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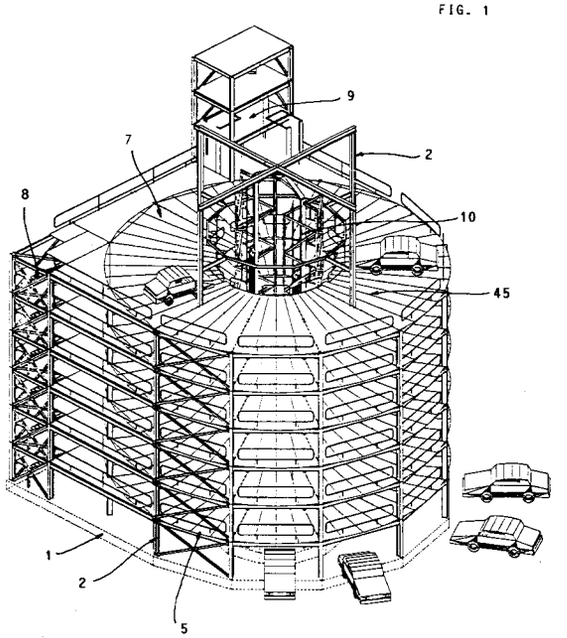
(54) **Radial mechanized garage parking system.**

(57) This invention refers to a multiple parking system of a radial and mechanized type, which is highly efficient since it requires very little space for circulation, as compared with the area used specifically to park the cars. This allows for a better use of urban space, efficient operation and a reduced investment cost.

FIG. 1



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BACKGROUND OF THE INVENTION

Field of the Invention

This invention refers to a mechanized, radial type parking system, allowing twelve vehicles to be parked per floor without the need of areas for maneouvring or circulation, and which applies to any urban area, especially where the land is scarce and expensive. The result is a high level of efficiency and density for vehicle parking as compared with the overall land and building area. A parking lot of this type is described in the applications for Mexican patents Nos. 927515 and 936173, belonging to the same titleholder of the present patent application.

Prior Art

Previously-existing parking systems are very varied, and can be classified in non-mechanized and mechanized categories. The first provide ease of circulation to allow vehicles to move from the entrance to the parking space, whether located on a single ground-level floor, or on a higher floor where access is by means of a sloping ramp, or where the parking spaces form part of such ramp. These parking lots are characterized by low efficiency, high investment costs, the need for a large land and construction area, and low operating and maintenance costs. The second type of parking lots (mechanized) are characterized by a higher level of efficiency, ranging from those with a low level of sophistication which combine an elevator mechanism with circulation lanes, to fully mechanized systems where the vehicles are suspended in the lifting equipment itself or in vertically-placed niches. Use of the latter has been extremely restricted and for very specific applications, due to their high investment cost.

The foregoing demonstrates the need for designing and building parking systems which combine the following factors of primary importance:

a) An efficient use of urban land
b) Vertical construction, to allow greater parking capacity
c) The requirement for land or reduced dimensions
d) A low investment cost
e) A low operting cost
f) High efficiency in connection with the area needed for parking a car vs. the overall construction area
g) Reliability
h) Low maintenance
i) Low live weight vs. dead weight ratio of the parking system
j) Easy operation
k) Modular construction
l) A capacity which can be expanded
m) Recovery of investment plus operating costs

A radial mechanized parking system takes the foregoing design factors into consideration, providing potential benefits in technical and economic aspects.

OBJECTS OF THE INVENTION

The object of the present invention is, therefore, to provide parking for cars in a mechanized, radial-type system which is efficient, novel, functional and extremely economical for installation in urban areas.

The other object of the present invention is to optimize the use of urban land areas by parking vehicles on two or more floors.

Another object of the present invention is to eliminate car circulation, ascent and descent ramps and lanes, in order to better utilize the available construction area of the parking system.

An additional object of the present invention is to have a car-lifting system which, once vehicles are lifted from one level to another, revolves on its own access to allow them to be placed at a suitable angle for ascent and descent.

Another object of this invention is to provide parking where the dead weight of the building is relatively low when compared with the live weight of the cars ad their occupants, in order to reduce the investment costs.

Yet another object of this invention is to provide a mechanized and semi-mechanized system to work faster in placing the cars, and which operates with a high degree of security for the occupants, the operating personnel, the vehicles and the parking system itself.

Finally, a object of the present invention is to provide a modular parking system the capacity of which can be increased in accordance with the needs of each specific case, and which is easily made, put together and operated.

The foregoing objects become reality with a new parking system of the radial, mechanized type, consisting basically of a foundation slab of reinforced concrete which will serve as a supporting platform for the structure of the building, as well as, serving as the lower floor of the parking system; a metallic or concrete structure with radial girders sustained by suitably-distributed columns for supporting both the dead weight of the building and the live weight of the cars and their occupants; a revolving elevator of a hydraulic or hydraulic with cables type in the center of each tower which, in addition to hoisting the vehicles, revolves around a central axis to acquire any of twelve preselected positions within 360°, a signalling and control sys-

tem which allows the operator to identify unoccupied spaces and make the elevator cabin stop vertically on the desired floor and horizontally in the required position, while at the same time allowing safe operation of the elevator in order to prevent any movement or rotation while a vehicle is being lifted or lowered to the elevator cabin.

More specifically, the parking system of the present invention consist of a cylindrically-shaped building of two or more floors in the form of a circular crown, placed one obove the other in perfect alignment, in such a way that its structural elements coincide when seen from above. The floors are supported by columns in such a way that each floor has the capacity to house twelve radially-placed cars.

A car elevator is placed in the center of the circular crown of each floor, which will raise or lower these to each floor or from each floor to ground level, and will position them by revolving on its central axis in the ascent or descent angle of the elevator required, according to the relative position of the parking space or point of exit. A feature of this elevator is that, in addition to its transfer movement, it also rotates the structural guide tower, the carlift and hydraulic lifting system. The elevator consists of a vertical revolving structure which turns on its vertical longitudinal axis and which, in its lower part, serves as a support for the hydraulic lifting equipment and as a guide for the lifting cabin which runs vertically within the guide bars of structure itself. The metallic structure consists basically of a revolving table in the form of an inverted pyramid which supports two structural legs throughout the vertical length of the entire elevator and the hydraulic equipment, and whose upper extremity is another pyramid.

Two central axis (an upper and a lower placed on the vertexes of the pyramids) formed by ball bearings, make up the revolving axis of the structure, the cabin and the hydraulic equipment by the action of an operator on the lower part of the table who, through a crown gear, a pinion and an electrical gearmotors, starts the rotatory movement which will permit the radial positioning of the elevator cabin in each of the twelve parking places corresponding to each of the floors.

The elevator will be actived by an oleohydraulic system equipped with hydraulic pistons and pumps so that, when the pistons move outside the cylinders, the elevator cabin is raised, and vice versa. The elevator is also equipped with electrical and electronic controls to allow its ascent and descent operation, turn clockwise and counterclockwise, and controls to prevent its transfer and rotating movements if the vehices obstruct the light ray of the photocell installed at the entrance to the rotating platform of the elevator itself.

The parking system will be equipped with a complete indication and control system, by means of which the equipment moves semiautomatically to allow the admission of cars, indication of vacant spaces, access, raising and rotation of the elevator, and the elevator call. The indication and control system consists basically of a logical control programmer, a control panel which governs the elevator, call buttons, obstruction sensors, positioning sensors and proximity sensors. The system as a whole will have a specially-designed operating language and logical programs for exercising the desired actions in accordance with the specific configuration of the equipment.

Finally, the parking lot will be equipped with stairs and an elevator for transporting clients in order for users to be transported to or from each floor of the building.

The characteristic aspects of the present invention will become clearer and easier to understand as the features of the new parking system are described, making use of the attached drawings for this object.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows an isometric view of the parking lot in accordance with its embodiment as a seven storey building giving a general placement and showing principal equipment;

Figure 2 shows an upper floor of the parking building, indicating the radial distribution of the parking spaces, the car elevator, the stairs and the client elevator;

Figure 3 a vertical cross sectional view of the parking building, showing the different floors, the car elevator and the client elevator;

Figure 4 is a cross sectional view from a 30° angle, seen from the back, showing the elevator;

Figure 5 is a complete view of the car elevator;

Figure 6 shows details of the elevator cabin, including protection and signaling equipment;

Figure 7 is an isometric view of the lower section or base of the car elevator;

Figure 8 shows a protection barrier in an extended position;

Figure 9 shows a retracted protection barrier;

Figure 10 shows an alternative arrangement of two parking towers in modular form.

Figure 11 shows the general configuration of the semiautomatic control system, with a logical control programmer.

Figure 12 shows a second embodiment of the parking system, the car elevator of which operates based on two telescopic-type hydraulic cylinders;

Figure 13 shows the car elevator with the hydraulic system depicted in the previous figure;

Figure 14 shows a third embodiment of the parking system, wherein the car elevator works based on a hydraulic system of a telescopic, cylindrical type installed below the central part thereof.

Figure 15 represents the car elevator, with the hydraulic system shown in the preceding figure;

Figure 16 represents a fourth embodiment of the parking lot, wherein the car elevator is driven by four hydraulic telescopic pistons, two of which rise vertically and the other two descend vertically. In this figure, the elevator cabin is located on the ground floor of the parking building.

Figure 17 is an isometric view of the elevator shown in the preceding figure, wherein the elevator cabin is located on one of the upper floors of the parking lot;

Figure 18 is a closeup of the car elevator in the embodiment shown in the precedent figure;

Figure 19 is a partial view, in perspective, of another embodiment of the car elevator system based on cylinders with hydraulic pistons, pulleys, cables and counterweights.

