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(54) Process to park vehicles automatically and construction making use of this process

(57) Process for the automatic parking of vehicles mainly characterised by the fact that it registers the vehicle (3); the correct positioning of this vehicle (3); the lifting from the floor of the vehicle (3); the transport of the vehicle (3) to a transfer station (17) ; the transfer of the vehicle (3) by means of the latter to a suitable parking place (9); and finally the removal from the vehicle (3) from the transfer station (17) to the parking place (9) aimed at.

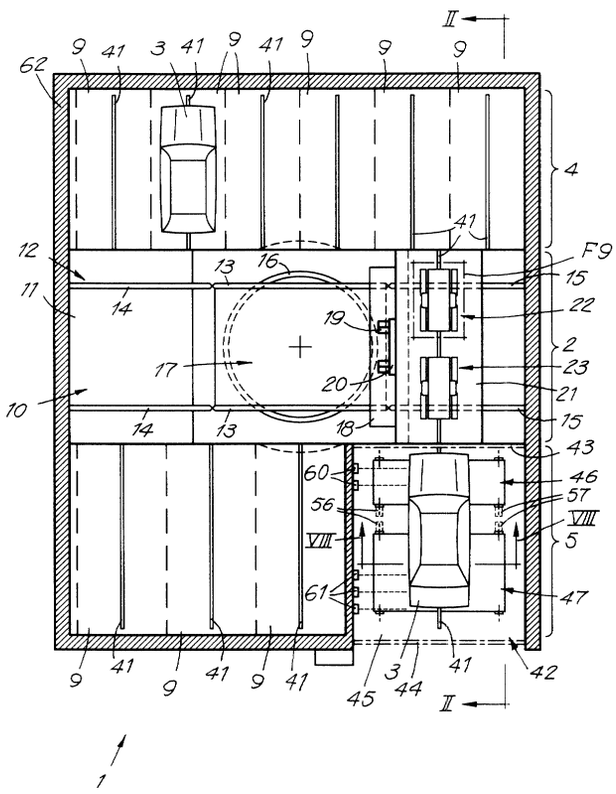

Fig. 1

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Description

[0001] The present invention refers to a process or an operating procedure to park vehicles automatically and in particular cars, as well as to the construction making use of this process.

[0002] More in particular, the invention relates to a process to park vehicles automatically, by which the vehicles are taken from a particular position and are brought to a well defined parking place, without any human intervention being needed.

[0003] Known parking garages of this type mainly present as disadvantages that the presented vehicles are not always positioned correctly, so that on the hand the vehicles often get damaged during their automatic transport within the automatic parking garage, and that on the other hand the available space is not completely utilized, because the places against the walls of such a parking garage cannot be used.

[0004] The object of the present invention is therefore an operating procedure or a process and a construction that applies this operating procedure, whereby the disadvantages of the existing parking garages can be totally excluded.

[0005] In consideration of this all the invention relates to an operating procedure or the automatic parking of vehicles, which consists mainly in the registration of a vehicle; the correct positioning of this vehicle, the lifting of the vehicle from the floor; the transport of the vehicle to a transfer station; the transport of the vehicle by means of the latter to a suitable parking place; and finally the removal of the vehicle from the transfer station in order to bring it to a suitable parking place.

[0006] The present invention also relates to a facility or construction applying the operating procedure mentioned above and which consists mainly in the means for the registration of a vehicle; the means for the automatic positioning of a vehicle; the means for the correct positioning of a vehicle; the means for the lifting from floor of the vehicle; the means for the transport of the vehicle to and from a transfer station; and the means for the transfer of the vehicle by means of the latter to a suitable parking place.

[0007] Although a parking garage working according to the invention can be realized with only one floor, it is clear that such a parking garage can be extended to several floors, in which case the above-mentioned transfer station will be combined with a lifting device.

[0008] The registration of a presented vehicle shall take place preferably by means of a registration/operating system that either receives information with regard to the dimensions of the vehicle, by means of a subscription card containing the data of the vehicle, or by appropriate scanning of the vehicle with the aim to collect the data about the dimensions, always aiming at the automatic assignment of a parking place which is best suited for the vehicle concerned and this with regard to its horizontal, as well as its vertical dimensions.

[0009] The positioning of the vehicle concerned according to the invention shall take place by means of two transport bands situated in the floor of the reception room and of which the moving direction is perpendicular to the driving direction of the vehicle.

[0010] These transport bands shall be driven by electric motors, whereby the movement of these transport bands shall be determined on the basis of data obtained by means of sensors or similar devices scanning the vehicle.

[0011] The means used to lift the vehicle from the floor consist of two carriages driven by electric, hydraulic or other motors, whereby the carriages are guided according to a guidance situated above the transport bands and which is extended according to the longitudinal direction of the vehicle.

[0012] The carriages mentioned above shall each be provided with two pairs of revolving arms which can work two by two at a vehicle wheel in order to lift the vehicle from the floor.

[0013] The transfer station mentioned above mainly consists in a platform to which the carriages can be transported in a guided way, whereby the platform can be moved in an appropriate way along the different parking places and whereby this platform will be part of the lifting device in case the parking garage is extended over several floors.

[0014] In the latter case such a lifting device will be combined with a rotating disc which makes it possible to turn the platform mentioned above over an angle of 180° in order to obtain the possibility to put vehicles in the utmost parking places, so that the available space can be used optimally.

[0015] In order to obtain a better understanding of the invention's characteristics, a description of an automatic parking garage will be given further on, as an example without having a limiting character, as well as a description of the operating procedure which shall be applied in such a parking garage, whereby reference is made to the drawings enclosed, in which:

figure 1 represents a schematic drawing of the view from above of the installation for the automatic parking of vehicles according to the invention;
figure 2 represents a cross-section according to line II-II in figure 1;
figures 3, 4 and 7 represent cross-sections for the succeeding position, similar to the one of figure 2;
figure 5 represents a view similar to that of figure 1, but for another position;
figure 6 represents a cross-section according to line VI-VI in figure 5;
figure 8 represents a cross-section according to line VIII-VIII in figure 1;
figure 9 represents a view from above of the part indicated in figure 1 by F9;
figure 10 represents another position of figure 9;
figure 11 represents a cross-section according to

line XI-XI in figure 10;
figure 12 represents a cross-section to a larger scale according to line XII-XII in figure 10.

[0016] The facility according to the invention for the parking of vehicles is situated in a building 1, subdivided in three zones, that is a middle zone 2 for the transfer of vehicles 3 and to both sides of the middle zone 2 a zone 4 and 5 respectively, which in this construction consist each of three floors 6-7-8, which are mainly subdivided in parking places 9.

[0017] The middle zone 2 consists of a passage way 10, of which the floor 11 is provided with rails 12, which are subdivided in three parts, that is a rotating part 13 on the one hand and on the other hand, at both far ends of this part 13, fixed parts, 14 and 15 respectively.

