(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 441 546 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.02.2019 Bulletin 2019/07

(51) Int Cl.:
E04H 6/28 *(2006.01)*

(21) Application number: **18183594.3**

(22) Date of filing: **16.07.2018**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **11.08.2017 IT 201700093594**

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(54) **MOVEMENT SYSTEM OF THE ROTARY TYPE FOR VEHICLES**

(57) A movement system (1) of the rotary type for vehicles (100) from and to a parking (200) space, having a movement structure (2) comprising a tower-like element (2a) extending vertically between a lower end (3) and an upper end (4); a supporting platform (2b), which is operatively combined with the tower-like element (2a) and designed to be translated along a translation direction (S); a base element (2c), a base support (2d) shaped to support the tower-like element (2a) and the supporting platform (2b). The system is characterized in that the tower-like element (2a) and the base element (2c) are rotatably assembled with respect to the base support (2d) so as to rotate the supporting platform (2b) with respect to a rotation axis (x).

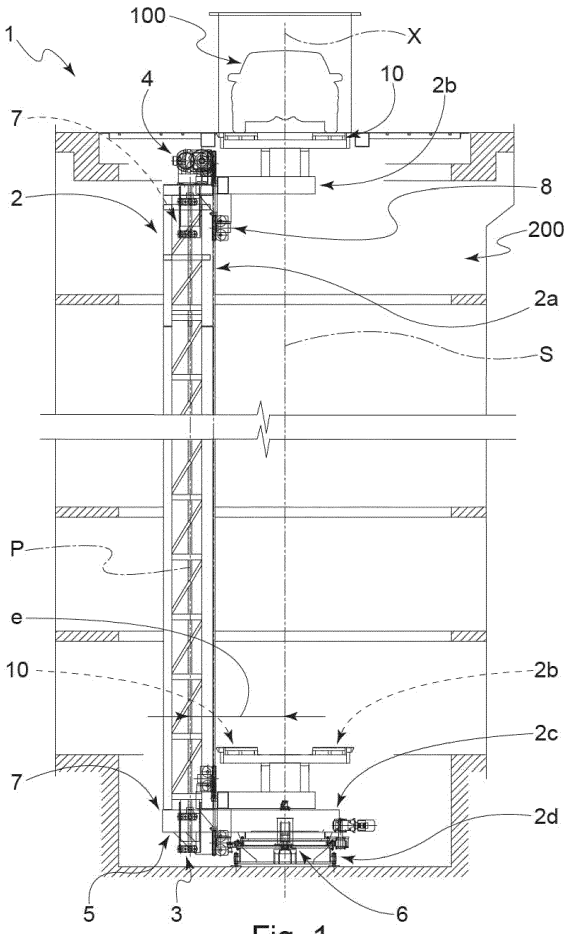

Fig. 1

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Description

[0001] The present invention refers to a movement system of the rotary type for vehicles.

[0002] In particular, the present invention refers to a movement system of the rotary type for vehicles, preferably cars, SUVs and vehicles for the private transportation of individuals, and which can be assembled inside multistorey carparks and parking lots generally developed on several floors.

[0003] More particularly, the movement system of the rotary type for vehicles of the present invention is a movement system suitable for being installed and used in cylindrical multistorey carparks, in which the parking spaces are arranged radially with respect to a central tunnel at the center of the cylinder along which the movement system of the present invention can be assembled.

[0004] In the state of the art, there are rotary movement systems for vehicles, wherein the structure of the system, always arranged in the geometric center of a circular parking lot and/or circular sector, can reach a certain number of parking spaces that is usually determined by a predetermined parking lot dimension/number ratio that cannot be exceeded due to encumbrances and structural limitations.

[0005] By way of example, a traditional multistorey carpark for the garaging of vehicles allows a number of 10 parking spaces per floor to be obtained in a cylindrical structure (over all) with a diameter of about 23m.

[0006] In fact, in the state of the art, the rotary movement system for vehicles, operating in a multistorey park as specified above, has a supporting structure comprising two vertical pillars so as to form together with a head portion and a base portion, a sort of closed quadrilateral sector inside which the vehicle is moved by means of a lift truck.

[0007] The structural design of the movement system of the traditional type has, however, certain limitations and drawbacks.

[0008] A first limitation resides in the fact that the structure, at least the supporting structure of the movement system of the known type, is rigid but very heavy, therefore, even the automation system designed to move all of its parts must be oversized according to the additional weight that the this type of structure must carry.

[0009] A second limitation resides in the fact that the supporting structure of the so-made movement system represents a significant encumbrance inside the parking lot, i.e. the two vertical pillars often limit the possibility to exploit more space for each circular sector of each parking floor of the same multistorey carpark. In other words, and for the sake of clarity, the movement system of the known type determines a number of parking spaces for each floor of the multistorey carpark, as a result of the bulky structure, that could theoretically be higher. Still in other words, at each floor of a multistorey carpark, the known movement system has a certain limitation of the parking spaces for vehicles, which, although they are arranged radially with respect to the central portion of the multistorey carpark where the same system is operating, are not optimized from a numerical point of view (the aforesaid parking dimension/number ratio must be kept in mind).

[0010] Consequently to the aforesaid limitation, more floors usable as parking spaces inside the multistorey carpark and/or significant dimensions (in diameter) of the same multistorey carpark, as specified above, must be achieved in order to create more parking spaces for vehicles according to a predetermined quantity.

[0011] The description of the present invention is provided with reference to the accompanying figures, also having a purely exemplifying and therefore not limiting purpose and in which:

- figure 1 is a schematic side view of the movement system of the rotary type for vehicles according to the present invention;
- figure 2 is a schematic plan view of the invention in figure 1;
- figure 3 is a perspective view of a detail of the invention in figure 1;
- figure 4 is another perspective view of a detail of the invention in figure 1;
- figure 5 is another different perspective view of a detail in figure 1;
- figure 6 is a schematic side view of the movement system in a different embodiment according to the present invention.