Figure 20 is a complete perspective view of the preceding elevator system, with the cabin shown on the ground floor;

Figure 21 is a view similar to that of the preceding figure, but in this case showing the cabin in the higher part of the structural tower of the elevator system;

Figure 22 is a partial view, in perspective, corresponding to another embodiment of the car elevator system based on cylinders with hydraulic pistons, pulleys and cables;

Figure 23 is a complete view, in perspective, of the system illustrated in the preceding figure, wherein the cabin appears at the ground floor;

Figure 24 is a view equivalent to that of the preceding figure, with the difference that the cabin is located in the upper part of the structural tower of the elevator system;

Figure 25 represents an additional embodiment of the parking system, operated by an electromechanical cable system;

Figure 26 is an isometric view of an additional embodiment of the car elevator;

Figure 27 corresponds to a closeup of the structure of the car elevator shown in the preceding figure;

Figure 28 is an upper view of another embodiment of parking system consisting of two towers with a single, continuous elevator;

Figure 29 is a cross sectional view of the parking system shown in the previous figure;

Figure 30 is a cross sectional view of another embodiment of the parking system, operated by an electromechanical cable system;

Figure 31 is a cross sectional view, at a 30° angle regarding the preceding view, from the rear part of the parking system;

Figure 32 shows the complete car elevator of the preceding parking system;

Figure 33 is a closeup to the elevator cabin of this embodiment, based on an electromechanical cable system;

Figure 34 is an isometric view of the mechanism which revolves the car elevator structure;

Figure 35 corresponds to another embodiment of parking system where the car elevator functions based on a hydraulic system;

Figure 36 shows the car elevator with the hydraulic system of the embodiment of the previous figure; and

Figure 37 represents the lower or base section of the car elevator in its embodiment with hydraulic system.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

Multiple parking systems can be classified as unmechanized and mechanized. The first ones can consist or one or several floors where the vehicles circulate by a central horizontal, or sloping ascending lane, with parking spaces at the sides the cars require extensive space for circulation and a relatively large turning ratio for parking in battery form. The second, mechanized parking systems, have evolved in some of the industriallized nations and usually include elevator systems or mechanical vehicle parking.

The system presented here falls within the mechanized type parking, with different alternatives for transporting the cars and the automatization desired. This type of parking system can sufficient space for installing one or several towers of two floors or more, as needed.

In order to explain better and clearly the new parking system, the following description has been divided into chapters, each of which referred to a fundamental part of the parking system.

PARKING BUILDING

The parking building consists of a vertical structure, of either reinforced concrete or, preferably metallic, which is

usually cylindrical in form with several floors, which can be from two to an indefinite number, in accordance with the special conditions of each case.

The building structure can be supported by foundations, depending on the specific conditions of the project, the height of the building, the overall weight, the soil conditions, etc. These foundations

can take the form of an extended slab of reinforced concrete (1), isolated shoes or continuous foundations in the form of concentric circular rings.

Columns (2) are placed on the foundation slab to support the first floor and the primary girders (3), which are placed in radial form, the interior end of each radial girder (3) in cantilever, since there is no center column as this would hinder the transit of the cars. All the radial girders on each floor (3) shown in figure 3, finish and are joined in a circular ring or a structural dodecagon (4), which limits the central space where the car elevator (10) circulates. Secondary and terciary girders (5,6) are connected to the primary girders in transversal form in order to provide sufficient rigidity and support for the floor (7) of each parking level.

The floor on each level can be made of reinforced concrete slabs or, preferably, steel sheeting (7) of a caliber suitable for the live weight it must support, being in the form of a natural U and an inverted U fo form a continuous accordeon, thus achieving a substantial reduction in the weight of each level, with a reduced dead weight and a lower investment cost.

The building will have stairs (8) and an elevator (9) for parking users, to be placed as shown in figures 1, 2, 3 and 4.

EQUIPMENT

The equipment will consist basically of two items, each covering various components of the system. The first item is the car elevator (10), in its various embodiments, and the signalling and control system (figure 11).

MECHANICAL EQUIPMENT FQR LIFTING AND PQSITIQNING CARS

The car elevator (10), as its name indicates, is intended to lift or lower vehicles to each of the operating levels and place them in an exact entry or exit position, complementing the effects of the transfer and rotation required for car placement, and reducing manouevres to a minimum. The car elevator consists of a supporting, rotating and guiding structure (11), as shown in figures 5, 13, 15, 17, 20, 23, 25, 29, 32 and 36 related to each embodiment of the elevator, which is formed by two structured metallic columns (11) joined only at top and bottom which are vertically parallel and serve as a guide for the elevator cabin (25). The lower part of the structure (11) ends in a kind of inverted pyramid (12) (partially shown), where the lower corner acts as a rotating support for the entire tower, including the elevator cabin and hydraulic equipment, utilizing an axial type bearing (15) which is firmly attached to the foundations on one side, and to the lower inverted pyramid of the structure also ends in a kind of structural pyramid with a transversal element which joins the two legs of the structure (11) guiding the elevator, the pyramid having another bearing, in this case for axial type loads, in the center o vertex (21), the lower part of which is joined to the elevator tower (11), while its upper part is connected to four horizontal girders (22) forming a cross- shaped member. Girders (22) are, in turn, attached to four internal columns (2) of the parking building (figure 4), in order to keep the vertical rotating shaft of the elevator itself centered and properly aligned. The two structural metallic columns are composed of primary elements (11), which form a vertebral column in conjunction with secondary elements (13), which will increase their rigidity by providing better proportions, above all in parking system where it is necessary to install a greater number of floors. The primary vertically-placed structural elements (11), serve as support for installing the vertical parallel rails (17), which will guide the ascent or descent of the elevator cabin (25). The secondary elements (13), aside from providing additional rigidity to the primary elements, allow the secondary guiding rails (14) to be stiffened for the upper pulleys (20) of the pistons (36) of the elevator's hydraulic system, avoiding in this way any possible misalignment in the vertical piston stroke on leaving or entering the cylinders (35).

The lower part of the elevator structure is also intended to house the elevator hydraulic system (19), consisting of the oleohydraulic tank, the hydraulic pressure pumps, the control valves and the cylinders (35), together with their hydraulic pistons (36) and, on the other hand, houses two electrical gearmotors (24), which are vertically placed and which at their ends, protruding from the rotor shaft, are connected by two pinion-type gears which turn around a circular crown (23) of straight gears which are firmly attached to the concrete foundation (1) of the elevator itself. The drive of the two geramotors will result in the entire elevator (10) as a whole (metallic structure, cabin, hydraulic system, etc.) turning around the vertical shaft driven by the movement of the electric gearmotors (24) around the crown of gears (23). The motive elements consist of electric motors which receive a precise signals from the control system in order to adopt a position preselected by the master control of the logical control programmer, clockwise or counterclockwise, permitting a turn in the shortest direction between the original cabin position and final destination position.

The oleohydraulic equipment of the elevator consists basically of the following essential elements: One or two metallic tanks (19) for storing and returning the system's hydraulic oil; one or two

hydraulic pumps activated by electric motors (not shown in the drawings), which are placed inside the oleohydraulic tanks with a submerged type installation, and are moved by one or two electric motors (not shown) which, on functioning, inject the hydraulic oil through the control valves (not shown) towards the lower part of the hydraulic cylinder (35) placed on each side of the cabin (25), and running parallel to the metallic structure (11) and the guide rail (17). Two pulleys (20) are placed on the upper ends of the cylinder pistons (36), said pulleys supporting the elevator cables (34), and being fastened at one end to the structural base of the revolving tower (12) and, at the other end, are connected to the elevator cabin (25). The electric actuation of the hydraulic pump motors results in the oil from the storage tanks being injected at high pressure at the base of the hydraulic cylinders (35), which results in the pistons (36) being vertically displaced upwards and outwards, so that the metallic cables (34) fastened to the elevator cabin are displaced in one direction to that the cabin itself rises with a run equal to twice the stroke of the hydraulic pistons. When the electric motors of the pumps turn anticlockwise, they will absorb oil from the hydraulic cylinders and transfer this to the storage tanks, retracting the pistons and displacing the metallic cables anticlockwise, so that the elevator cabin descends.

The elevator cabin (25) consists of a box of metallic sheeting in parallelepiped form, suitably reinforced by structural elements (26) to allow it to be hoisted from the transversal ends, preventing their permanent deformation. Some guides (27) are placed on the upper and lower edges of the cabin, which can be the sliding shoe or revolving bearing type which engage the guide rails (17) on three sides, allowing the cabin to move vertically, perfectly guided, thus achieving the desired alignment of the cabin (25) throughout its vertical journey. Two metallic guides (28) are placed inside the cabin for car tires, so that these enter or leave the elevator in the direction and with the alignment required for their suitable functioning. At one end of the elevator guides (28), automatic traps (29) are placed for the front wheels of the vehicles, in such a way that when they are actived the movement of the wheels is hampered either accidentally or on purpose. The traps (29) consist, for example, of four structural steel plates or angles placed in reverse, which slide or turn by means of a gear and lever mechanism, which is moved by a mechanical actuator (30), with an electrical or reversible hydraulic motor, so that the angle wedges or plates in front of and behind the front wheels of cars to prevent their moving when the traps are applied, or are withdrawn by either sliding or turning a center at one end to withdrawn from the path of the vehicles and free the tires, allowing them to move over the guides (28) of the elevator cabin. Bipartite metallic doors (31) will be placed at both ends of the elevator cabin, which slide towards each side of the cabin. The doors are electrically operated by a mechanism which is actived once the elevator cabin has been vertically and angularly placed in front of each of parking spaces.

Protective barriers (32) are placed on each floor of the parking building, around the car elevator shaft, for the purpose of preventing any person or car from coming too close to the open elevator shaft. These barriers are folding and are raised upwards by pushing a stem (33), which is moved automatically by an extension mechanism of the elevator itself, connected to the actuator (30) of the elevator traps.

Two spring shock absorbers (18) are placed on the upper part of the turntable (12), the purpose of which is to progressively reduce the impact of a sudden descent of the elevator cabin.

INSTRUMENTATION AND CONTROL EOUIPMENT

The signalling and control system of the parking system forms a basic part of same, since this permits the semiautomatic and safe operation of the entire system. A more advanced version of the same is the fully automatic control system, which is described as embodiment hereafter.

The general configuration of the semiautomatic control system for the parking system takes various forms into consideration, based on the basic equipment, the sophistication of which can increase to the point where a fully automatic system is obtained.

The basic equipment consists of the elements shown in figure 11. The instrumentation and control system consists basically of three interconnected subsystems to provide the necessary operating and safety conditions, which are:

a) Subsystems for entering, paying and leaving the parking building.

b) Subsystem for occupying and calling the elevator.

c) Subsystem for controlling and raising the elevator cabin, together with the latter's security system.