[0018] The above-mentioned rotating part 13 of the rails 12 will be mounted to a rotating disc 16 which can be rotated over an angle of 180°.

[0019] On the rails 12 mentioned above a transfer station 17 is provided for, which is mainly made up of a lifting device consisting of a carriage 18 which is being placed by means of guidance wheels not being shown on the rails 12, whereby a telescopic mast 19 is attached to this carriage and to this mast 19 a running carriage 20 is fitted, on which a platform 21 is attached.

[0020] On the platform 21 two identical carriages 22-23 are present, which consist mainly in a basis 24 provided with running wheels 25, whereby such a carriage 22-23 is driven forward by means of a motor 26, which can drive one of the afore-mentioned running wheels 25 through a suitable transmission 27.

[0021] The above-mentioned carriages 22-23 are each provided with two pairs of revolving arms 28-29 and 30-31, which are fixed at one far end in such a way that they can freely hinge on an axle which is therefore attached in the protrusions 33 of the basis 24 mentioned above.

[0022] Furthermore, between the afore-mentioned basis 24 of each carriage 22-23 and each revolving arm 28 until 31, a pneumatic or hydraulic cylinder 34 is attached of which the cylinder house on the one hand, and the piston rod on the other hand, are hinged by means of spindles 35-36 with the above-mentioned basis 24 and a revolving arm 28 until 31.

[0023] The afore-mentioned revolving arms 28 until 31 are each equipped with a freely rotating roll 37, which is combined with a running wheel 38 with a larger diameter than the diameter of roll 37.

[0024] At the bottom the basis 24 of each carriage 22-23 is also equipped with wheels 39-40, which are thus attached that they can work together with a guidance 41 in the form of a reversed T-shaped profile that has been attached in the middle of the longitudinal direction of every place where the carriages 22-23 can come and can move, in other words in a reception room 42 for vehicles 3, on the above-mentioned platform 21 and near every parking place 9.

[0025] The afore-mentioned zone 4 and the two bottommost floors 7 and 8 of zone 5 are completely subdivided in parking places 9.

[0026] The upper floor 6 of zone 5 is divided in two parts, namely a part that is also subdivided in parking places 9 of which the floor is provided with a guidance 41, and the above-mentioned reception room 42, which is preferably separated from the rest of the facility, for instance by means of a gate 43.

[0027] On the other hand the reception room 42 for the vehicles 3 can be closed off on the street side by means of a second gate 44, a barrier or similar.

[0028] The floor of the reception room 42 consists in a floor plate 45 which is locally interrupted by two countersunk transport bands 46 and 47 in the floor plate 45 of which the moving direction is perpendicular to the driving direction of the vehicle 3, and whereby the transport bands 46 and 47 are situated at such a distance from each other that, if two wheels 48 of a vehicle 3 are positioned on the front transport band 46, the two other wheels 49 of this vehicle 3 rest on the rear transport band 47.

[0029] As the wheelbase is not equal for all vehicles 3, the rear transport band 47 has to be broad enough, so that both large vehicles and small vehicles 3 can be positioned with their four wheels 48-49 on the two transport bands 46 and 47.

[0030] The afore-mentioned transport bands 46 and 47 are supported under their top end 50, which is meant to receive the vehicle wheels 48-49, by means of plates 51 which are attached themselves to I-profiles 52 which are firmly fixed in the interruptions for the transport bands 46-47 in the floor plate 45.

[0031] The guidance 41 in the reception room 42 is thus installed that the transport bands 46 and 47 can move freely under this guidance 41.

[0032] Every transport band 46-47 consists of an endless band 53 running over rolls 54-55, which can each be driven by an electric motor, 56-57 respectively, for instance by means of a chain transmission, so that the transport band 46-47 involved can be turned to the left or to the right.

[0033] Finally sensors or similar will be installed at various places of the facility according to the invention in order to guarantee the good and safe functioning of the facility.

[0034] In the reception room 42 for instance sensors 60 will be put up which will control the position of the vehicle 3; sensors 61 which measure the length of the vehicle; non shown sensors which check how oblique the vehicle 3 is positioned in relation to the guidance 41 and sensors which are not shown either, measuring the height of the vehicle 3.

[0035] In order to move the transport bands 46-47 in such a way that the vehicle 3 is correctly positioned, it is also possible to provide feeler sensors, which are for instance fixed to the telescopic arms on both sides of a transport band 46-47, whereby the feeling sensor that

makes the first contact with the vehicle 3, whereas the above-mentioned arms are extended simultaneously, signals that the top end 50 of the transport band 46-47 involved has to be moved in the opposite direction.

The functioning of the facility is very simple and as follows.

[0036] When a vehicle 3 drives into the reception room 42 of a building 1, in which a facility according to the invention for the automatic parking of vehicle 3 has been installed, this vehicle 3 will be either detected and the necessary data will be registered automatically by means of a registration/operating system so that on the basis of these data a suitable parking place 9 will be assigned and at the same time a parking ticket will be printed by which the vehicle can be picked up later, or the above-mentioned provisions can be arranged on the basis of a subscription card or similar which has to be introduced in the reader thereto installed.

[0037] When a vehicle 3 is driven into the reception room 42 two optical sensors 60 will for instance trigger a light signal by which the driver receives a sign that the vehicle 3 is situated at the right distance from gate 43 of the reception room 42.

[0038] When the driver and possible passengers have left the car, vehicle 3 will be positioned correctly with assistance of the sensors and by means of the transport bands 46-47 which are installed in the floor of the reception room 42. In other words: the vehicle will thus be centred and/or will be put straight.

[0039] The centring of a vehicle 3 will take place at the front transport band 46 as well as at the rear transport band 47, so that the longitudinal direction of vehicle 3 concerned is put parallel to the afore-mentioned guidance 41.

[0040] For this purpose the transport bands 46-47 are driven by electric motors 56-57, whereby the moving direction of these transport bands 46-47 will be determined on the basis of the data obtained by means of the sensors scanning the vehicle 3.

[0041] At the same time that the vehicle 3 is positioned correctly, the above-mentioned platform 21 is moved from a rest position, which is preferable bottom 11 of passage 10, to the position situated in line with the afore-mentioned reception room 42, as represented in figure 2.

[0042] When platform 21 has taken this position, gate 43 will open.

[0043] At that moment the afore-mentioned carriages 22-23 will be moved from the afore-mentioned platform 21 along guidance 41 until they are situated under vehicle 3 to be parked, more specifically until they are situated near the wheels 48, respectively 49, which will be registered by means of sensors, which are not represented in the drawings.

[0044] Thereby the carriages 22-33 are moved along the guidance 41 by means of the wheels 39-40 situated at the bottom of the carriages 22-23.

[0045] The revolving arms 28 until 31 are then revolved with assistance of the cylinders 34 in such a way that the rolls 37 of the arms 28-29, respectively 30-31, are pushed against the respective tires of the wheels 48 and 49, whereby these wheels 48 and 49 are pushed upwards and vehicle 3 is lifted from the floor.