[0012] The present invention refers to a movement system of the rotary type for vehicles, such as private cars for the transport of people and/or people and freight. Preferably, the system of the present invention allows a vehicle to be moved in the entry/exit areas of said parking space.

[0013] In particular, the movement system of the rotary type for vehicles from and to a parking space of the present invention has a movement structure comprising at least one tower-like element extending vertically between a lower end and an upper end. The movement structure further comprises a vehicle supporting platform, which is operatively combined with the tower-like element and designed to be translated along a translation direction "S" between the lower end and the upper end of the tower-like element. The movement structure further comprises a base element combined with the tower-like element and shaped to transfer the load of the tower-like element to a base support.).

[0014] To this purpose, the movement structure of the present invention comprises a base support combined with at least with the base element and shaped to support the tower-like element and the supporting platform of movement system itself.

[0015] According to the inventive concept of the present invention, the tower-like element and the base element are rotatably assembled with respect to said

base support so as to rotate the supporting platform with respect to a rotation axis "X". Preferably, the translation direction "S" coincides with or is parallel to the rotation axis "X". Even more preferably, the rotation axis "X" is vertical.

[0016] According to the inventive concept of the present invention, the base element is assembled on the base support so as to have a cantilevered portion with respect to the base support.

[0017] More specifically, the tower-like element has a vertical development direction "P" and is fastened to the base element at the aforesaid cantilevered portion so as to have a predetermined eccentricity "e" between the development direction "P" and the rotation axis "X".

[0018] According to the present invention, the eccentricity "e" has a value that is at least equal to half of the width of a vehicle arranged on the supporting platform.

[0019] The system of the present invention has a supporting base comprising a first rotation pivot of the tower-like element and of the supporting platform of a vehicle along the rotation axis "X".

[0020] Therefore, the embodiment of the movement structure of the system has a substantially "L" shaped structure with the longer vertical side coinciding with the tower-like element and the horizontal side shorter than the vertical side arranged at the first rotation pivot.

[0021] More specifically, the aforesaid first rotation pivot comprises a support/rotation member of the motorized fifth-wheel type rotating around the rotation axis "X".

[0022] In order to balance the loads at least on the supporting platform in movement, the system of the present invention comprises a counterweight element operatively combined with the same supporting platform, so as to slide along a portion of the tower-like element in an operative translation arrangement of at least the supporting platform along the translation direction "S".

[0023] Instead, the base support comprises an encoder system to determine an angular position of at least the supporting platform.

[0024] The movement system comprises a monitoring and adjusting member to monitor and adjust the vertical attitude of at least the tower-like element.

[0025] By way of example, the monitoring and adjusting member comprises at least one adjustable supporting foot, for example of the electric and/or hydraulic type.

[0026] For the purpose of an accurate and punctual control, the system of the present invention comprises a position detecting member to detect the position of at least the supporting platform of a vehicle in an operative translation arrangement of the same platform along the translation direction "S". Preferably, the detecting system comprises an optical detecting member of the laser light type.

[0027] The present invention also has a supporting platform comprising guide and translation roller elements along at least the tower-like element. The aforesaid guide roller elements are designed so as to prevent the platform from skidding or laterally displacing with respect to the tower-like element in an operative working arrangement of the system. In detail, the guide roller elements are designed to comprise sliding rollers and/or low friction elements to facilitate the sliding and to avoid any increase in friction.

[0028] According to the present invention, the system also comprises a head element operatively combined with the tower-like element at the upper end and designed and designed to rigidly rotate the supporting platform with respect to the rotation axis "X" together with the base element and tower-like element.

[0029] According to the present invention, in a different embodiment of the invention, the head element comprises a second rotation pivot of the tower-like element and supporting platform of a vehicle along the rotation direction "X". Preferably, the second rotation pivot is operatively combined with the first rotation pivot and both are rotatable around the aforesaid rotation axis "X". In fact, the second rotation pivot and the first rotation pivot have respective rotation axes coinciding with one another, preferably coinciding with the rotation axis "X".

[0030] In this other embodiment of the system, the movement structure has a substantially "C" shaped structure and the vertical side coinciding with the tower-like element and the two opposing horizontal sides shorter than the vertical side and respectively arranged at the first rotation pivot and the second rotation pivot.

[0031] Preferably, the supporting structure of a vehicle comprises a carriage to allow the horizontal movement of the vehicle so as to position it in front of the predetermined parking space with a translatory movement of the carriage from and toward the same parking space.

[0032] In the annexed figures 1-6 and in the present detailed description, the number of reference 1 denotes the movement system 1 of the rotary type for vehicles 100 from and to a parking space 200, according to the present invention.

[0033] The movement system 1 of the rotary type for vehicles 100 from and to a parking space 200 according to the present invention has a movement structure 2 comprising different elements listed and specified in detail here below.

[0034] In particular, the movement structure 2 comprises a tower-like element 2a extending vertically between a lower end 3 and an upper end 4, as illustrated by way of example in figure 1.

[0035] In particular, in the annexed figures 1, 2 or 6, the movement structure 2 further comprises a supporting platform 2b of a vehicle 100 operatively combined with the aforesaid tower-like element 2a and is designed to be translated along a translation direction "S" between a lower end 3 and an upper end 4 of the tower-like element 2a.

[0036] Preferably, the supporting platform 2b of a vehicle 100 comprises a carriage 10 to allow the horizontal movement of the vehicle 100 so as to position it in a predetermined parking space 200. The carriage 10 is an element not intrinsically linked to the architecture of the

structure of the system 1 of the present invention, but can however be an auxiliary element mechanically integrated within the system 1 itself. More specifically, the carriage 10 allows the vehicle 100 to be horizontally moved towards the supporting platform 2b from a parking space 200 and vice-versa. As schematically illustrated in the annexed figure 2, the parking spaces 200 are radially arranged with respect to the movement system 1 of the present invention. With such architecture, it is convenient to mount the carriage 10 on the supporting platform 2b to place and remove the vehicles 100 and to move them with the same system 1.

