, wherein, when the cabin (2) is in said raised position and devoid of a car, the control unit (100) automatically returns said cab (2) to said lowered position.

8. Method according to claim 6 or 7, wherein preliminarily to the movement of the cabin (2), the control unit (100) verifies that at least the perimeter area (P1, P2) is clear.

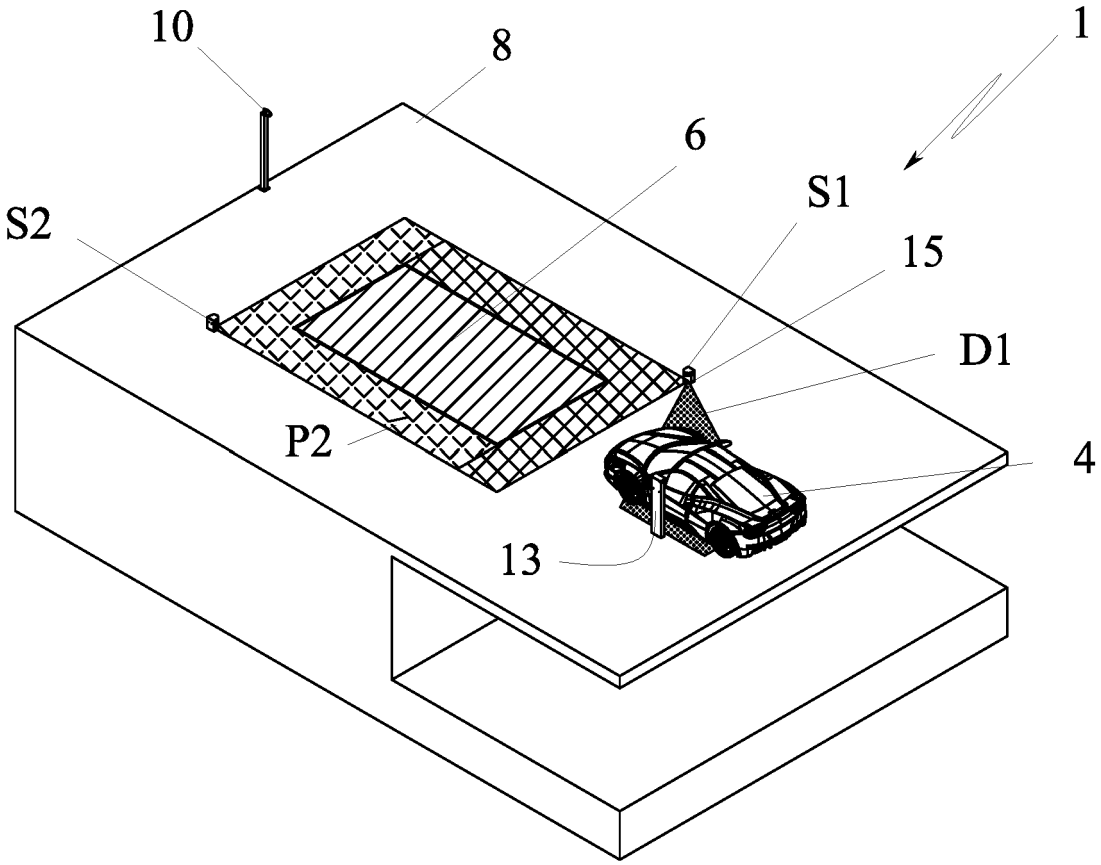

FIG.1

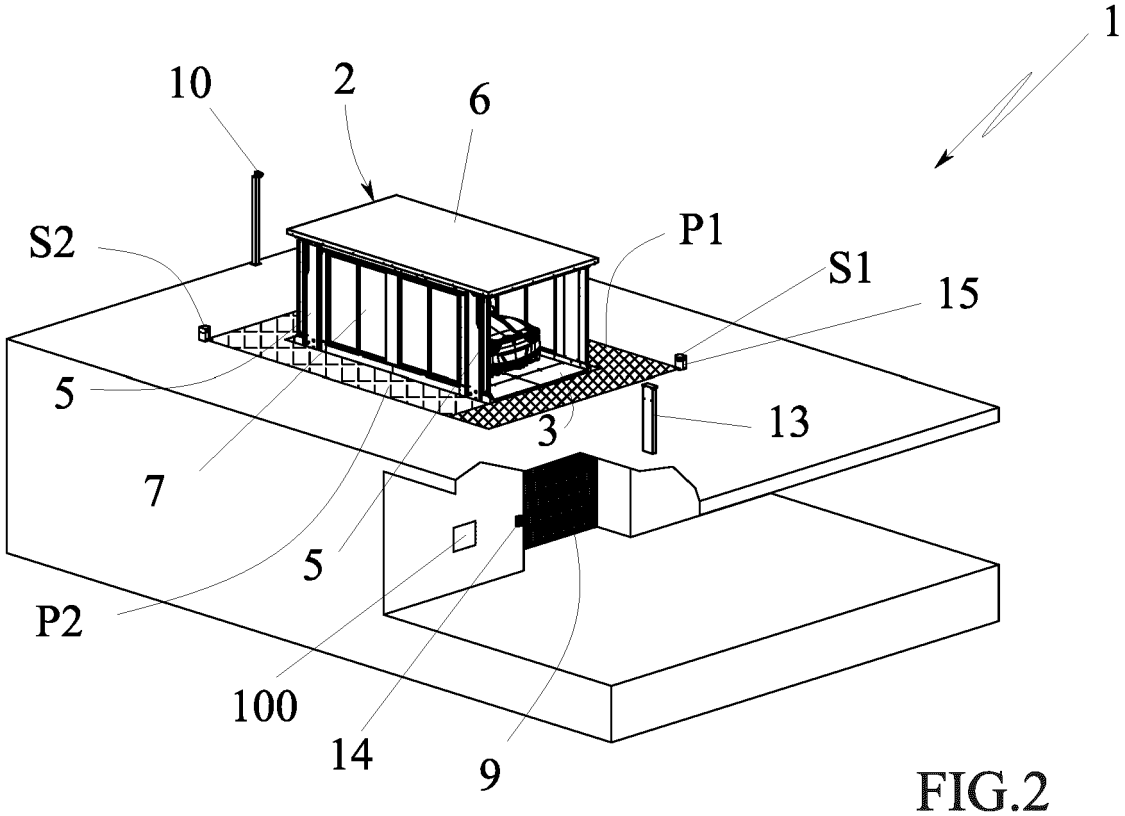

FIG.2

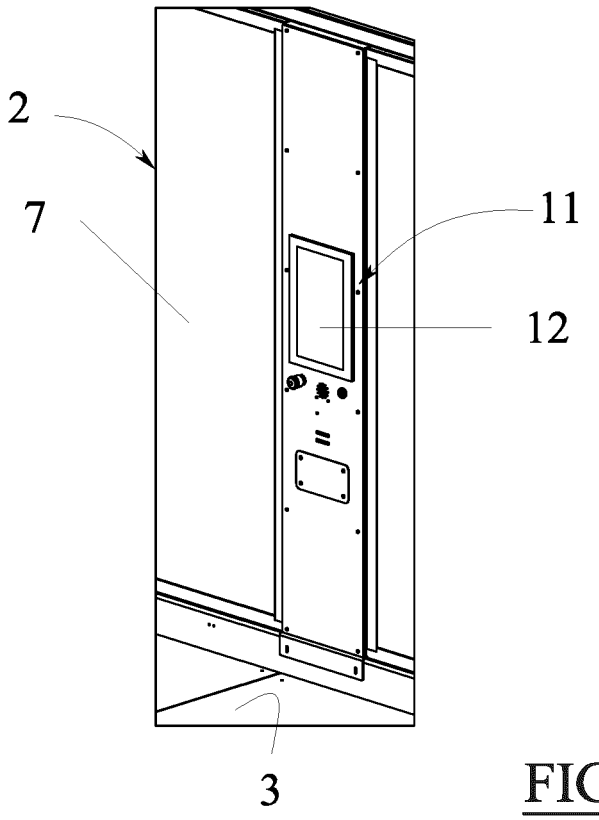

FIG.3

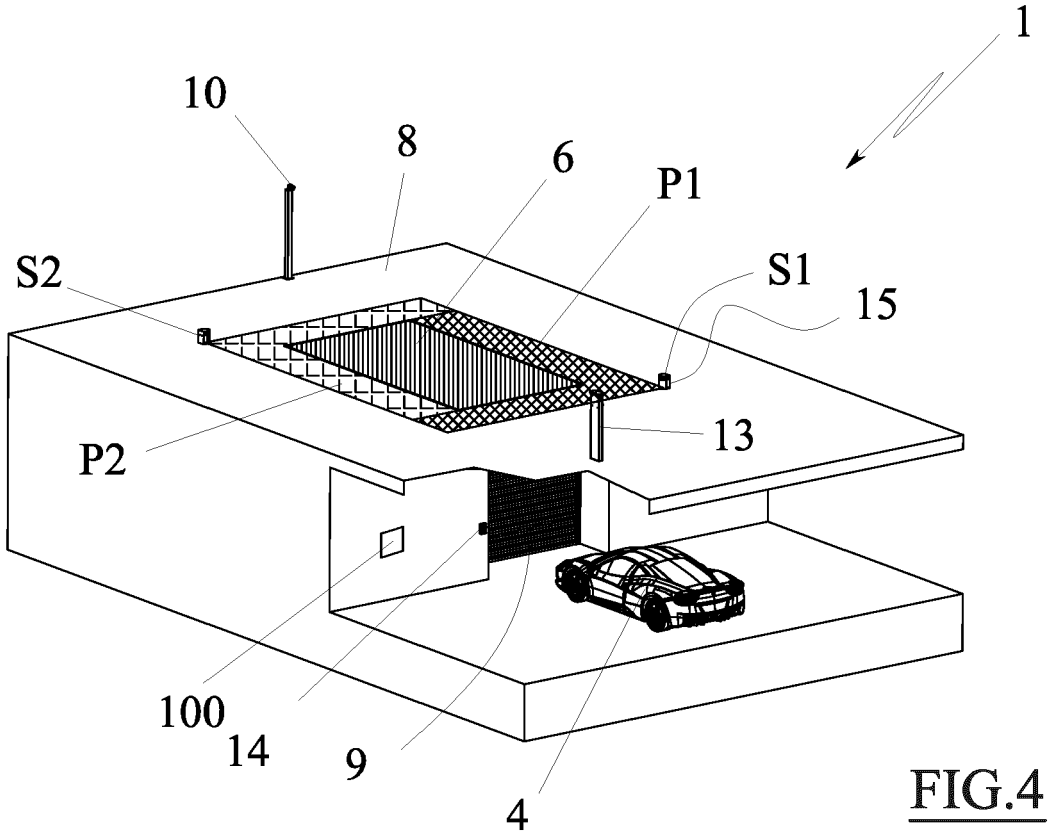

FIG.4