When a vehicle 3 is lifted from the floor the revolving arms 28 until 31 are supported by the running wheels 38.

[0046] Subsequently the carriages 22-23 will transport the vehicle 3 to the transfer station 17. This situation is represented in figure 4.

[0047] The afore-mentioned platform 21 can be moved at least horizontally, but in the present case, whereby the parking places 9 are situated on more than one floor 6-7-8, it can be moved vertically as well by means of the transfer station 17 which can be moved over the rails 12.

[0048] If necessary, for instance to put a vehicle 3 at a parking place 9 situated against an outer wall 62 of the building 1, the transfer station 17 will be rotated over an angle of 180° by means of the rotating disc 16, so that the mast 19 of the transfer station 17 will not be situated between the platform 21 and outer wall 62 and no costly parking places 9 will be lost.

[0049] Once the afore-mentioned platform 21 has been brought towards the parking place 9 which has been selected by the registration/operating facility, the carriages 22-23 of platform 21 are driven into the selected parking place 9.

[0050] Subsequently the revolving arms 28 until 31 of the carriages 22-23 will be retracted, so that the vehicle 3 is put on the floor of the parking place 9, after which the carriages 22-23 are driven again onto platform 21.

[0051] Finally platform 21, with the carriages 22-23 on top of it, is moved back to its rest position.

[0052] It is obvious that the reverse order of this operating procedure will be applied to pick up a vehicle 3 from a parking place 9.

[0053] In order to do so a person collecting his vehicle 3 will have to put his card, his parking ticket or similar in the card reader installed for this purpose, after which platform 21 is moved to the parking place 9 concerned. Subsequently the vehicle 3 will be put on the platform 21 by means of the carriages 22-23, after which the platform 21 will be brought in line with the reception room 42. Finally the vehicle 3 will be transferred by means of the carriages 22-23 from the transfer station 17 to the reception room 42.

[0054] It is obvious that the operating procedure described above for the automatic parking of vehicles 3 and the facility applying this operating procedure, utilizes a maximum number of parking places 9 on a specific surface without any danger that the vehicles 3 will be damaged during the automatic parking.

[0055] The present invention is by no means limited to the example given and to the operating procedure for the automatic parking of vehicles represented in the figures, nor to the facility applying this operating procedure.

Claims

1. Process for the automatic parking of vehicles characterised mainly by the fact that it consists in the registering of a vehicle (3) ; the correct positioning of this vehicle (3) ; the lifting from the floor of the vehicle (3) ; the transport of the vehicle (3) to a transfer station (17) ; the transport of the vehicle (3) by means of the latter (17) to a suitable parking place (9) ; and finally the picking up of the vehicle (3) from the transfer station (17) to bring it to the parking place (9) concerned.

2. Process according to claim 1, characterised by the registering of a presented vehicle (3) by means of a registration/operating system that assigns automatically a parking place (9) which is best suited with regard to the dimensions of the vehicle (3) concerned and this as far as its horizontal as well as its vertical dimensions are concerned.

3. Process according to claim 2, characterised by the fact that the registration/operating system obtains information with regard to the dimensions of the vehicle (3) by means of a subscription card containing the data of the vehicle (3),

4. Process according to claim 2 characterised by the fact that the registration/operating system obtains information with regard to the dimensions of the vehicle (3) by means of the suitable scanning of the vehicle (3) .

5. Process according to claim 1, characterised by the fact that the positioning of the vehicle (3) concerned takes place by means of sensors through which a driving motor of two transport bands (46-47) situated in the floor of the reception room (42) is driven, and the vehicle (3) is moved sideward.

6. Construction applying the process according to one or several of the previous claims, characterised by consisting mainly in the means for the registering of a vehicle (3) ; the means for the correct positioning of a vehicle (3) ; the means for the lifting from the floor of the vehicle (3) ; the means to move the vehicle (3) from and to a transfer station (17) ; and the means to transfer the vehicle by means of the latter (17) to a suitable parking place (9) .

7. Construction according to claim 6, characterised by the fact that the means for the registration of a vehicle (3) consist in a registration/operating system.

8. Construction according to claim 6, characterised by the fact that the means for the automatic positioning of a vehicle (3) consist in transport bands (46-47) which are driven by one or more electric motors (56-57), whereby the moving direction of the transport bands (56-57) is perpendicular to the driving direction of the vehicle (3) .

9. Construction according to claim 8, characterised by the fact that the distance between the transport bands (46-47) is smaller than the distance of the wheel base of a vehicle (3) to be parked.

10. Construction according to claim 8, characterised by the fact that the means for the automatic positioning of a vehicle (3) contain sensors steering the above-mentioned motors (56-57).

11. Construction according to claim 6, characterised by the fact that the means to lift the vehicle (3) from the floor consist in carriages (22-23) each provided with two pairs of revolving arms (28-29-30-31) which can work two by two at a wheel (48-49) of a vehicle (3) in order to lift the vehicle (3) from the floor.

12. Construction according to claim 11, characterised by the fact that each revolving arm (28-29-30-31) is provided with a freely rotating roll (37).

13. Construction according to claims 11 and 12, characterised by the fact that each revolving arm (28-29-30-31) is provided with a running wheel (38) with a larger diameter than the diameter of the roll (37).

14. Construction according to claim 11, characterised by the fact that the carriages (22-23) are equipped with running wheels (25).

15. Construction according to claim 11, characterised by the fact that the carriages (22-23) are equipped with wheels (39-40) which are fixed in such a way that they can work together with a guidance (41) .

16. Construction according to claim 14, characterised by the fact that each carriage (22-23) is equipped with an electric motor, a hydraulic motor or similar (26) driving one of the running wheels (25).

17. Construction according to one or more of the claims 6 until 13, characterised by the fact that the means for the moving of a vehicle (3) consist in a transfer station (17), consisting mainly of a lifting device consisting of a carriage (18), whereby a telescopic mast (19) is attached to it and whereby this mast (19) is provided with a running carriage (20), on which a platform (21) is attached.

18. Construction according to claim 17, characterised by the fact that the transfer station (17) is attached to rails (12) by means of guidance wheels (12).

19. Construction according to claim 18, characterised by the fact that the rails (12) are subdivided in three parts, namely a rotating part (13) on the one hand and on the other hand, at both far ends of this part (13), fixed parts, (14) and (15) respectively.

20. Construction according to claim 19, characterised by the fact that the rotating part (13) of the rails (12) is mounted to a rotating disc (16) which can be rotated over an angle of 180°.

21. Construction according to claim 6, characterised by the fact that it is installed in a building (1) subdivided in three zones, that is a middle zone (2) for the transfer of vehicles (3) and to both sides of the middle zone (2) a zone (4) and (5) respectively, which zones (4-5) are mainly subdivided in parking places (9) and a reception room (42).