[0037] The movement structure 2 further comprises a base element 2c combined with the tower-like element and shaped to transfer the load of the tower-like element 2a to the base support 2d.

[0038] In the annexed figure 1, the dotted line shows the position of the supporting platform 2b resting on the base element 2c when the platform is at the end of the lower limit, i.e. at the lower end 3 of the tower-like element 2a.

[0039] The movement structure 2 further comprises a base support 2d combined with at least the base element 2c and shaped to support at least the tower-like element 2a and the supporting platform 2b of the system 1 itself.

[0040] According to the inventive concept of the present invention, the tower-like element 2a and the base element 2c are rotatably assembled with respect to the base support 2d so as to rotate the supporting platform 2b with respect to a rotation axis "X", as illustrated by way of example in figures 1, 2, 5 and 6.

[0041] Preferably, the translation direction "S" of the supporting platform 2b coincides with or is parallel to the aforesaid rotation axis "X".

[0042] More specifically, the base element 2c is assembled on the base support 2d so as to have a cantilevered portion 5 with respect to the base support 2d itself, as it can be appreciated in the schematic illustration of the annexed figure 1.

[0043] In other words, the movement structure 2 comprises a single element developed vertically and designed to guide during the translation, in addition to serving as structural support, the supporting platform 2b, i.e. the tower-like element 2a fastened to the base element 2c, which is in turn rotatably and cantileverly assembled to the base support 2d.

[0044] With regard to the scheme of the movement structure 2 of the present invention, what has been described up to now implies that there is only one vertical supporting and guiding pillar and that it is arranged cantileverly, or eccentrically with respect to the aforesaid rotation axis "X".

[0045] In particular, with reference for example to annexed figure 1, the tower-like element 2a has a vertical development direction "P" and is fastened to the base element 2c at the aforesaid cantilevered portion 5 so as to have a predetermined eccentricity "e" between the development direction "P" and the rotation axis "X".

[0046] Preferably, the eccentricity "e" has a value between about 1.3 m and about 2 m.

[0047] According to the inventive concept of the invention, the aforesaid eccentricity "e" preferably has a value that is at least equal to half of the width of a vehicle 100 arranged on the supporting platform 2b.

[0048] In order to allow the relative rotation of the tower-like element 2a and the base element 2c with respect to the base support 2d, the base support 2d comprises a first rotation pivot 6 of the tower-like element 2a and of the supporting platform 2b of a vehicle 100 along the rotation direction "X".

[0049] According to a preferred embodiment of the present invention, the first rotation pivot 6 comprises a support/rotation member of the motorized fifth-wheel type rotating around the rotation axis "X" and arranged at the lower end 3.

[0050] In the present embodiment of the system 1, the movement structure 2 has a substantially "L" shaped structure with the longer vertical side coinciding with the tower-like element 2a and the horizontal side shorter than the vertical side arranged at the first rotation pivot 6 and coinciding with the base element 2c.

[0051] The present system 1 provides a reliable and precise operation by means of the base support 2d comprising an encoder system to determine an angular position of at least the supporting platform 2b in an operative working arrangement of the system 1.

[0052] According to a preferred embodiment of the present invention, the supporting platform 2b comprises guide and translation roller 8 elements along the tower-like element 2a and designed to prevent the platform 2b from skidding or laterally displacing with respect to the tower-like element 2a in an operative working arrangement of the system 1.

[0053] Moreover, the system 1 comprises a counterweight element 7, which is operatively combined with the supporting platform 2b and slides along a portion of the tower-like element 2a in an operative translation arrangement of at least the supporting platform 2b along the aforesaid translation direction "S".

[0054] The counterweight element 7 is designed to slide on the opposite side of the structure of the tower-like element 2a with respect to the long side, which translates the supporting platform 2b so as to synchronously move its ascending and descending translation gently. Preferably, the counterweight element 7 and the supporting platform 2b are connected to one another by means of gearing chains, for example by means of multiple gearing chains, as schematically illustrated by way of example in the annexed figures 3-5.

[0055] In the movement system 1 of the present invention, as may also be the case for certain systems of the known types, the positioning and maintenance of the vertical attitude of the movement structure 2, in particular of the tower-like element 2a, and of the attitude of the supporting platform 2b, are important so that the vehicle 100 is leveled with respect to a resting surface of a parking

space 200.

[0056] The system 1 of the present invention comprises a monitoring and adjusting member to monitor and adjust the vertical attitude, not visible in the annexed figures 1-6, of at least the tower-like element 2a.

[0057] In addition to what has already been described, the system 1 of the present invention comprises a position detecting member, not visible in the annexed figures 1-6, of at least the supporting platform 2b of a vehicle 100 in an operative translation arrangement of the platform 2b along the translation direction "S". By way of example, the optical position detection member of the supporting platform 2b is of the laser light type.

[0058] In particular and with reference to the annexed figure 6, according to the inventive concept of the present invention, the movement system 1 has another embodiment comprising a head element 9, operatively combined with the tower-like element 2a at the upper end 4 and designed to rigidly rotate the supporting platform 2b with respect to the rotation axis "X" together with the base element 2c and the tower-like element 2a.

[0059] More specifically, the aforesaid head element 9 comprises a second rotation pivot 9a of the tower-like element 2a and of the supporting platform 2b of a vehicle 100 along the rotation axis X.

[0060] The second rotation pivot 9a is operatively combined with the first rotation pivot 6.

[0061] In this other embodiment of the system 1, the movement structure 2 has a substantially "C" shaped structure with the vertical side coinciding with the tower-like element 2a and two opposing horizontal sides, shorter than the vertical side, respectively arranged at the first rotation pivot 6 and the second rotation pivot 9a.