SUBSYSTEM FOR ENTERING, PAYING AND LEAVING THE PARKING.

This system consists of one, two or three folding access barriers (37) and conventional ticket machines (38), which will have car presence detectors which permit these to enter when there are spaces available, or refuse entry when the signal of

the Logical Control Programmer shows that there are no places available. On another aspect, this system includes the conventional collection system (39), which consists of a parking time reader which issues the cost when the time recorded is multiplied by the unit cost of the time unit. Both items of equipment, that for issuing tickets and that for reading and invoicing, can be replaced by access and exit equipment which utilized plastic cards with magnetic tapes, achieving the same efect.

The system described here is connected to a logical control programmer and a conventional personal-type computer (40) which, in turn, forms part of the elevator operation and call sybsystem.

If the ticket issuer is of the bar code type, showing date, hour and minute, a car reader will be installed which will calculate the length of stay and the invoicing.

ELEVATOR OPERATION AND CALL SUBSYSTEM This system consists basically of a Logical Control Programmer (41) with suitable entry and exit signals, for receiving occupation signals from each parking space, the permanent location of the elevator cabin, and to give the command signal to the elevator to attend a request. The Logical Control Programmer will have doors to connect the personal computer, which will have doors occupancy conditions and the calls pending answer on the monitor screen, together with the possibility of calculating invoicing and showing the operation acrual. It will also show autodiagnoses of the status of different system elements.

The Logical Control Programmer has additionalä communication ports for connecting a portable programming computer, the card reader, a VHF frequency radio modem (42), the ticket issuer and the data channel or "bus" (43), obtained from the cable concentrators (44) on each floor of the parking building.

There are two primary elements in each parking space which will transmit signals to the logical control programmer. The first are photoelectric cells (45), which will detect the presence or absence of a car in each space, showing their availability for occupancy, which will be located by means of the logical control programmer to a specific space as a possible destination of the elevator to unload cars. The second will be the call buttons (46) located in each parking space which, on being pushed, will request the presence of the elevator at the correct floor and in the correct radial position, to permit the exit of a specific car from the parking building. Both the photoelectric cells and the call buttons will be connected to the logical control programmer by means of cable concentrators (44), which will classify the signals to identify their origin and send them through a data bus to a signal converter (47) which will, in turn, be connected to the logical control programmer.

ELEVATOR CABIN ROTATION AND RAISING CONTROL SUBSYSTEM AND SAFETY SYSTEM THEREFOR

The purpose of this invention is to command the actions of the elevator. Some of these are of the conventional type, such as the opening and closing of doors, the detection of door obstructions, the raising and descent of the elevator cabin, the closing of the hydraulic valves, the sequential registration of calls requesting the elevator and the floor destination to which the elevator should be sent. Others are completely innovative, such as th transmission by VHF bandradio (42) of requests from the different users located in parking space, the rotation of the elevator around its vertical shaft to place itself in a required radial position, application of the counterturn brake to avoid horizontal rotation, the permanent location of the cabin transmitted to the logical control programmer and application of the elevator cabin tire traps, among others.

The control equipment consists of the conventional equipment used for elevators, which is not described since it is in common use, to which controls similar to that of vertical elevation will be added to achieve the startup, acceleration, deacceleration, stoppage and braking of the angular rotation motors of the elevator cabin by means of the speed reducers (24), which act on the gear crown (23). In order to transmit the orders coming from the parking system, photoelectric cells (45) and call buttons (46), a cordless data transmission will be utilized, using a pair of "duplex" type transmitters/receivers on the VHF (Very High Frequency) waveband (42), connected to signal modulators for converting digital signals into radio signals and vice versa. One radio terminal is mounted in the fixed part of the parking building and the other in the revolving structure (11) of the car elevator. The elevator cabin has a command panel with buttons (49) for indicating the desired destination to the control panel, with regard to the floor and the anular location of the specific space. There are also emergency stoppage buttons, a manual and automatic operator selector and indicating lights.

The safety control equipment is to be found within this subsystem, consisting of photoelectric cells on each of the elevator doors which avoids their closing if any obstruction exists, in which case they do not give the affirmative signal to the control panel for beginning the lifting and rotation movements; and, on the other hand, the starting controls of the tire trap actuators which, on being appplied, should similarly give permission to commence the lifting and rotation movements of the elevator cabin.

DESCRIPTION OF THE OPERATION OF THE PRINCIPAL EMBODIMENT

The operation described is following the sequence of entering the car park, parking the car and, subsequently, leaving the parking building.

All cars will arrive at the ground floor entrance, which
can be one of the parking spaces (two or three), the sole purpose of which is to permit entrance. On stopping in front of the access barrier (37), the optical or loading sensors of same, they will detect their presence, and the automatic ticket issuer (38) will print the date and time and, if desirable, the exact location of a vacant space to which the parking of the vehicle has been allocated, and will send an automatic signal to the logical control programmer (41) notifying the presence of a car which wishes to enter, which will look for a vacant space as near as possible to the ground floor, in accordance with the period of time the vehicle is scheduled to be parked, which will be defined by the entrance space utilized. When the driver takes the ticket, the entrance bar o barrier (37) will be lifted to allow the car to enter the ground floor parking space acting as a passage, to then enter the elevator cabin. If the cabin is not placed in front of this space, the ground floor protection barrier (32) will be in place, preventing the car from going farther. Once the elevator cabin (25) has been placed facing the access space, the barrier (32) will be vertically lifted, the doors (31) of the elevator cabin will be opened, the tire traps (29) will be released, and a green light will go on the advise the driver that the car should enter the elevator cabin.

When the vehicle is temporarily parked in the cabin and there is no obstruction in the photoelectric cell of the door, the elevator operator can see from the command panel which of the pilotlights is lighted, indicating a vacant space on a specific level. On pressing the button which assigns the destination to which the vehicle should be taken, the operator gives an order to the logical control programmer (41) to commence the operation of the hydraulic pumps (19) of the car elevator (10), and the rotation movement of the platform will begin simultaneously, in order to place the elevator in the required direction. Before beginning either movement and after having selected the car's destination, three simultaneous actions will take place: the first will be to draw back the piston of the safety barrier (32) on the ground floor, allowing it to fall, corresponding to the space where the car is located, and the safety device will be activated to prevent this rising solely by pushing same; the second, that the traps (29) be applied to the front wheels of the car, and the third is that of shutting the sliding doors (31) of the elevator cabin. The confirmation of these three actions by the logical control programmer (41) will give the command to begin opening the hydraulic valves connecting the hydraulic cylinders, and release of the counterturn brake of the horizontal rotation gearmotors (12), commencing the vertical transfer and rotation of the elevator cabin through the control panel and the respective motors (19 and 24).

When the car elevator reaches its destination, the hydraulic valves of the oleohydraulic plant and the counterturn brake of the rotation motors (24) will be automatically applied and the tire traps (29) will be deactived one by one, the elevator doors will be opened (31) and the protective barrier (32) corresponding to the parking space of destination will be lifted, allowing the driver of the vehicle to park this in reverse in the assigned space with the assistance and help of the elevator operator. The vehicle should be driven to some stops placed on the floor to limit the perimetral transit passage of pedestrians in the area, whether or not they are coming for their vehicles.

Once the elevator cabin has been vacated, the elevator can be requested by the driver of another vehicle on the same, or another, floor, or by the driver of any vehicle which is entering the parking building. The selection of priorities can be automatically programmed, or the elevator operator can decide manually, depending on the proximity of the space of the vehicle wishing to leave, or the demand for the entry or exit of vehicles at a certain time of day.

In order for a vehicle to be able to leave the parking building, drivers should reach same by using the passenger elevator (9) or the stairs (8), or the perimetral passages. Once within his vehicle, the driver should press the call button (46) for the elevator, located on the inside columns of the building at the height of the driver's window. At the same time, the driver should star his car and await the elevator. When the elevator call button is pushed, the signal is transferred through the cable concentrators (44) and the data bus (43) to the logical control programmer (41), which will process the call and send a codified signal to the VHF radio equipment which will, in wireless form, transmit this signal to the radio receiving equipment located close to the hydraulic system of the elevator. Signals are modulated and demodulated in order to be digitally fed to the car elevator control panel, in response to the request for positioning the elevator cabin (25), exactly opposite the parking space from which the call came. When the latter detects the call, the signal can be stored in the waiting line control or automatically or manually executed directly by the operator, so that the elevator descends vertically with a circular movement in th

desired direction.

If the elevator reaches the desired level and place, the counterturn brakes will again be applied and the hydraulic valves closed, the protective barrier will be lifted and the green light of the elevator parking lights will be put on the indicate that the vehicle can drive into the elevator cabin. No elevator operation can be carried out while the car is blocking the light ray from the photoelectric cells, signifying that the doors cannot be closed. Once the vehicle is inside the elevator cabin, the motor should be kept runnning, but with the brake on the avert any movement, in addition to the restraining action of the tire trap described above.

The elevator, on descending to the ground floor, should revolve as necessary in order for the platform to remain in such a way that the front of the vehicle is pointing towards the exit lane. Once the elevator has come to a standstill, the driver will be allowed to approach the payment booth, where he will deliver his ticket so that the amount owing can be calculated.

The platform can revolve up to 360°, however, control will be programmed so that the maximum turn in any direction either clockwise or counterclockwise, is up to 180°, in order to minimize the time and length of the rotating movement.

As a part of the safety equipment operations is a startup by electrogenic alternate current generating equipment due to lack of power when a breakdown occurs in the normal power supply, thus permitting the electrical and electronic equipment to continue in normal operation under normal operating conditions are resumed.

Operation of the passenger elevator is normal and usual and it is not therefore described in this document.

ALTERNATIVE EMBODIMENTS OF THE INVENTION

Figures 12 and 13 represent an alternative embodiment of the radial parking system, in which the parking is similar to that previously described but with the difference that the elevator(10), instead of using cylinders with a single piston, use hydraulic cylinders (55) of the telescopic piston type, thus reducing the length of piston (56) to half if there are two telescopic piston sections, or to one-third in the case of four telescopic pistons. These telescopic cylinders are in common use, for which reason no further details are given here. The rest of the components, both for the building, the elevator, the controls, etc., remain as in the previous description.