22. Construction according to claims 8 and 21, characterised by the fact that the transport bands (46-47) are situated in the reception room (42).

23. Construction according to claims 6, 15, 17 and 21, characterised by the fact that the guidance (41) is attached to the floor of every parking place (9), on the floor of the reception room (2) and on the platform (21).

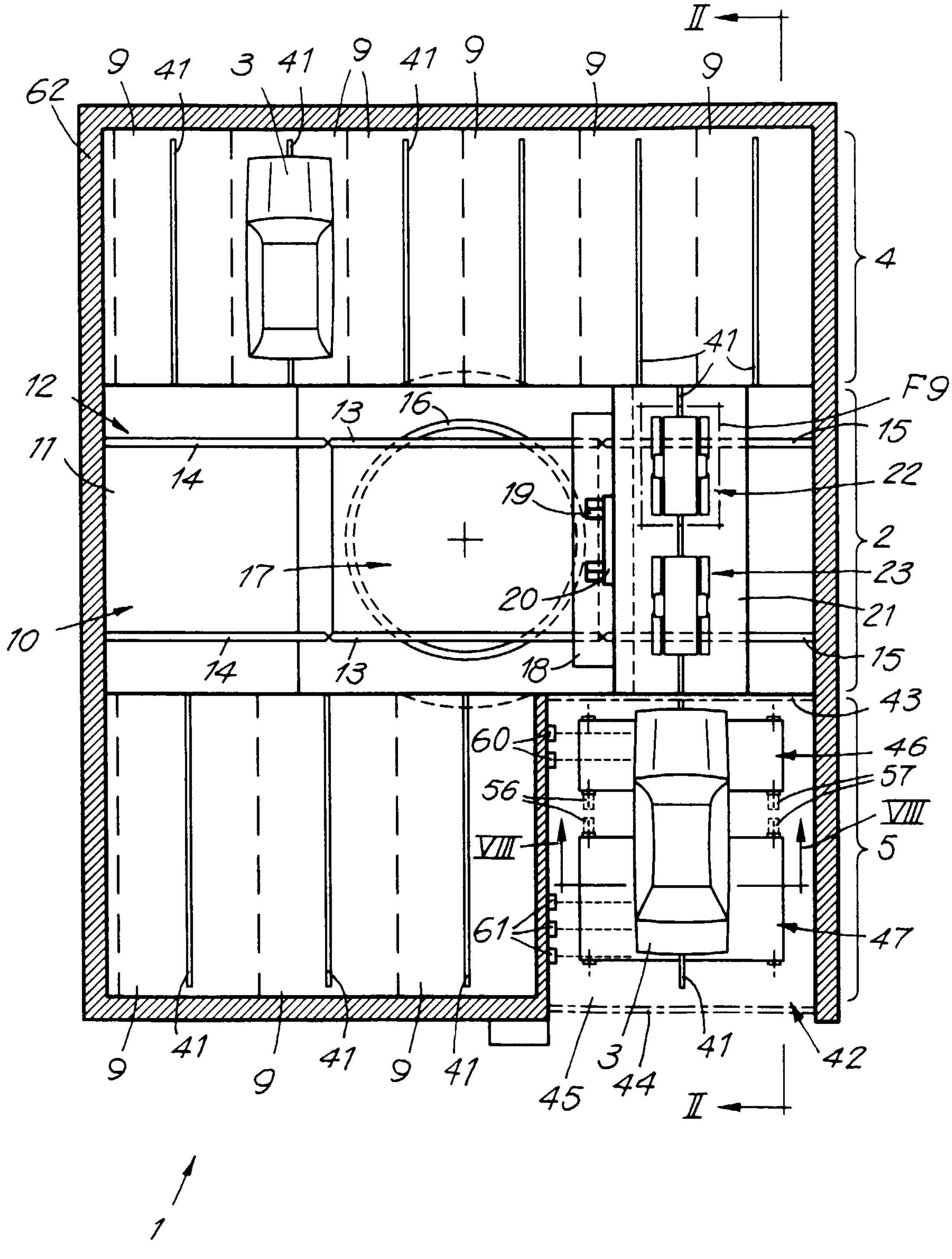
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Fig.1

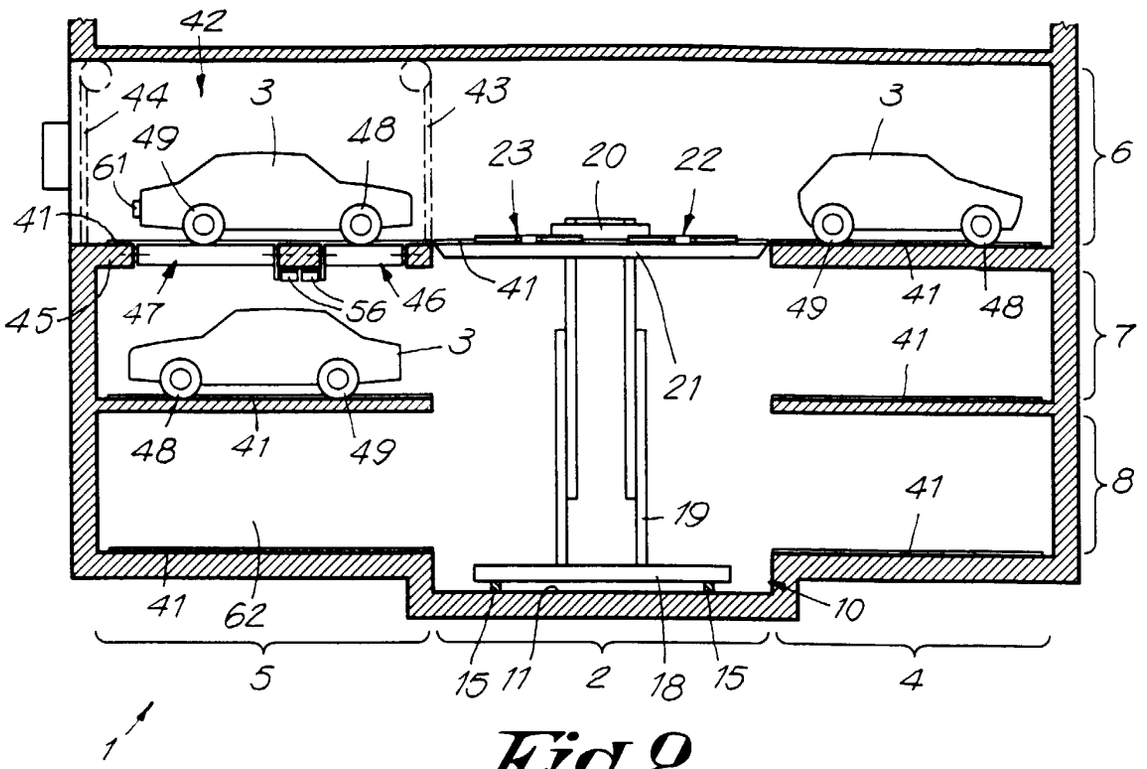
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Fig.2