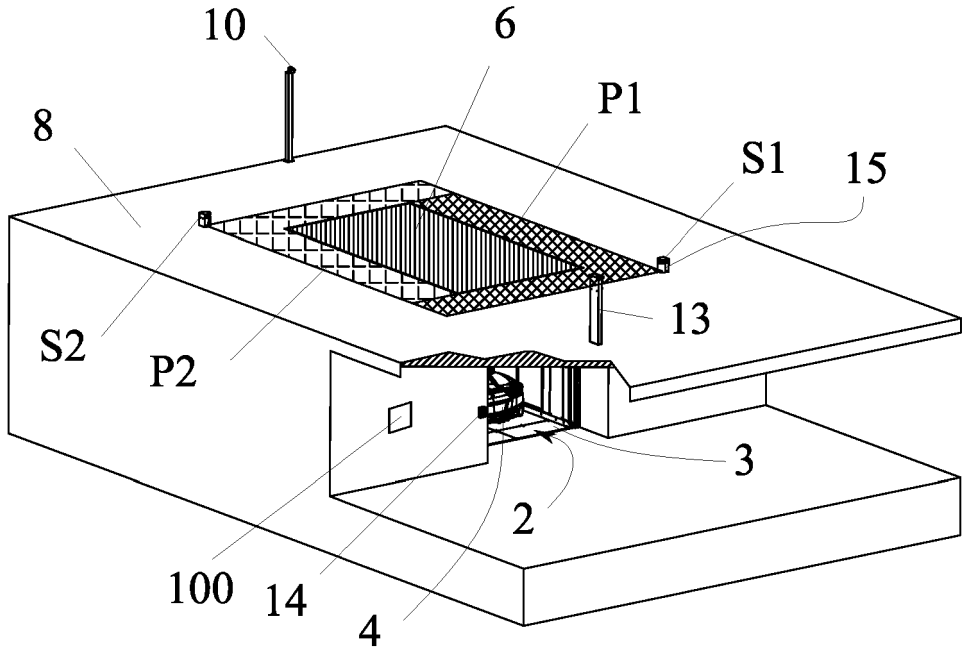

FIG.5

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EUROPEAN SEARCH REPORT

Application Number
EP 24 21 0619

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	ES 1 042 361 U (CYCESMA S L [ES]) 16 August 1999 (1999-08-16) * column 1, line 41 - column 4, line 23 * * figures 1, 2, 3 *	1-8	INV. B66B9/00 E04H6/06
Y	JP 2023 026429 A (JP2023026429) 24 February 2023 (2023-02-24) * paragraphs [0001], [0009], [0010] * * paragraphs [0039] - [0049] * * figures 1-3 *	1-8	
A	FR 2 638 480 A1 (KRUPP TECH INDLES [FR]; GLES CIE PARISIENNE ENTREPRISE [FR]) 4 May 1990 (1990-05-04) * page 3, line 17 - page 7, line 35 * * page 9; claims 4, 6 * * figures 1-4 *	1-8	
A	JP H10 46851 A (SUMITOMO FORESTRY) 17 February 1998 (1998-02-17) * paragraphs [0013] - [0021] * * figures 1-6 *	1-8	
			TECHNICAL FIELDS SEARCHED (IPC) B66B E04H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 March 2025	Baytekin, Hüseyin

CATEGORY OF CITED DOCUMENTS

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10-03-2025

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