Figures 14 and 15 represent another embodiment of the radial parking system in which the latter is similar to those previously described, but with the variation that there is one hydraulic cylinder (57) instead of two, which is placed in the center of the elevator exactly below the platform, and is the same type as the telescopic cylinder with 2, 3 o 4 telescopic pistons. In this case, the piston would have a larger diameter, with a resulting larger pushing area if the same hydraulic pressure of the pump is maintained, and the length of the run will be equal to the length of the total height of the floors to which service is to be provided. The action of this piston is directed over the elevator cabin, and the ratio of run is, therefore, 1:1. For the present embodiment, pulleys (20), described in the previous versions, and the cables (34) which were connected to the structural girder (26) underneath the elevator cabin, are eliminated. The stroke speed of the piston is, in this case, equal to the speed of movement of the cabin. The use of cylinders with telescopic pistons (58) in 3 or 4 sections is preferred, in order to shorten the lenght of the cylinder which should be partially embedded in a central hole within the rotatory foundation of the elevator, within which the cylinder will be housed and will rotate inside at the time the elevator, including tower and cabin, rotates in order to acquire the necessary loading o unloading position. The remainder of all components, both of the building, the elevator, the instruments, etc., will remain unchanged in relation to the main embodiment of this invention.

The embodiment proposed in Figures 16, 17 and 18 is characterized by a parking elevator (10) being moved by four cylinders (60) with a single piece tubular piston (not shown), or by telescopic pistons (61, 62), as in the case shown, which can be two, three or four-stage. This alternative embodiment can be used to advantage in installations where the number of floors to be served by the elevator are numerous, and the lenght of the cylinder and the pistons must be limited. At the same time, this embodiment reduces the diameter required for each piston by duplicating the number if pistons for the same given weight and the same hydraulic fluid pressure. The elevator system consists of a system similar to that described in the preferred embodiment, where a rotatory tower (11), is moved around a vertical center by two electric gearmotors (24), and which has a cabin (25) to lift the cars through a hydraulic system (19) consisting of an oil tank, hydraulic pumps, valves and four cylinders with hydraulic pistons, normal or telescopic type, which are placed vertically at the sides of the cabin, two in vertical ascending form and two in vertical descending form. Each of the pistons has a metallic pulley (63) at the protruding end, where the cables of flexible steel in the form of a leaning S are housed, and which at one end are fixed to the base plate (64) of the inverted

pistons (62) and, at the other, to the elevator cabin (25), so that the movement transmission ratio is 4:1; that is, for each unit of distance travelled by the pistons (61, 62), the cabin travels four units of distance. In other words, the distance travelled by the cabin and the speed of ascent and descent is four times greater than that of the pistons.

Another embodiment is shown in Figures 19, 20 and 21 in which the parking system is similar to those previously shown but with the elevator featuring two sets of mechanisms consisting of pulleys, cables, counterweights and hydraulic pistons, to obtain vertical movement transmission ratios of 6:1. The system consists of two sets of five grooved pulleys placed on the upper part of the elevator tower, at each side of the cabin; three pulleys (66) are fixed at each side and the remaining two (67) are movable, and move vertically up or down; each of the pulleys having free rotatory movement. The movable pulleys (67) are linked by a metallic structure or member (68), which keeps them separated and includes at its ends two sliding guides for pulley rails (69), which will keep the movement straight throughout the journey of ascent or descent, which will only be one-sixth of the vertical journey of the elevator cabin (25). The rails are suitably supported and spaced from the secondary structure (11) of the elevator. Two counterweights (70) are hung from the center of the metallic structures (68) of the pulleys, the purpose of which is to reduce the power necessary for raising the elevator cabin plus the weight of the cars and their occupants. The total weight of the two counterweights will in fact be approximately equal to between 120% and 140% of the dead weight of the cabin, plus the elevator load. The mobile pulleys and the fixed pulleys are connected as shown in figure 19, by means of continuous flexible metal cables (71) in the form of a vertical zigzag with 6 steps, one end of the cables being fixed to the structure of the elevator tower (11) and the other to the elevator cabin. Below the counterweights are two cylinders with oleohydraulic pistons (72), which are supported by the elevator structure (11), and their pistons (73) work vertically underneath the counterweights. This results in the following advantages: first, a ratio of cabin travel as compared with the hydraulic piston travel is obtained of six to one; secondly, the counterweights are used to raise the elevator cabin and load, and the hydraulic pistons are only used to lift the counterweights and thus lower the elevator cabin. In fact, the form of operation consists of whether or not the cabin is loaded, oil is drained from the hydraulic cylinders, allowing the pistons to retract and lower the counterweights, so that the steel cables move one way only and the elevator cabin rises.

When it is wished to lower the cabin, then the hydraulic pump or pumps of the station (19) will inject oil to the cylinders, resulting in the pistons extending beyond the cylinders and pushing the counterweights upwards, thus raising the mobile pulleys, and the cables will move in the opposite direction so that the elevator cabin descends.

This embodiment can result in substancial saving in the cost of the elevator mechanisms, since the needs of the oleohydraulic mechanisms is considerably reduced, and also gives us relatively large elevation distances with relatively small pistons.

The embodiment proposed in figures 22, 23 and 24 corresponds to a parking system similar to those previously described but with the difference, as in the previous case, that the car elevator has a cable system (71), fixed pulleys (66) and hydraulic cylinders (72), with a transmission ratio of 6:1. In contrast to the previous embodiment, in this case there are no counterweights to raise the elevator cabin (25), and the pistons act in the opposite direction, pushing the mobile pulleys downwards to increase the distance separating them from the fixed pulleys. In this case the manner of operation is different from that described in the previous embodiment since, in order to raise the elevator cabin plus the load, hydraulic oil would have to be pumped to the cylinders (72), leading the pistons (73) to project outwards and the mobile pulleys (67) on each side of the elevator to descend, increasing the distance between the mobile and fixed pulleys so that the cables (71) move to one side, and the elevator cabin (25) rises. On supressing the hydraulic pressure inside the cylinders (72), the pistons contract and the mobile pulleys go up, pulled by the cables, due to the weight of the cabin and load transported. The advantage of this system is a reduction in the overall weight of the elevator, maintaining relatively-small cylinders with very short runs due to the 6:1 ratio.

In either of the foregoing embodiments, the present invention can consists of two or more adjacent parking towers, utilizing the same passenger elevator services and stairs, with the possibility of transferring vehicles from one building to another should any operational problem arise in one of the car elevators.

According to the parking system embodiment represented in figures 25, 26 and 27, the car elevator (110) consists of a supporting structure (111), in the form of a hollow paralelepiped, with a structural square containing diagonals and a center plate (112) on the upper face, hanging from the steel cables (113) which hoist the elevator cabin. Four structural legs (114) extend from the vertexes of the square which, in turn, support the lower face of the structure, which is similar to the upper face

described above, but with the addition of a structural square (115), which serves to support the rollers (116) the purpose of which is described below. An axial load bearing hangs from the central part of the lower face, serving as a pivot for the circular movement of the elevator platform (118).
The metallic sheeting platform (118) is circular and has an axis in the form of a solid shaft in its center and lower parts, and is placed on the lower face of the elevator structure and within the vertical legs forming the edges of the elevator structure. The platform (118) is reinforced in its lower part by two concentric circular channels (119, 119'), one channel (119) being placed within the periphere of the platform and the other channel (119') appproximately in the middle of the platform radius, the purpose of these channels being to stiffen the platform and to serve, at the same time, as a taxiway for the turning rollers (116).

The turning rollers (116) will be placed in a minimum of twelve, and consist of rubber coated steel rolllers which contain a solid metallic shaft supported by two side bearings. Each roller group is suitably placed on the lower structure of the elevator (figure 27), and fixed by means os screws and nuts in a suitably angle position.

By the help of the central axial bearing (117) and the loading rollers (116), the elevator platform can turn 360° by the action of two motors (120), which are vertically placed on the lower part of the platform, suitably fixed to the lower structure of the elevator (110). The two motors have pinion-type gears attached which, on turning, displace a sprocket (121) which is placed on the outside part of the internal reinforcement ring of the platform (118), andä therefore turn the platform. The motors (120) consist of an electric motor which receives specific signals from the control system in order to adopt a position previously selected by the master control of the logical control programmer. Having two motors, the turning system becomes redundant, thus increasing its reliability to 200%, and allowing a motor to turn the platform in one direction and the other in the other direction, one motor being idle while the other is working.

The hoisting motor of the car elevator (122) is placed on the upper part of the parking center, and consists of the conventional parts of any passenger elevator, but with a larger capacity. The hoisting mechanism of the elevator consists of a gearmotor, with reversible action, traction pulleys for the cables, counterweights and electrical call, destination, emergency stops, alarm, etc., controls. In contrast to other conventional elevators, this possesses additional turning controls as described in the preceding paragraph.

As in the foregoing embodiments, the signalling and control system of the parking system forms a substantive part of same, since it is this which allows semiautomatic and safe operation throughout the system.

Another embodiment of the present invention is shown in figures 28 and 29, consisting of two adjacent towers (A, B) for radial parking, the height and distance between elevators of which is suitably modulated in such a way that the horizontal distance between the elevator centers is an exact multiple of the vertical distance between every two floors, and which has the speciality that the elevator has continuous action in a single direction, having a fixed number of platforms (137), as shown in figure 29. For an arrangement of two towers with seven levels, there are eight platforms (137) joined by metal chains (138), placed at the ends of a diametral cord. Each of the platforms has its own rotating movement to place the platform at the desired angle with respect to the parking spaces for the cars. The plataforms joined by the traction chains (138) ascend by an elevator shaft and subsequently, when they reach the top floor of the parking building, move horizontally over a roller table (139), and then descend vertically within the elevator shaft of the adjoining tower, finally moving horizontally in the opposite direction over a second roller table (140) to close the cycle of movement. The chains are moved by racks (141) located in the four vertexes of the elevator's motive system, three of the racks being motorized, with the exception of the lower pulley located where the platforms descend. These racks (141) are impelled by electrical gearmotors of the capacity necessary to carry out the work of lifting the platforms or the movements over the upper and lower roller tables. The work of each motor is synchronized with the other two. Conveyance of the electromotive power necessary for the turning motors of the platforms, is carried out by trolleys located on the lateral guides of the elevators and at one end of the roller tables. The control signals to establish the startup, positioning and stoppage of the platform rotative movement motors is of the shortwave radio type, or an optic sensor with the breadth and lenght of a regulated wave. The purpose of operating in this embodiment is to have a greater capacity for the entry and exit of cars from the parking system.