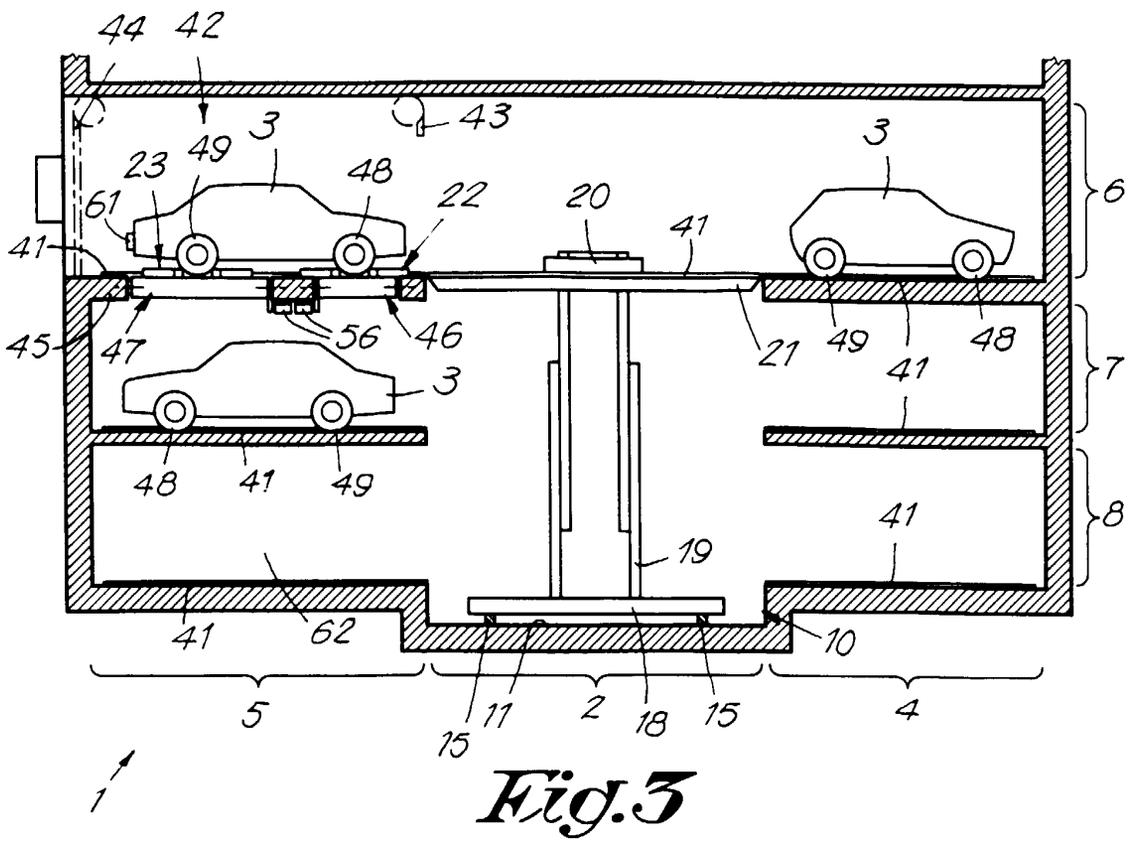
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Fig.3

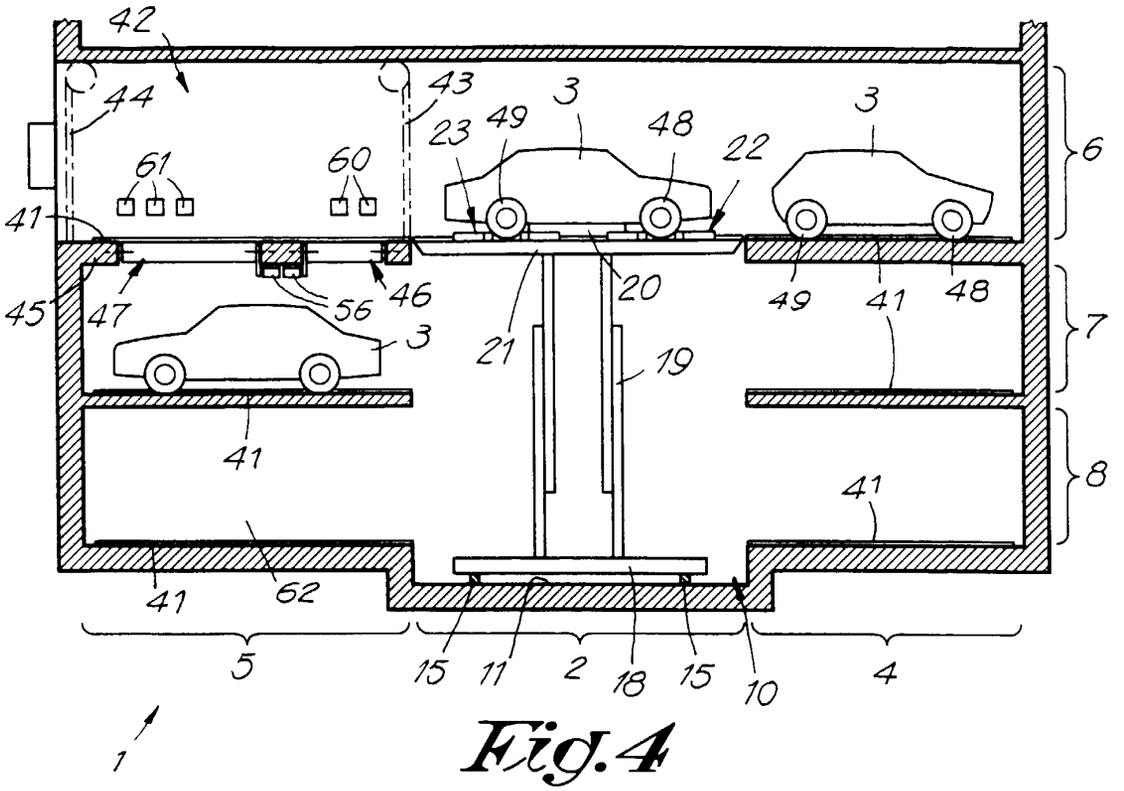
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Fig.4