[0062] More specifically, the second rotation pivot 9a and the first rotation pivot 6 have respective rotation axes coinciding with one another, preferably coinciding with the rotation axis "X".

[0063] The present invention has achieved the predetermined purposes.

[0064] Advantageously, the movement system of the rotary type for vehicles of the present invention makes it possible to exploit the volume and/or surface of each parking floor of a circular multistorey carpark and/or of a parking lot with circular sector. Advantageously in fact, the movement structure of the system of the present invention comprising a single vertical supporting pillar allows encumbrances, and therefore dead angles, to be limited, especially, but not only, during the rotation and movement maneuvers, as opposed to the movement system of the known type. In fact, the cantilevered pillar alone avoids exploiting the traditional portal structure of the known type, which de facto suffers from numerous limitations, such as the heavy weight, greater lateral encumbrances for the access of the carriage to the parking spaces and more expensive maintenance.

[0065] By way of example, but not limited to, the system of the present invention would advantageously make it possible, whenever installed in a multistorey carpark of the cylindrical type, to manage the movement of vehicles from 12 parking spaces per floor for a maximum encumbrance of about 18 meters in diameter (obviously including the system itself) with respect to about 10 parking spaces contained in a diameter of 23 meters for a movement system of the known type. In fact, the tower-like element of the present invention is arranged cantileverly on the base element and, given its encumbrance, only takes up a very small angular sector (with respect to the rotation axis "X" as a main reference), much smaller than the space that a conventional structure of the known type would take up.

[0066] Advantageously, the movement system of the structure described above allows the same movement structure to have both the vertical supporting pillar, referred to as the tower-like element in the present invention, and the base portion to rotate fully at 360° without any limitations with respect to the base support.

[0067] Advantageously, as already mentioned above, the movement structure of the present movement system is lighter and simpler than a system of the known type, therefore its implementation and/or maintenance is also minor.

Claims

1. Movement system (1) of the rotary type for vehicles (100) from and to a parking space (200), having a movement structure (2) comprising:

   - a tower-like element (2a) extending vertically between a lower end (3) and an upper end (4);
   - a supporting platform (2b) to support a vehicle (100), which is operatively combined with said tower-like element (2a) and designed to be translated along a translation direction (S) between said lower end (3) and said upper end (4) of said tower-like element (2a);
   - a base element (2c) combined with said tower-like element (2a); - a base support (2d) combined with said base element (2c) and shaped to support said tower-like element (2a) and said supporting platform (2b) of said system (1);
   - said base element (2c) being shaped to transfer the load of said tower-like element (2a) to said base support (2d);

   characterized in that said tower-like element (2a) and said base element (2c) are rotatably assembled to said base support (2d) so that said supporting platform (2b) is rotated with respect to a rotation axis (X), said base element (2c) being assembled to said base support (2d) so that to present a cantilevered portion (5) with respect to said base support (2d).

2. System (1) according to claim 1, wherein said tower-like element (2a) has a vertical development direc-

tion (P) and is fastened to said base element (2c) at said cantilevered portion (5) so that there is a predetermined eccentricity (e) between said development direction (P) and said rotation axis (X).

3. System (1) according to any one of the preceding claims, wherein said base support (2d) comprises a first rotation pivot (6) of said tower-like element (2a) and said supporting platform (2b) of a vehicle (100) along said rotation axis (X).

4. System (1) according to claim 3, wherein said first rotation pivot (6) comprises a support/rotation member of the motorized fifth-wheel type rotating around said rotation axis (X).

5. System (1) according to one or more of the preceding claims, wherein said base support (2d) comprises an encoder system to determine an angular position of at least said supporting platform (2b).

6. System (1) according to one or more of the preceding claims, comprising a counterweight element (7) which is operatively combined with said supporting platform (2b) and slides along a portion of said tower-like element (2a) in an operative translation arrangement of at least said supporting platform (2b) along said translation direction (S).

7. System (1) according to one or more of the preceding claims, comprising a monitoring and adjusting member to monitor and adjust the vertical attitude of said tower-like element (2a).

8. System (1) according to one or more of the preceding claims, comprising a detecting member to detect the position of at least said supporting platform (2b) of a vehicle (100) in an operative translation arrangement of the platform (2b) itself along said translation direction (S).

9. System (1) according to one or more of the preceding claims, wherein said supporting platform (2b) comprises, along said tower-like element (2a), guide and translation roller elements (8) designed to prevent the platform (2b) from skidding or laterally displacing with respect to said tower-like element (2a) in an operative working arrangement of said system (1).

10. System (1) according to any one of the preceding claims, comprising a head element (9) operatively combined with said tower-like element (2a) at said upper end (4) and designed to rigidly rotate said supporting platform (2b) with respect to said rotation axis (X) together with said base element (2c) and said tower-like element (2a).

11. System (1) according to claim 10, wherein said head element (9) comprises a second rotation pivot (9a) of said tower-like element (2a) and said supporting platform (2b) of a vehicle (100) along said rotation direction (X), said second rotation pivot (9a) being operatively combined with said first pivot (6).

12. System (1) according to one or more of the preceding claims, wherein said supporting platform (2b) of a vehicle (100) comprises a carriage (10) to allow said vehicle (100) to be horizontally moved so that to be positioned in the predetermined parking space (200).