The automatization degree is complete, each platform stopping automatically on each floor for a preestablished period of time, allowing drivers to place their cars in the center of elevator platforms through luminous traffic signals and audible instructions, following which the platforms descend vertically and turn with a rotatory movement until they find the preselected position and level, to descend radially to the desired parking space. The exit operation of the cars will be inverse to that of their entry, but with the same control and protection

philosophy.

Regarding the embodiment of figures 30 to 34, the car elevator consists of a supporting, rotating and guiding structure formed by a lower metallic table (212), supported by six metallic rollers (213), which turn over a static circular rail (214) anchored to the parking building foundations (201). At its central part, the table (212) has a turning shaft (215), permitting an angular displacement of up to 360°, consisting of a shaft which turns within one or several bearings which are rigidly supported in turn by a concrete jackbits which form part of the foundation. Four vertical metallic columns (211) are placed on the swivel table suitably stiffened with secondary structural elements (216) to reduce their slenderness ratio in the case of relatively high elevators. The four columns (211) serve also as support for fixing the guide rails (217) of the elevator, and the guide rails of the counterweight (235). An engine room is located in the upper part of the four columns (218), containing a traction engine (219) for elevator, together with the pulleys (229) necessary for same. An upper center of turning (221) is installed at the central part of the engine room, which also has a shaft and one or more bearings, fixed to structural girders (222) forming a cross-shaped structure which is linked with the internal columns (202) of the building, providing the uppermost center of turning of the elevator.

At the lower part of the turntable (212), two electrical gearmotors (224) are provided, suitably attached to the structure, with connected pinion-type gears (260) which are, in turn, duly geared in a circular ring (223), which is rigidly supported over the reinforced concrete foundations (201) of the parking building. These gearmotors on being placed in operation, will result in the rotation of the elevator (210) as a whole with the supporting structure (211), (212), (216), (218), (219) and (225). The use of two gearmotors has been chosen for the purpose of having a balanced turn at the opposite ends of the ring. The motive elements consist of an electric motor which receives precise signals from the control system, to adopt a position which has been preselected by the master control of the logical control programmer, clockwise or counter-clockwise, allowing the turn to take place in the shortest direction between the original cabin position (225) and the final destination position.

The equipment for hoisting the cabin vertically is of traditional elevator type, consisting of a gearmotor (219) with a reversible traction pulley, diverting pulleys (220), traction cables (234), cable pulleys (if the traction ratio is 2:1), a counterweight (235) and the necessary fittings to fasten same.

Shock absorbers (236) are placed on the upper part of turntable (212), these being spring and oil absorbers, for the cabin (225) and counterweight (235), for the purpose of progressively reducing the impact of a sudden descent of the elevator cabin.

The counterweight will move vertically up or down in accordance with the relative cabin position, for the purpose of reducing consumption of the power required to lift the cabin and the corresponding load of the car plus its occupants.

With regard to figures 35, 36 and 37, these represent a new alternative embodiment of radial car parking, wherein the rotatory elevator is operated by a single hydraulic piston type (251) which will be placed in the lower part of the cabin. This type of elevator is now in common use, and their working is not therefore described in detail, mentioning the main parts and the modifications necessary for them to be utilized for this specific purpose.

The revolving structure of the elevator (211), in addition to the turntable (212), the rollers (213), the circular rail (214), the lower turn shaft (215), the guiding rails (217) and the upper center of turning (221) will remain unchanged. In addition, for this embodiment of the engine room (118), the traction machine (119) and the pulleys (120) are not needed. Instead of the traction equipment, a hydraulic piston (251) fixed to the lower part of the parking lot is included, for which purpose it has a tubular cylindrical casing (250) which will be embedded in the ground and will have the same length as the hydraulic elevator piston (251). The casing (250) will contain the earth and water of the phreatic levels and act as a receptacle for the hydraulic piston (251). The piston is assembled on the turntable (212) and housed within the casing (250), without having contact with the casing because the piston will have a rotatory movement. An important part of the hydraulic piston is its stem, which moves up to down supporting the weight of the cabin and the weight of the car on applying the hydraulic pressure obtained from the hydraulic pumps (253) which, together with the hydraulic fluid tank (254), are also mounted on the elevator turntable (212).

The gearmotors (224) and circular ring (223) continue to act in a way similar to that described in the cable traction elevator. The control panel will also be similar, but instead of commanding the electrical hoisting motor, will now start the hydraulic pumps in order to increase the pressure or the volume of the hydraulic fluid in the piston, and make the elevator ascend, or reduced these and send the hydraulic fluid coming from the piston to the storage tank, thus forcing the elevator cabin to descend.

Even though the invention has been described in its preferred embodiments, it should be emphasized that other variations can result from the foregoing concepts which will be obvious in the

light of the foregoing description, which should be taken as an example, with no limitation.

Claims

1. A car parking system allowing a reduction in the overall area required for parking vehicles on one or several levels, as it reduces to an important extent the manoeuvring area for placing vehicles in their respective space, characterized by consisting of a building of two or more floors in cylindrical form having a rotary car elevator in the center to carry the vehicles to the parking level or floor required, and placing them in such a way that solely by leaving the elevator they are placed in their final parking position; said parking system also includes signalling and control equipment, stairs and passenger elevator.

2. The car parking system, in accordance with claim 1, characterized by the vehicles being parked in radial form and without the need for circulation passages, since the car elevator has a turning central cabin which, as it rises, turns to place itself at the required angle for parking.

3. The car parking system, in accordance with claim 1 and 2, characterized by the vehicles being raised or lowered by the action of a rotatory car elevator operated by a hydraulic system combined with cables, which provides the cabin carrying the vehicle with a vertical transfer movement and a horizontal rotatory movement; said elevator comprising:
   a) a metallic rotatory structure consisting of two structural legs facing one another and interconnected in their upper and lower parts by reinforcement and supporting elements; each leg includes guides extending along the length of same;
   b) a cabin for receiving a car, which moves vertically up and down between the legs of the structure and along the guides provided therein;
   c) driving means placed in each structural leg to move the cabin up and down, with which they will be connected via cables; and
   d) turning means located on the lower part of the metallic structure for turning this so that the cabin is suitably placed on termination of its vertical travel.

4. Car parking system, in accordance with claim 2, characterized in that the driving means consist of a pair of cylinders with hydraulic pistons placed on a base adjacent to the lower part of said rotatory structure and which is in fluid flow communication with the cylinders so that the telescopic pistons move vertically.

5. Car parking system, in accordance with claim 2, characterized by the driving means consists of a pair of cylinders with hydraulic telescopic pistons sustained by bases essentially located at the middle of each structural leg, and an oleohydraulic center placed at the lower part of said rotatory structure which is in fluid flow communication with the cylinders so that the telescopic pistons move vertically.

6. Car parking system, in accordance with the claim 1, characterized by the vehicles are raised or lowered to another level by means of the rotatory car elevator operated with a hydraulic system, transfer movement and a horizontal rotatory movement; this elevator consists of:
   a) a metallic rotatory structure consisting of two structural legs facing one another and interconnected in their upper and lower parts by reinforcement and support elements; each leg includes guides which extend along the length of same;
   b) a cabin for receiving a car, which moves vertically up and down between the legs of the structure, moving along the guides provided for such purpose;
   c) driving means to move the cabin up and down, which consist of:
      i) a hydraulic telescopic piston connected at the upper end with the lower part of the cabin and which is embedded in the lower part of the parking lot, and has a cylindrical tubular casing embedded in the ground which has the length of the telescopic hydraulic piston of the elevator divided between the number of sections of the piston itself; and
      ii) an oleohydraulic system placed at the lower part of the rotatory structure which is in fluid flow communication with the hydraulic telescopic piston for vertically moving same; and
   d) turning means located at the lower part of the metallic structure for turning the latter in order for the cabin to be suitably placed when completed the vertical journey thereof.

7. Car parking system, in accordance with claim 1, characterized in that the vehicles are lifted or lowered to another level by the action of a rotatory car elevator operated by a hydraulic system, which provides the vehicles with a vertical transfer movement and a horizontal

rotation movement; said elevator comprising:

a) a rotatory metallic structure consisting of two structural legs facing one another interconnected in their upper and lower parts by reinforcement and support elements; each leg includes guides which extend along the length of same;

b) a cabin to receive a car, which moves vertically up and down between the legs of the structure, moving along the guides provided therein;

c) driving means placed on each structural leg to move the cabin up and down, which are connected by cables; said driving means comprisisng:

i) an assembly of hydraulic telescopic pistons formed by a first pair of pistons which move vertically up, and a second pair of inverted pistons which move vertically down; each of said pistons has a grooved pulley at the protruding end thereof, through the groove of which the cables slide; said cables are connected at one end to the elevator cabin and at the other are fixed firmly in a base plate supporting the pistons; and

ii) an oleohydraulic system placed in the lower part of said rotatory structure, and in fluid flow communication with the telescopic hydraulic pistons to move these vertically; and

d) turning means located on the lower part of the metallic structure for turning this latter so that the cabin is suitably placed at the end of is vertical travel.