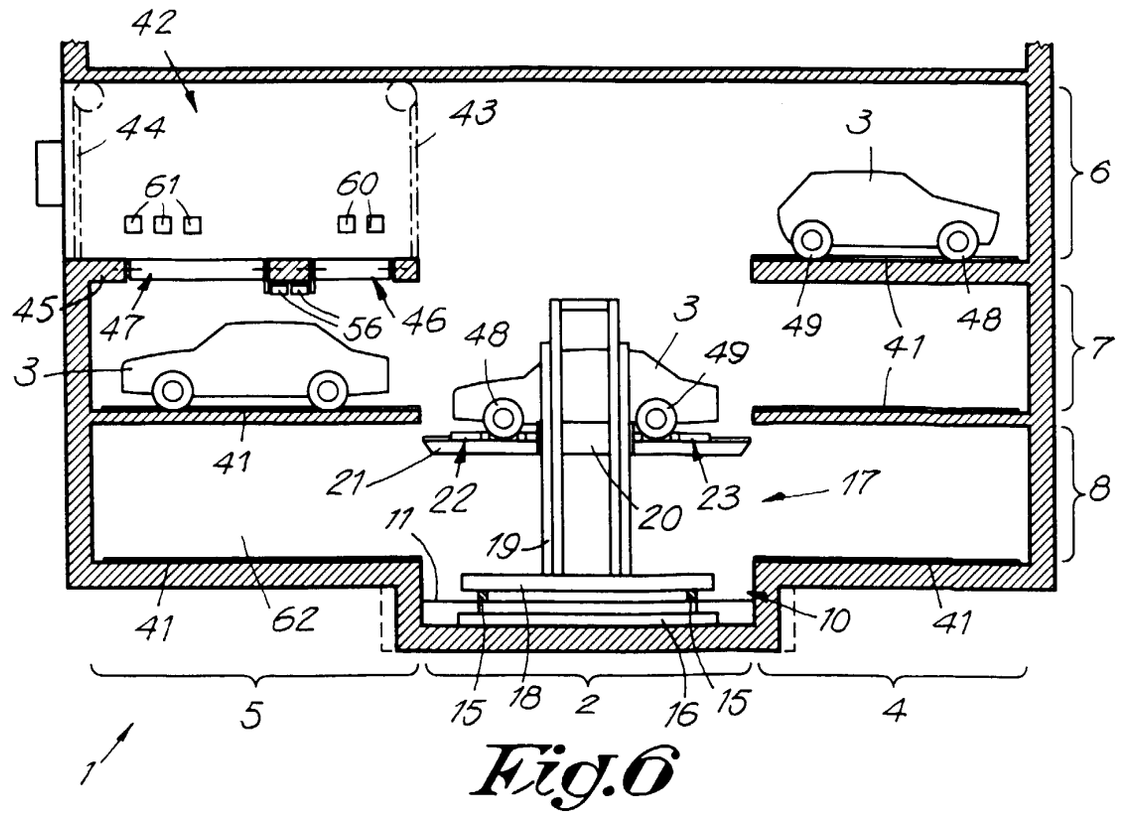
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Fig.6