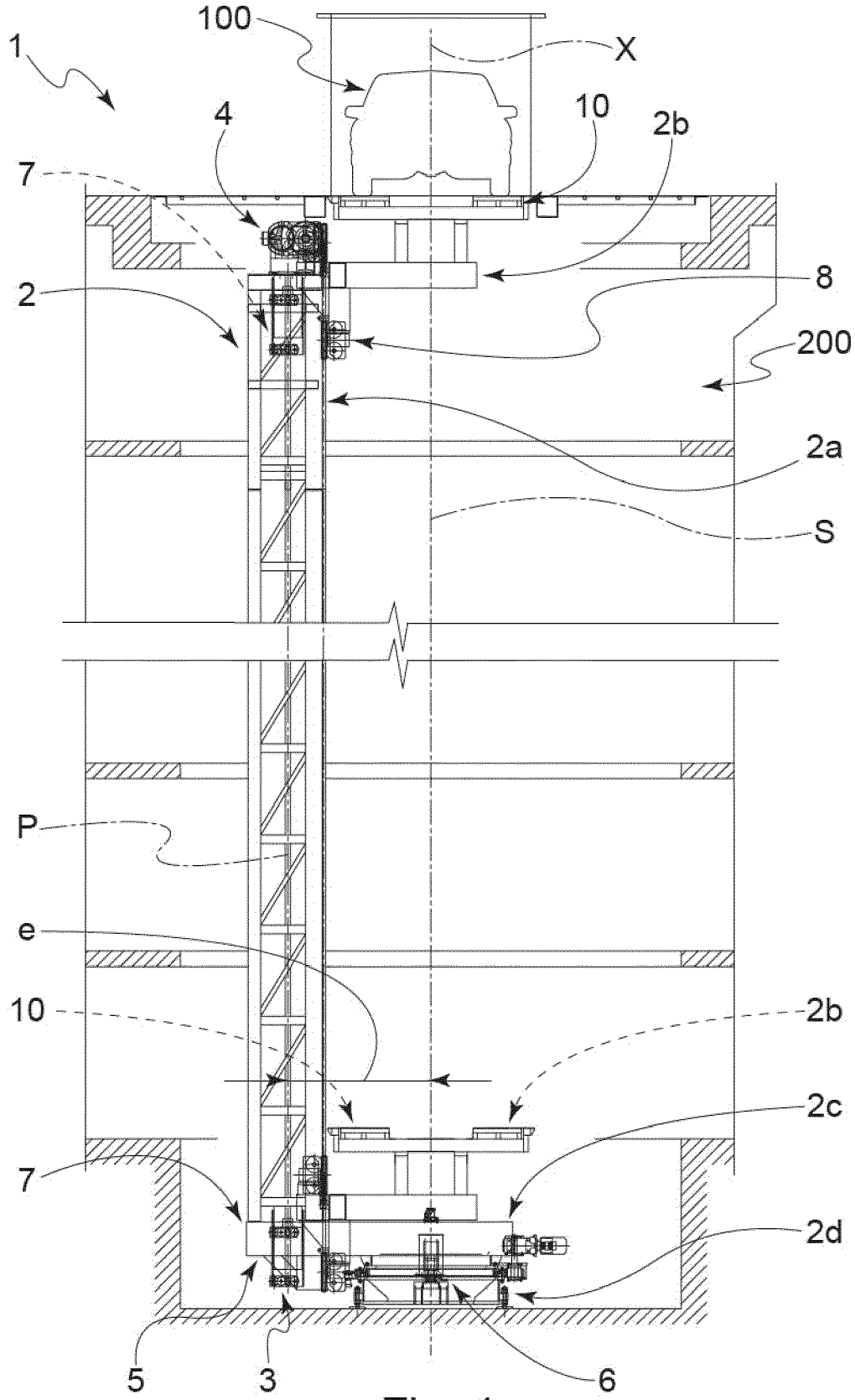

Fig. 1

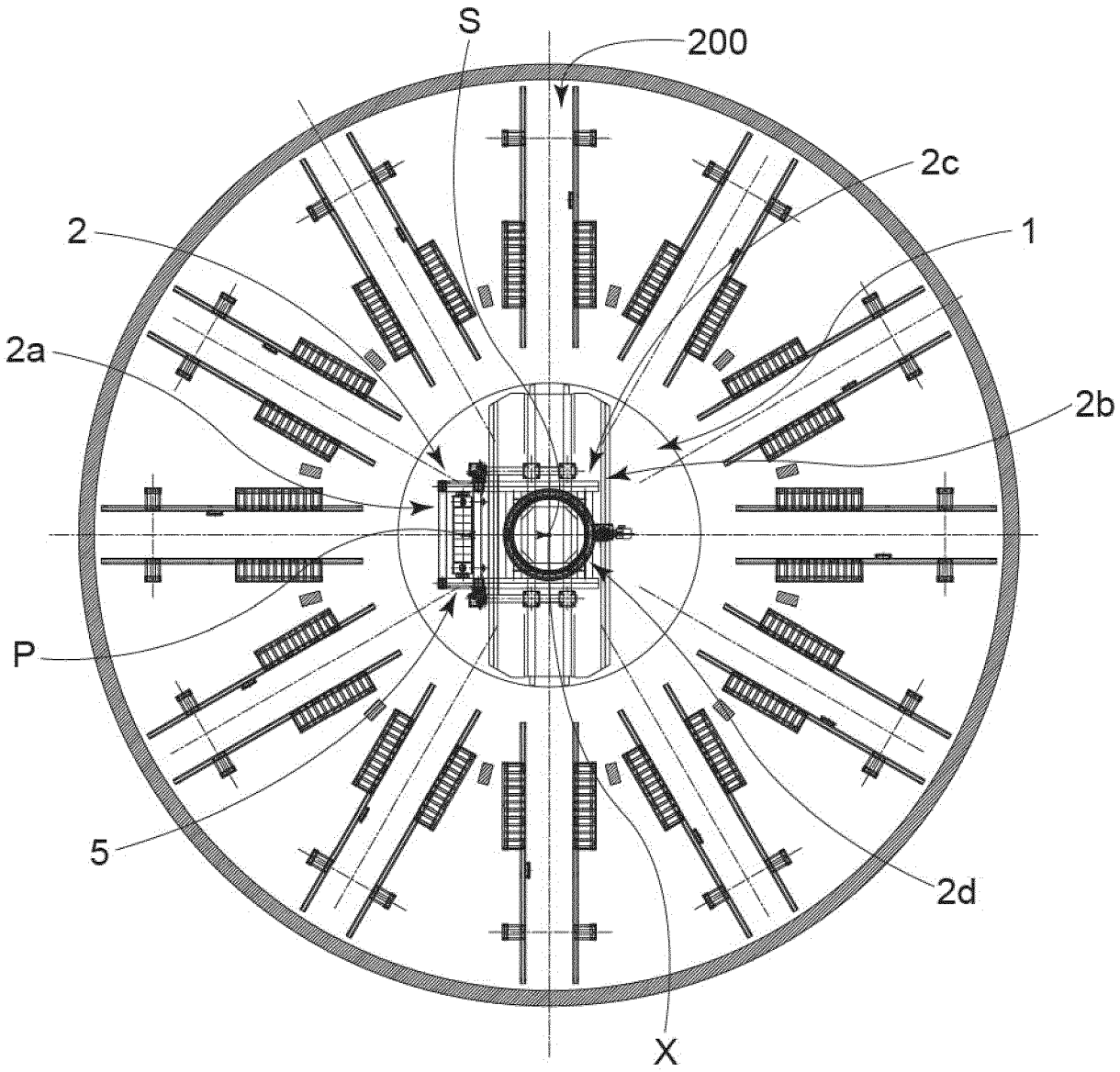

Fig. 2

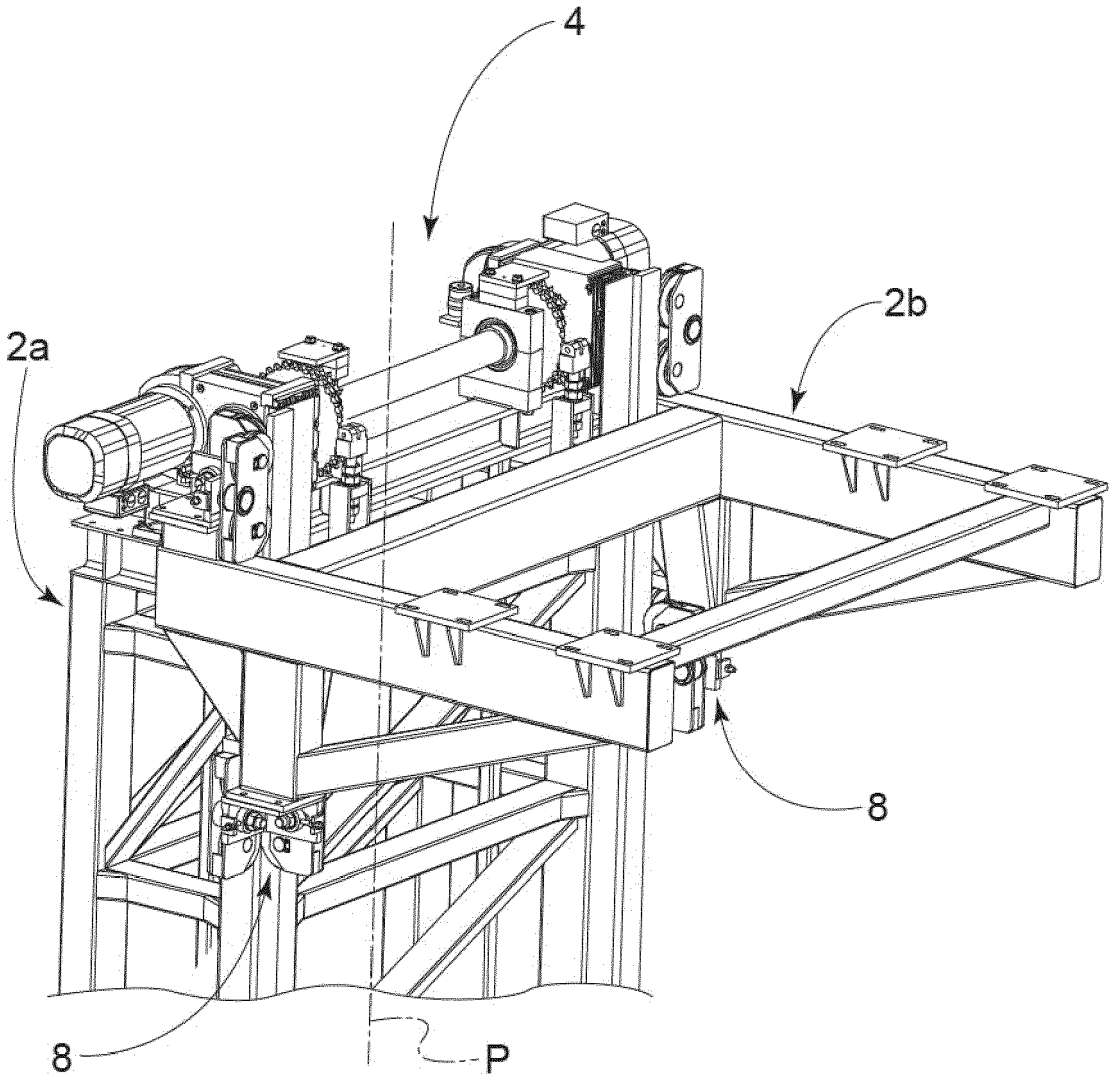

Fig. 3

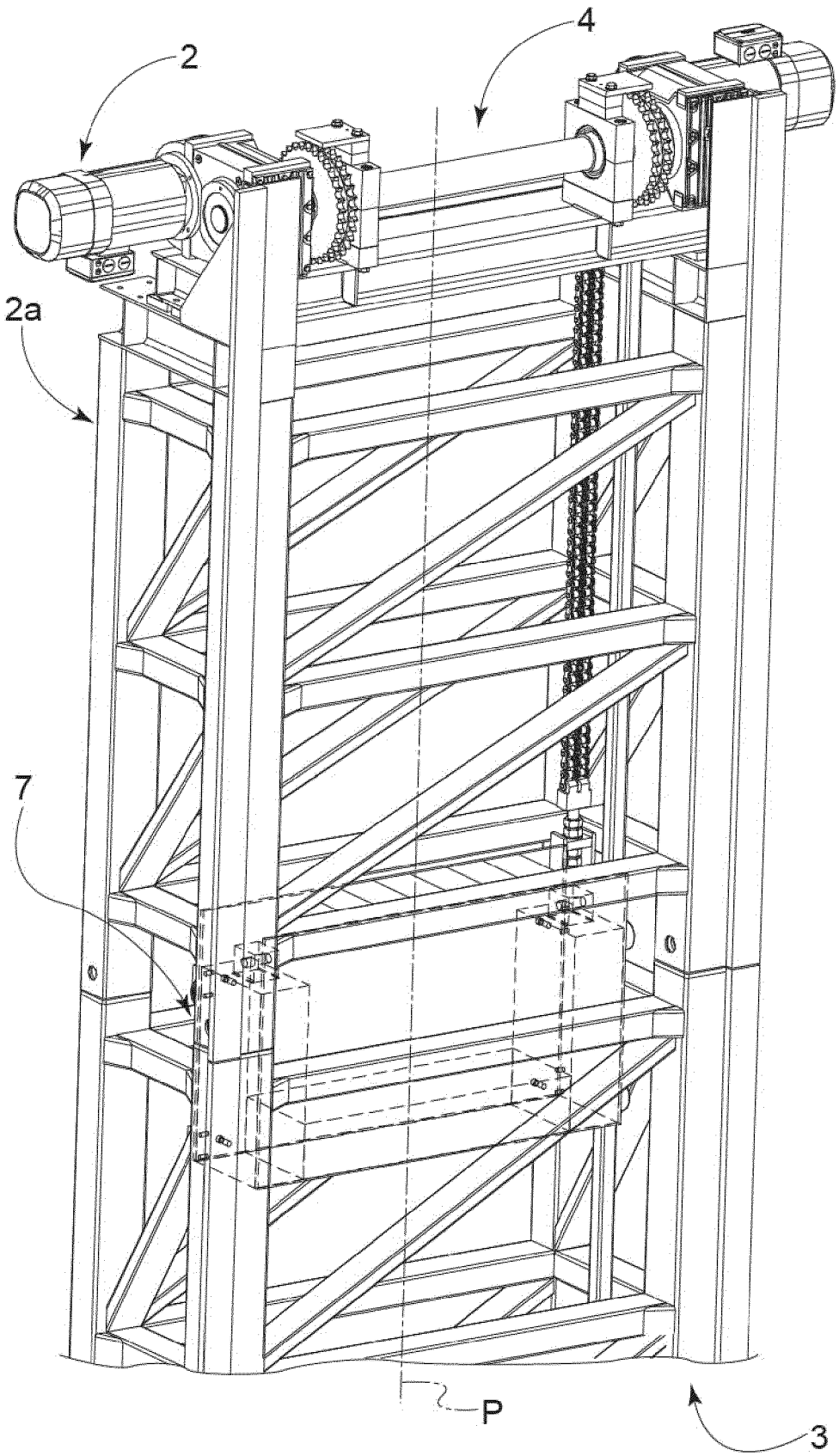

Fig. 4

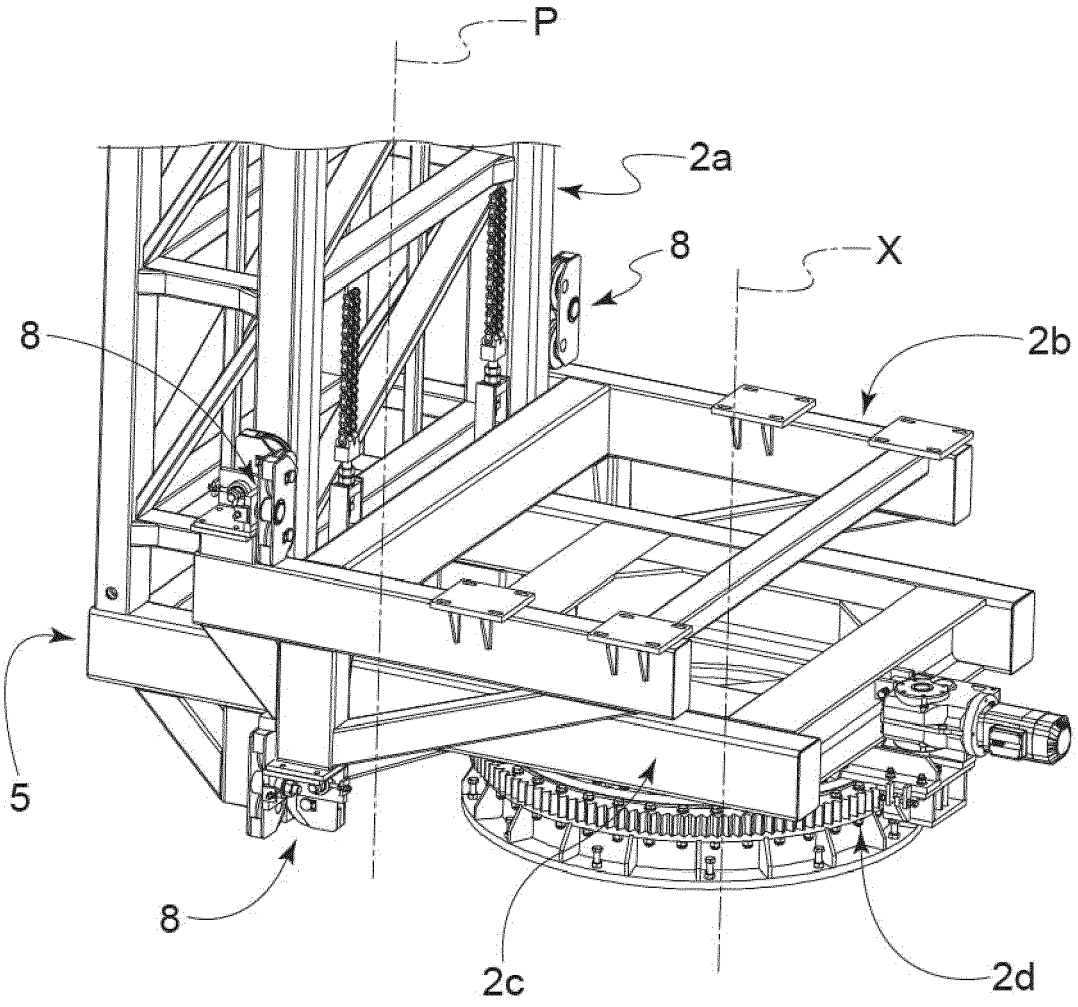

Fig. 5

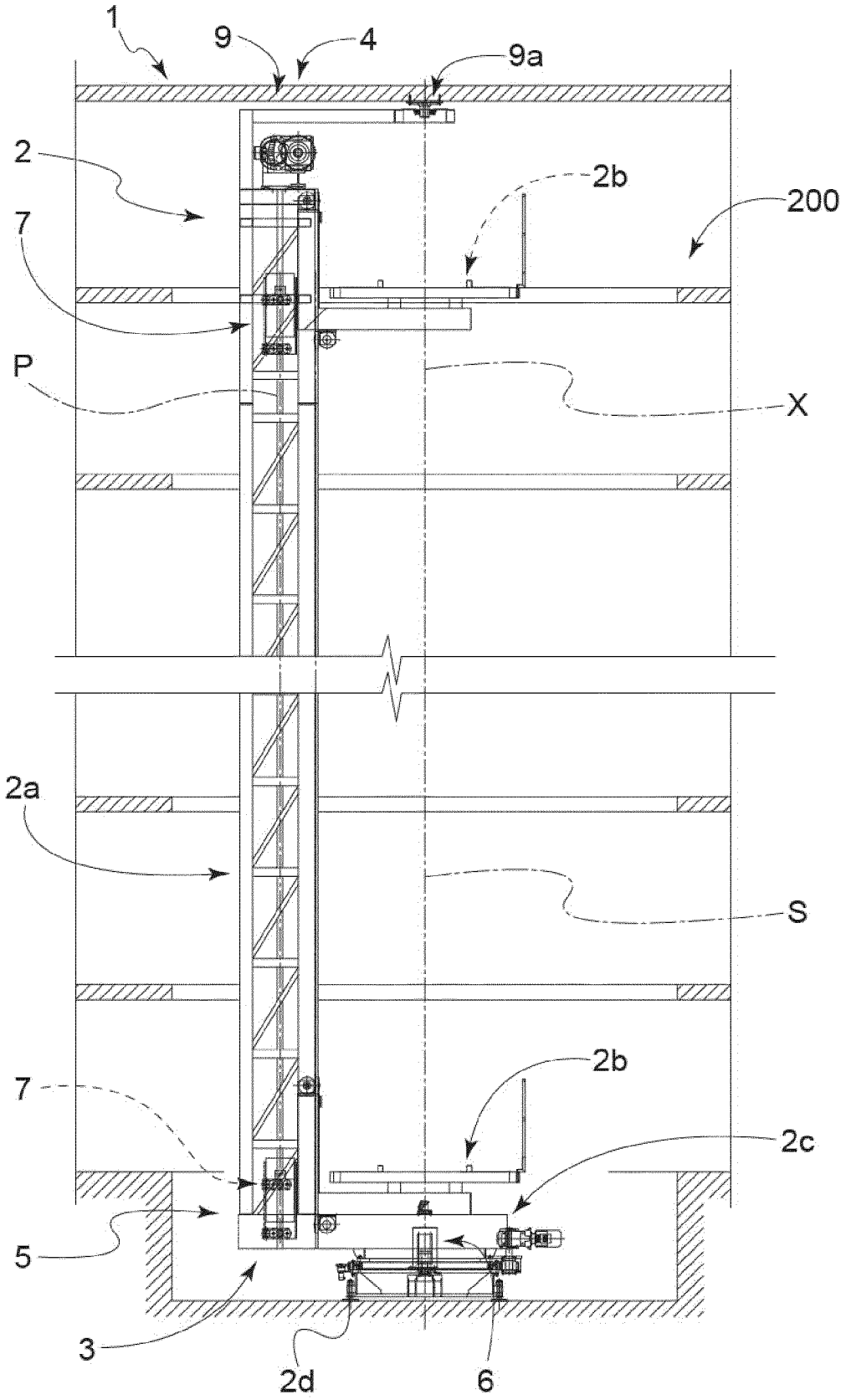

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 18 18 3594

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 5 829 941 A (ZAMORANO MORFIN LUIS RODOLFO [MX]) 3 November 1998 (1998-11-03) * column 4, line 31 - column 9, line 19; figures 1-10 *	1,3,4, 6-12	INV. E04H6/28
A	CN 106 013 898 A (QINHUANGDAO XI'AN HEAVY MACHINERY RES INST YANSHAN UNIV HEAVY MACHINER) 12 October 2016 (2016-10-12) * paragraph [0001] * * paragraph [0037] - paragraph [0061]; figures 1-9 *	1,2,5, 8-12	
A	WO 2017/071222 A1 (YU XIAOGANG [CN]) 4 May 2017 (2017-05-04) * paragraph [0077] * * paragraph [0095] * * paragraph [0111] - paragraph [0123]; claim 2; figures 1,2 *	1,3,8,9	
			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	20 November 2018	Stefanescu, Radu

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 18 3594

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5829941 A	03-11-1998	NONE	
CN 106013898 A	12-10-2016	NONE	
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82