8. Car parking system, in accordance with claim 1, characterized in that the vehicles are lifted or lowered to another level by the action of a rotatory car elevator operated through a combined hydraulic system with pulleys, cables and counterweights, providing the vehicles with a vertical transfer movement and a horizontal rotation movement; said elevator comprising:

a) a metallic rotatory structure consisting of two structural legs facing one another and interconnected in their upper and lower parts by reinforcement and support sections; each leg includes guides which extend a long the length of same;

b) a cabin to receive a car, which moves vertically up and down between the legs of the structure, moving along the guides provided therein;

c) driving means placed on each structural leg to move the cabin up or down, with which they are connected by cables; said driving means comprising:

i) a first set of pulleys fixed to the upper part of the elevator structure, and a second set of movable pulleys, these latter being linked between themselves by a metallic member having guides at the ends thereof; the movable pulleys move vertically up and down; both the fixed pulleys and the movable pulleys can turn freely; further, said fixed and movable pulleys are connected by the cables which are fixed to the cabin by one end and, by the other, to the rotatory metallic structure;

ii) a counterweight placed immediately below the movable pulleys and fastened to the metallic member joining same, so that said counterweight also moves vertically up and down; and

iii) a cylinder with a hydraulic piston placed under each counterweight for moving this vertically upwards when it is wished to move the elevator cabin down; said cylinders are supported by the rotatory elevator structure; and

d) turning means located on the lower part of the metallic structure in order to turn said structure so that the cabin is suitably placed at the end of its vertical journey.

9. Car parking system, in accordance with claim 1, characterized in that the vehicles being lifted of lowered to another level by the action of a rotatory car elevator operated by a hydraulic system combined with pulleys and cables, providing vehicles with a vertical transfer movement and a horizontal rotation movement; said elevator comprising:

a) a rotatory metallic structure consisting of two structural legs facing one another and interconnected in their upper and lower parts by reinforcement and support elements, each leg includes guides which extend along the length of same;

b) a cabin to receive a car, which moves vertically up and down between the legs of the structure, moving along the guides provided therein;

c) driving means placed on each structural leg for moving the cabin up and down, with which they are connected by cables; said driving means comprises:

i) a first set of pulleys fixed to the upper part of the elevator structure, and a second set of movable pulleys, the latter joined between themselves by a metallic member having guides at its ends, the movable pulleys move vertically up and down; said movable and fixed pulleys can rotate freely; further, the fixed and

movable pulleys are operatively connected by means of the cables which are attached by one end to the cabin and by the other end to the rotatory metallic structure; and

ii) a cylinder with a hydraulic piston for inverse movement sustained by the metallic structure immediately under the fixed pulleys, the end of the piston being firmly fixed to the metallic member joining the movable pulleys for moving these up and down, and thus vertically move the elevator cabin; and

d) turning means placed on the lower part of the metallic structure in order to turn the latter so that the cabin is suitably placed when completed the vertical journey thereof.

10. Car parking system, in accordance with claim 9, characterized in that the metallic rotatory structure also includes rails or tracks to cooperate with the guides of the metallic part in order to maintain the verticality of the movable pulleys throughout their ascending and descending journeys.

11. Car parking system, in accordance with any of preceding claims, characterized in that guiding elements are placed on the side of the cabin which slide along the structure guides during the vertical movement of the cabin; the sliding relation of both guides allows the cabin to move vertically in a form which is perfectly guided and aligned throughout its course.

12. Car parking system, in accordance with any of preceding claims, characterized in that the cabin has guides or tracks inside for the tires of vehicles being transported therein, and means for fastening and releasing said tires.

13. Car parking system, in accordance with any of preceding claims, characterized in that the rotatory means comprises two gearmotors connected by gear mechanisms with the metallic structure in order for the latter to move in both directions.

14. Car parking system, in accordance with any of preceding claims, characterized in that the signalling and control system operates with safety systems which do not permit transfer and rotation movements in the car elevator when any object interferes in the safety areas, and which captures information on current conditions and issued operating orders to the different electrical devices, either simultaneous or in sequence, in accordance with a preestablished operating protocol, in order for the different activities of the car elevator to be carried out in conjunction with the associated action and access equipment.

15. Car parking system, in accordance with any of preceding claims, characterized in that the signalling and control system can be manual, semiautomatic or automatic.

16. Car parking system, in accordance with any of preceding claims, characterized in that the rotatory structure is connected at its upper part to the building, and its lower part to the foundations by means of rollers, in order to keep the vertical rotation shaft of the elevator centered and without variations.

17. Car parking system, in accordance with any of preceding claims, characterized in that the parking building is modular and made of steel, in such a way that it can increase its vertical capacity by installing more floors, or can have two or more cylindrical towers adjoining one another, which can be intercommunicated by floor extensions and utilize the same passenger elevator and stairs, optimizing the installation of equipment and auxiliary accessoires and increasing the operative availability of the equipment during maintenance or operative breakdown.

18. A car parking system, characterized in that vehicles are raised or lowered to another level by means of a car elevator with a rotatory platform providing vehicles with a vertical transfer movement and a horizontal rotation movement; said elevator comprises a metallic structure which slides between four vertical metallic guides and is moved when ascending or descending by steel cables, which are actived by an electrical gearmotor; a metallic platform which serves as a support for the cars and which is rotatory, said platform being impelled by two motors placed on the lower part, by means of a mechanism of pinion and ring; said parking system also includes equipment which carries the cars to the parking level or floor required, and places them in such a way by solely leaving the elevator they are placed in their final parking position, at the exit of the building.

19. A car parking system with two adjacent towers, characterized by using a continuous rotatory elevator system including eight platforms which place the cars in the radial spaces of the two buildings; said system increasing storage

and transportation capacity; said parking system consists of eight platforms joined by metallic chains placed at the ends of a diametral cord, each of said platforms having its own rotatory movement to place the platform at the desired angle with respect to the spaces for parking the vehicles; said platforms ascend an elevator shaft and subsequently, when they reach the top level of the parking building, move horizontally over a turntable amd then descend vertically within the elevator shaft of the adjacent tower, finally the platforms move horizontally in the opposite direction on a second turntable to close the movement cycle.

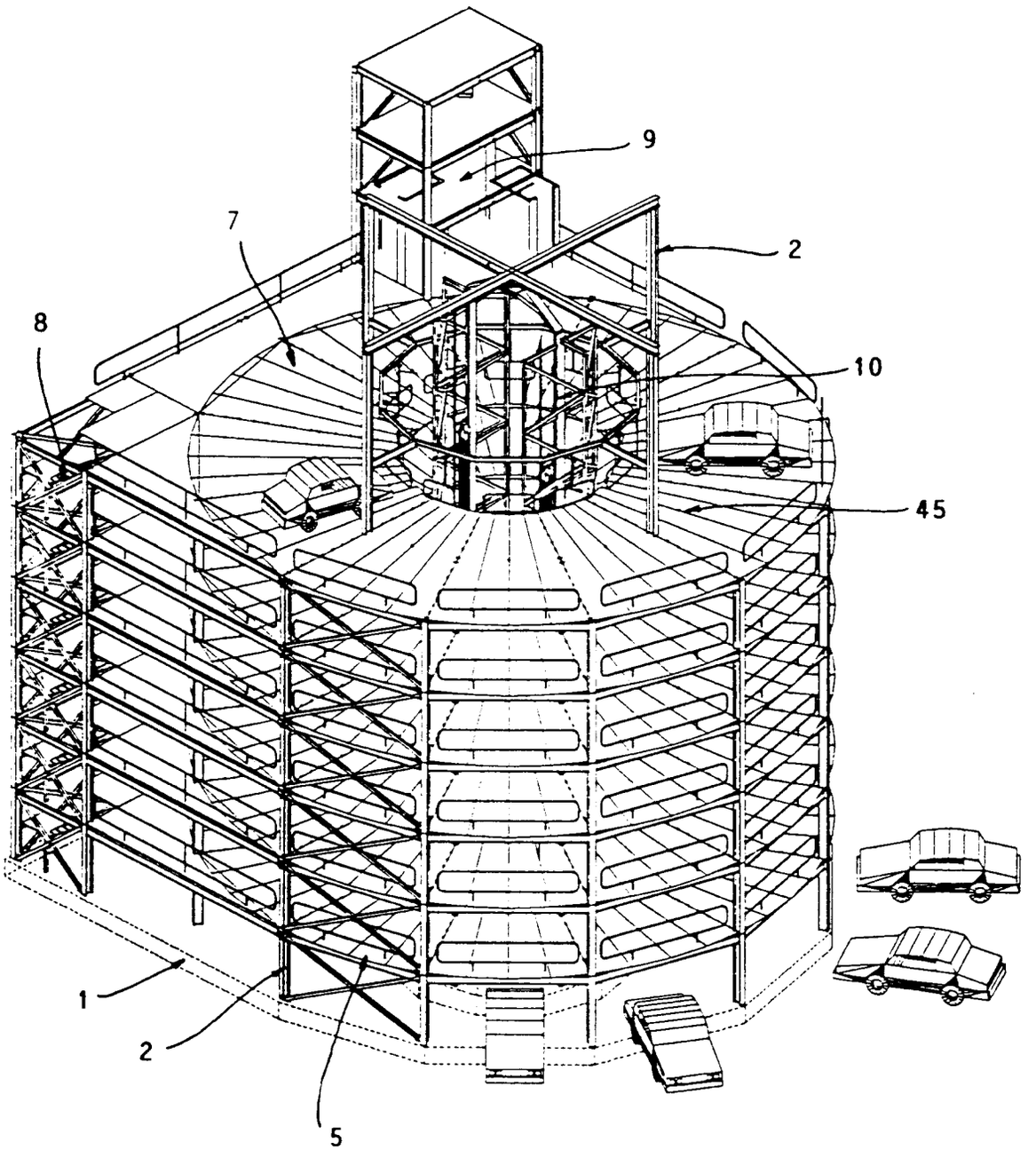
20. Car parking system, in accordance with the preceding claim, characterized in that said chains are moved by racks located at the four vertexes of the elevator's motive system, three of these being motorized with the exception of the lower pulley placed in the descent of the platforms; said racks are driven by electrical gearmotors of the necessary capacity for carrying out the work of raising the platforms or carrying out movements on the upper and lower turntables.

21. Car parking system, characterized in that vehicles are raised or lowered to another level by the action of rotatory car elevator operated by means of an electromechanical cable system which provides the vehicles with a vertical movement and a horizontal rotation movement; said elevator is formed by a metallic rotative structure consisting of a central rotating axis around which a vertical metallic structure, which contains guides for the vertical movement of the elevator cabin, turns; and, at the upper part of said structure, an engine room containing a control panel and a hoisting motor connected by pulleys and cables with the elevator cabin and a counterweight is positioned; the elevator cabin moves vertically up and down along the structural guides, all of the above forming an integral equipment with the facility of rotatory through the action of a pair of motors placed on the lower part, which turn by gearing mechanisms around a sprocket which is fixed to the foundations of the parking building.