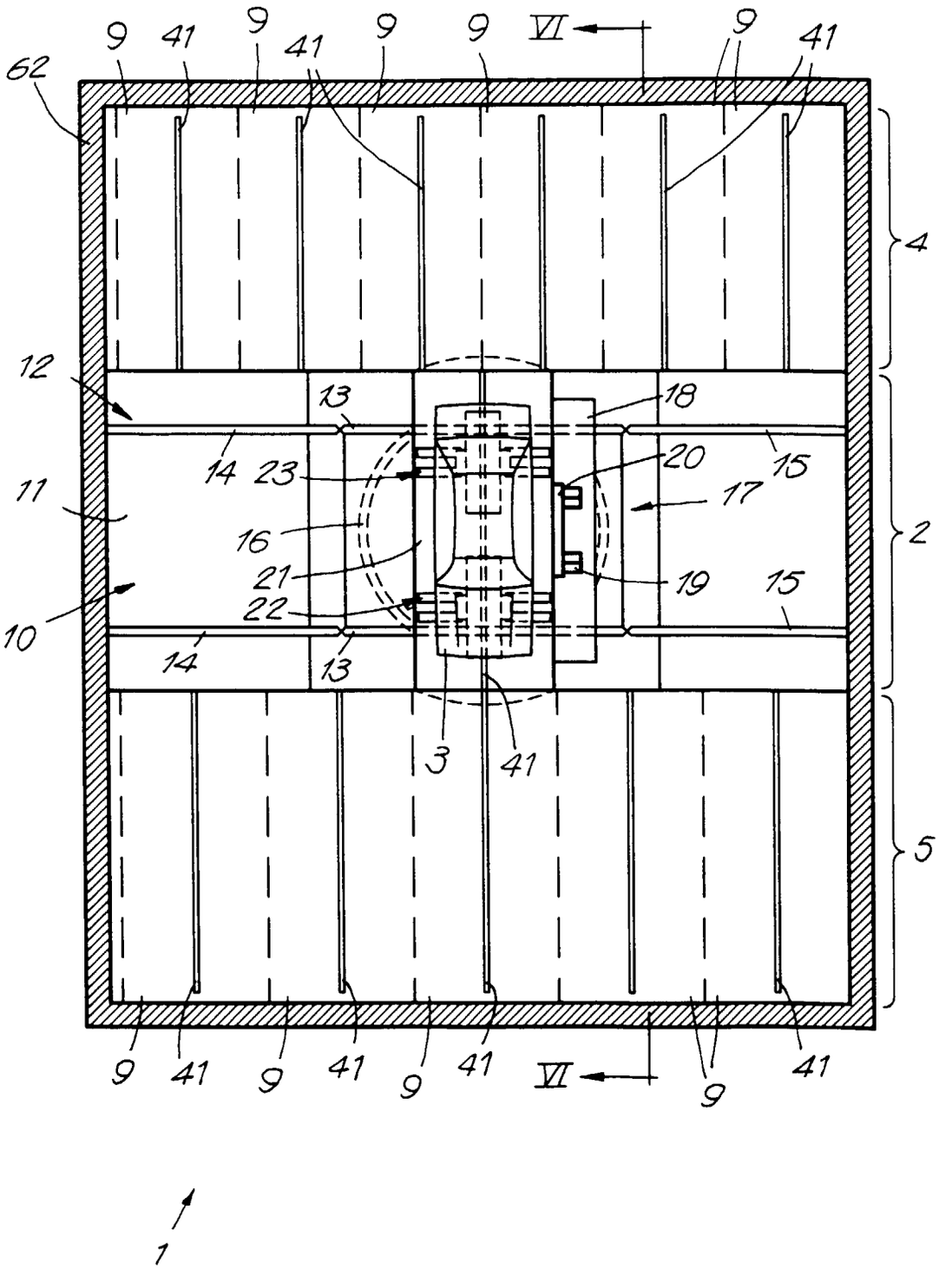

Fig.5

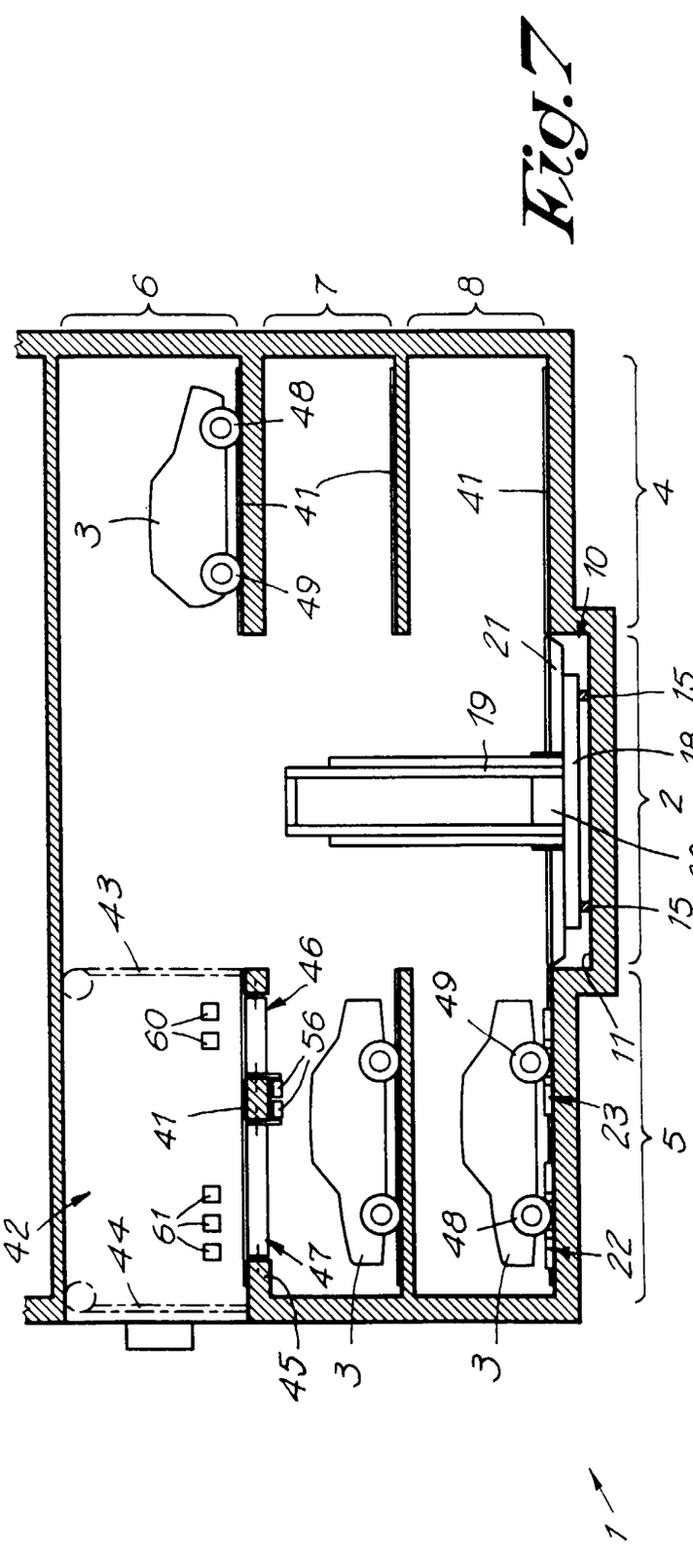
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Fig.7

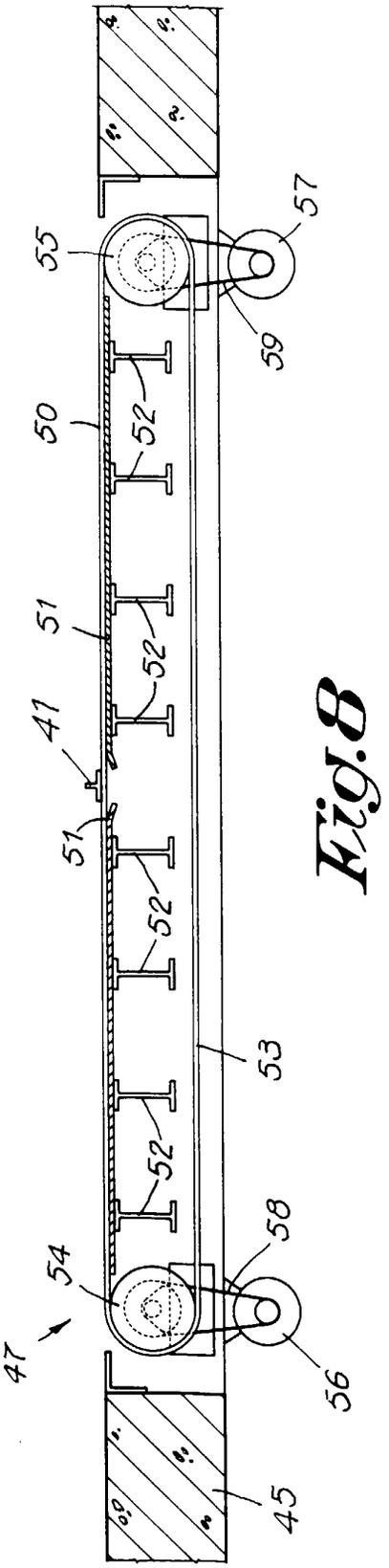
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Fig.8

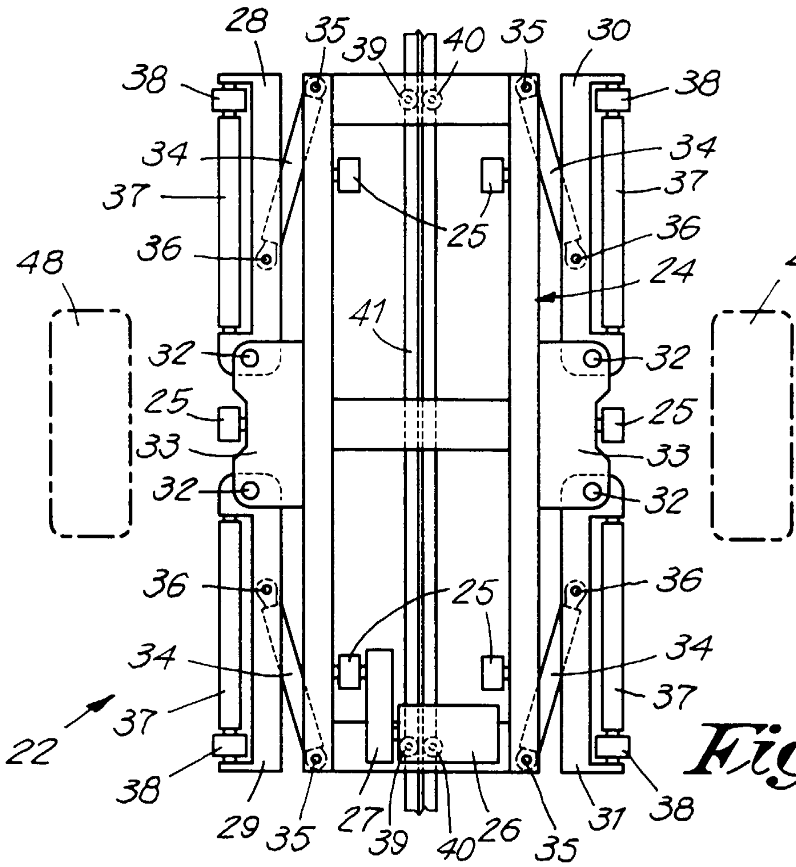
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Fig.9

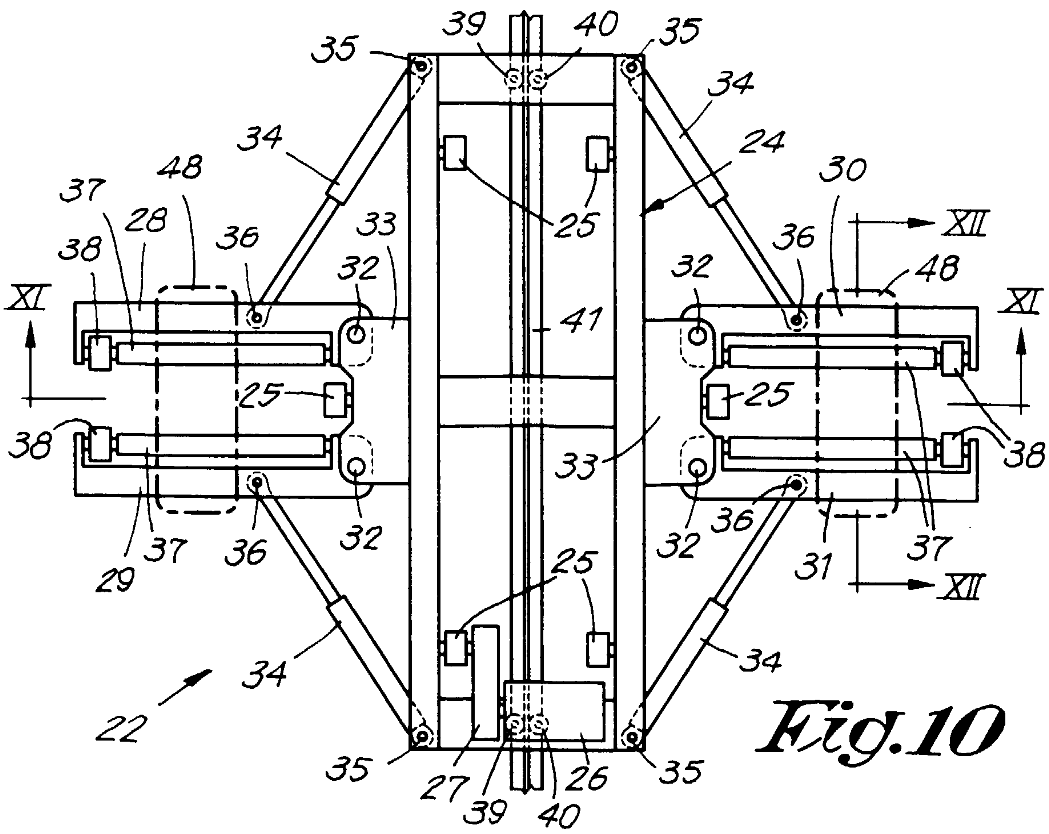
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Fig.10

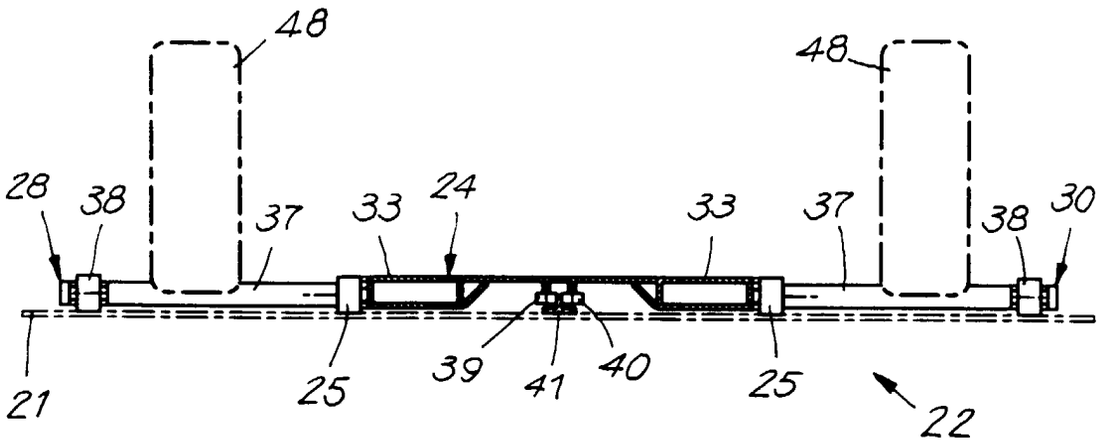
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Fig.11

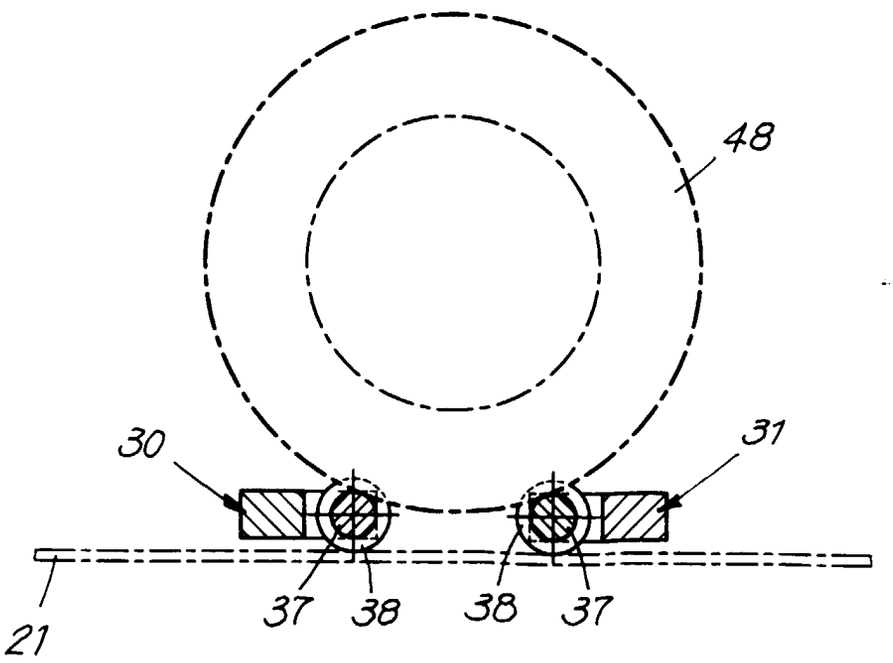
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Fig.12