22. Car parking system, characterized in that the vehicles are raised or lowered to another level by the action of a rotatory car elevator operated by a hydraulic system, providing the vehicles with a vertical transfer movement and a horizontal rotation movement; said elevator is formed by a metallic rotative structure consisting of a central rotating axis around which a vertical metallic structure turns, the latter structure containing guides for the vertical movement of the elevator cabin; a hydraulic piston which is embedded in the lower part of the parking system, for which there is a cylindrical tubular casing embedded in the ground and has the length of the hydraulic elevator piston; the elevator cabin moves vertically along the structural guides, either up or down, all of the above forming an integral equipment which is rotatory through the actuation of a pair of motors placed on the lower part which turn with gear mechanisms around a sprocket which is fixed to the floor of the parking system itself.

23. Car parking system, in accordance with the claim 22, characterized in that the hydraulic elevator further includes hydraulic pumps and a hydraulic fluid tank which together make the elevator cabin ascend or descend vertically.

FIG. 1



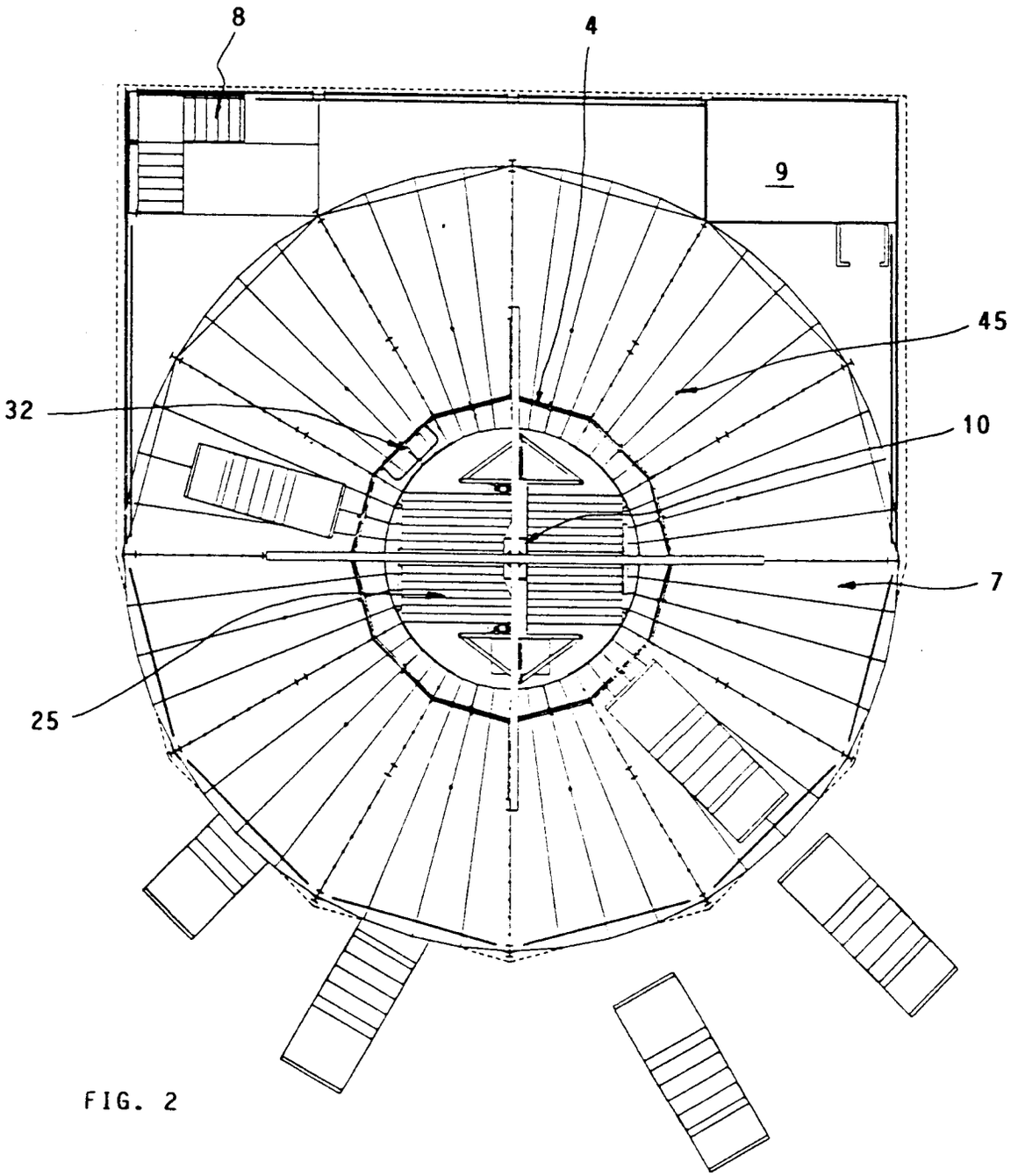


FIG. 2

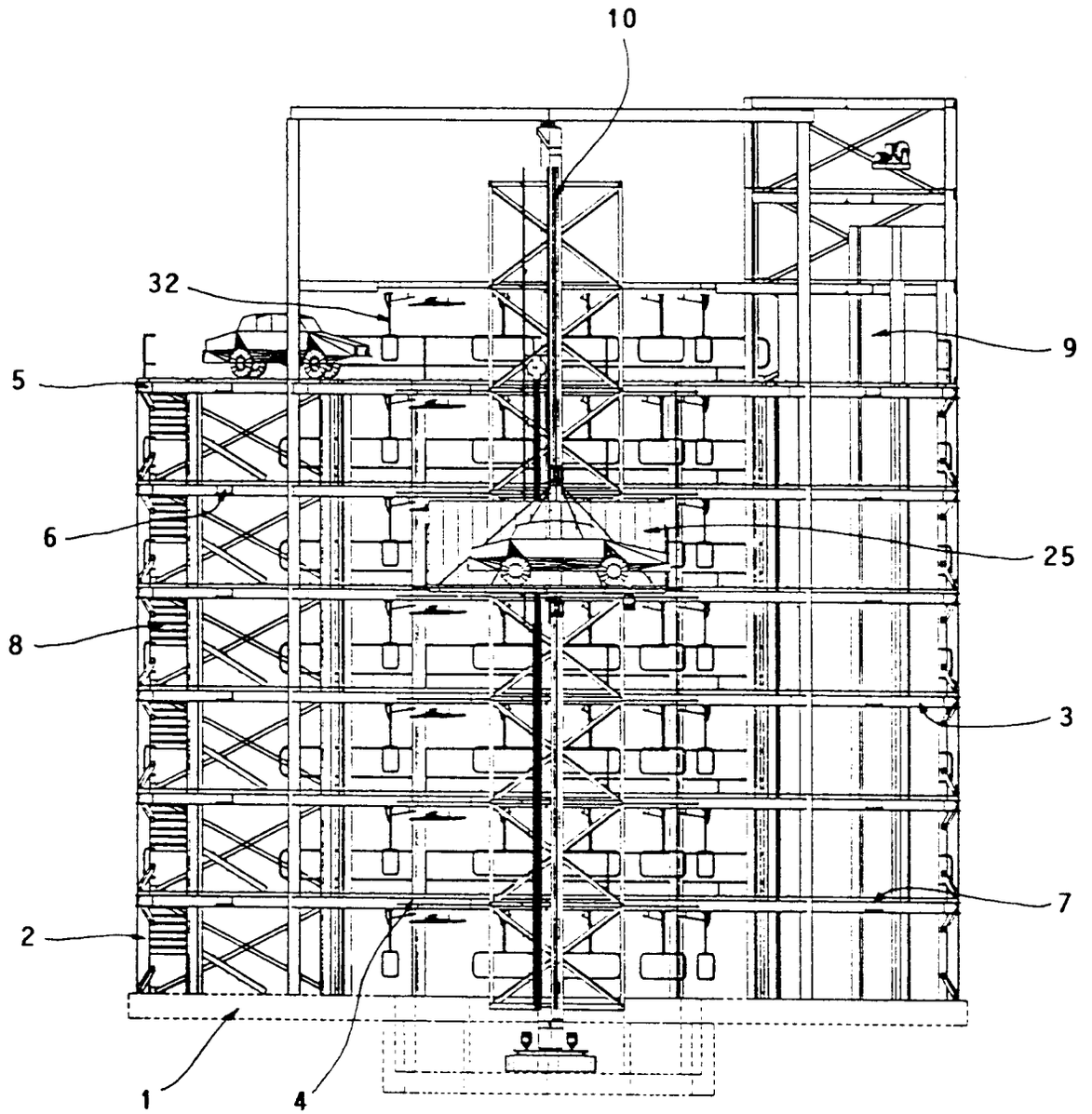
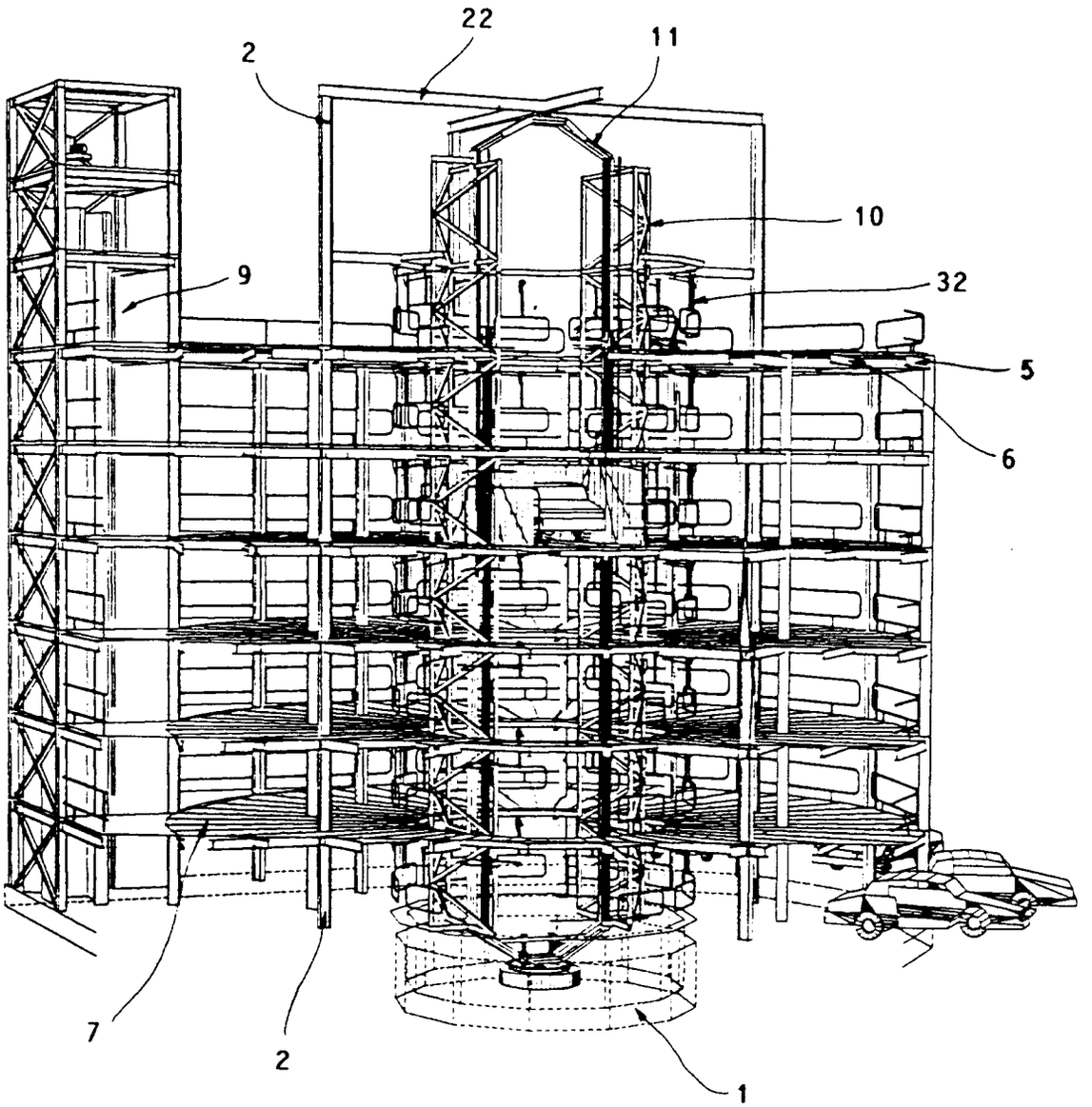


FIG. 3

FIG. 4



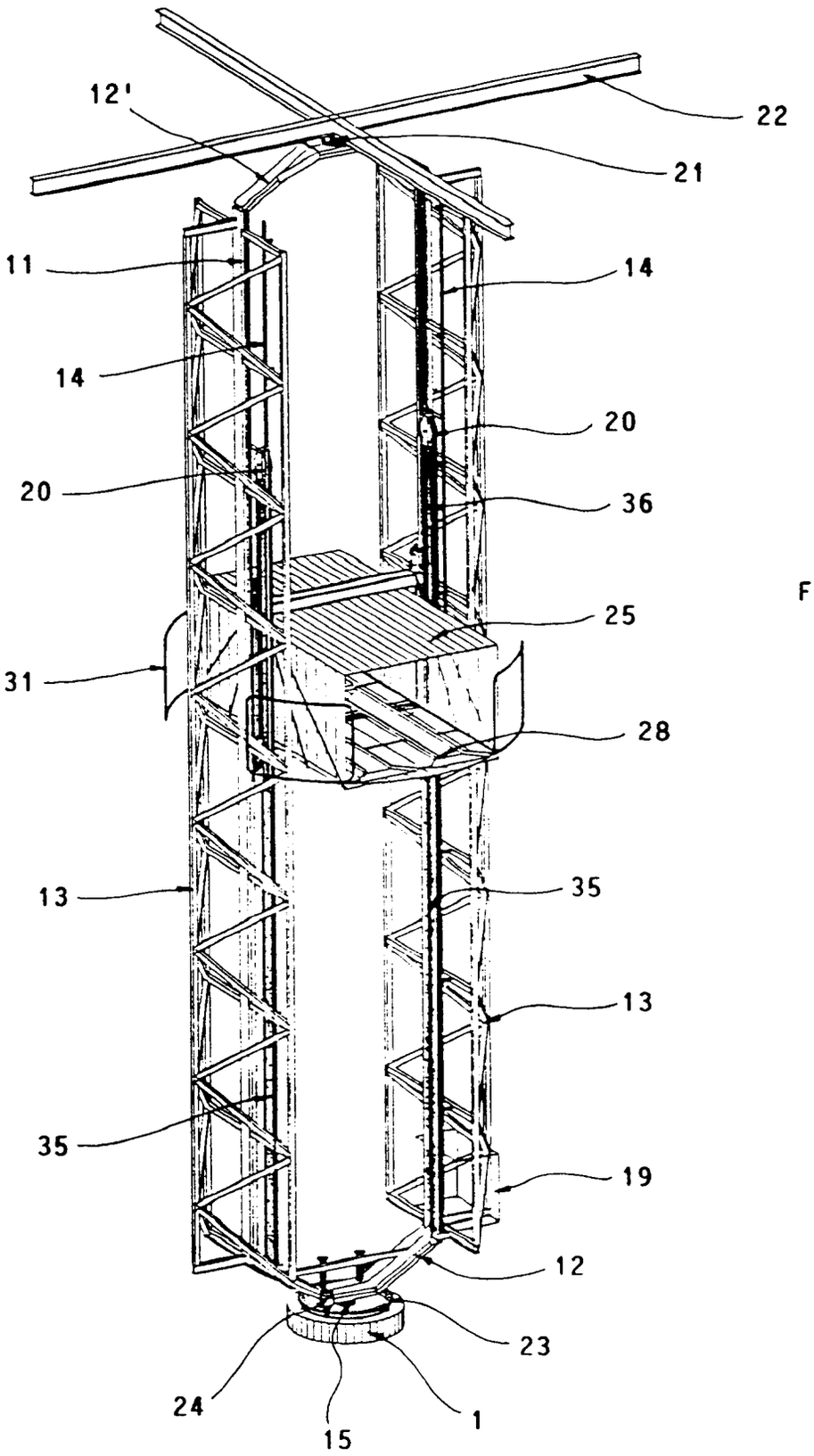


FIG. 5

FIG. 6

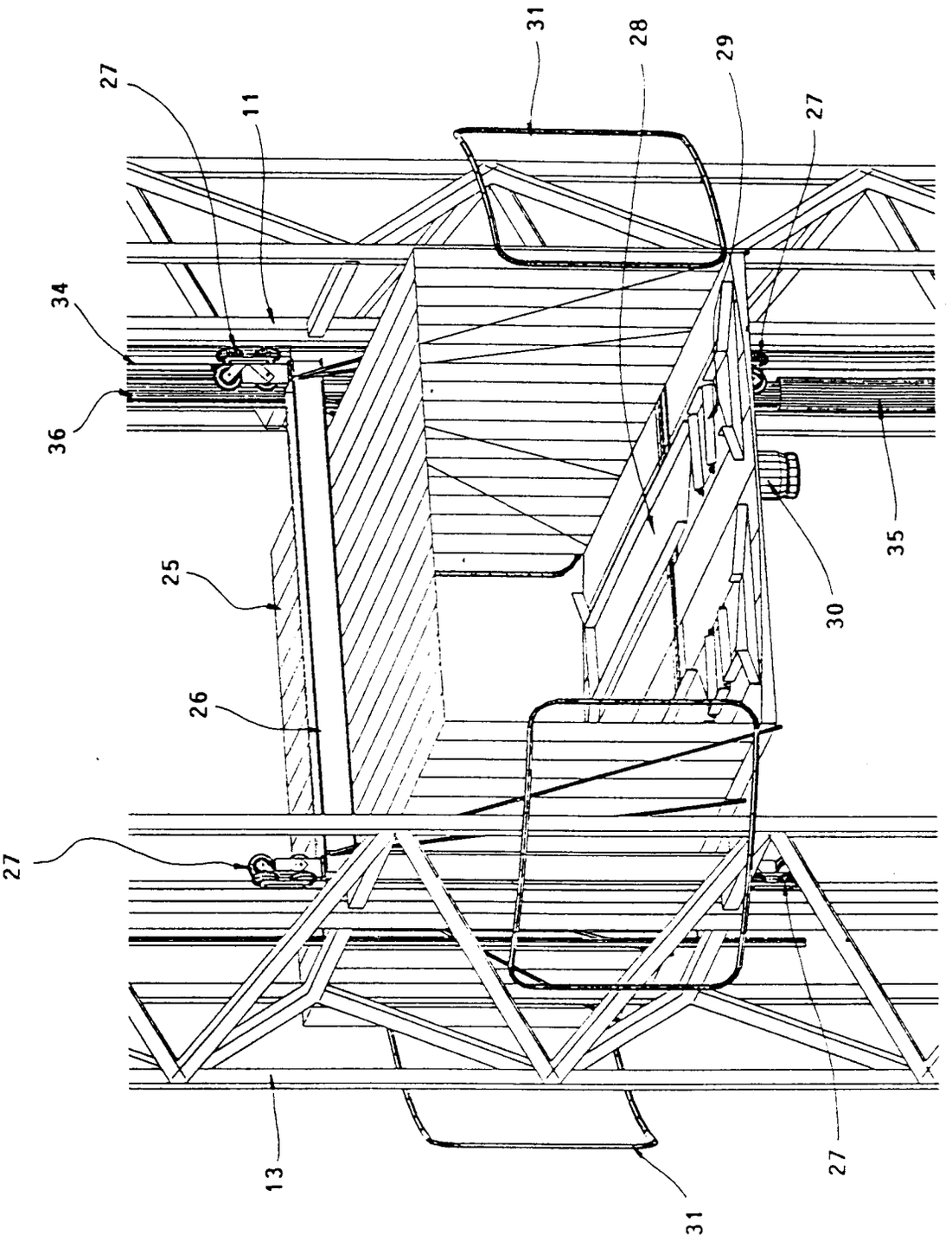
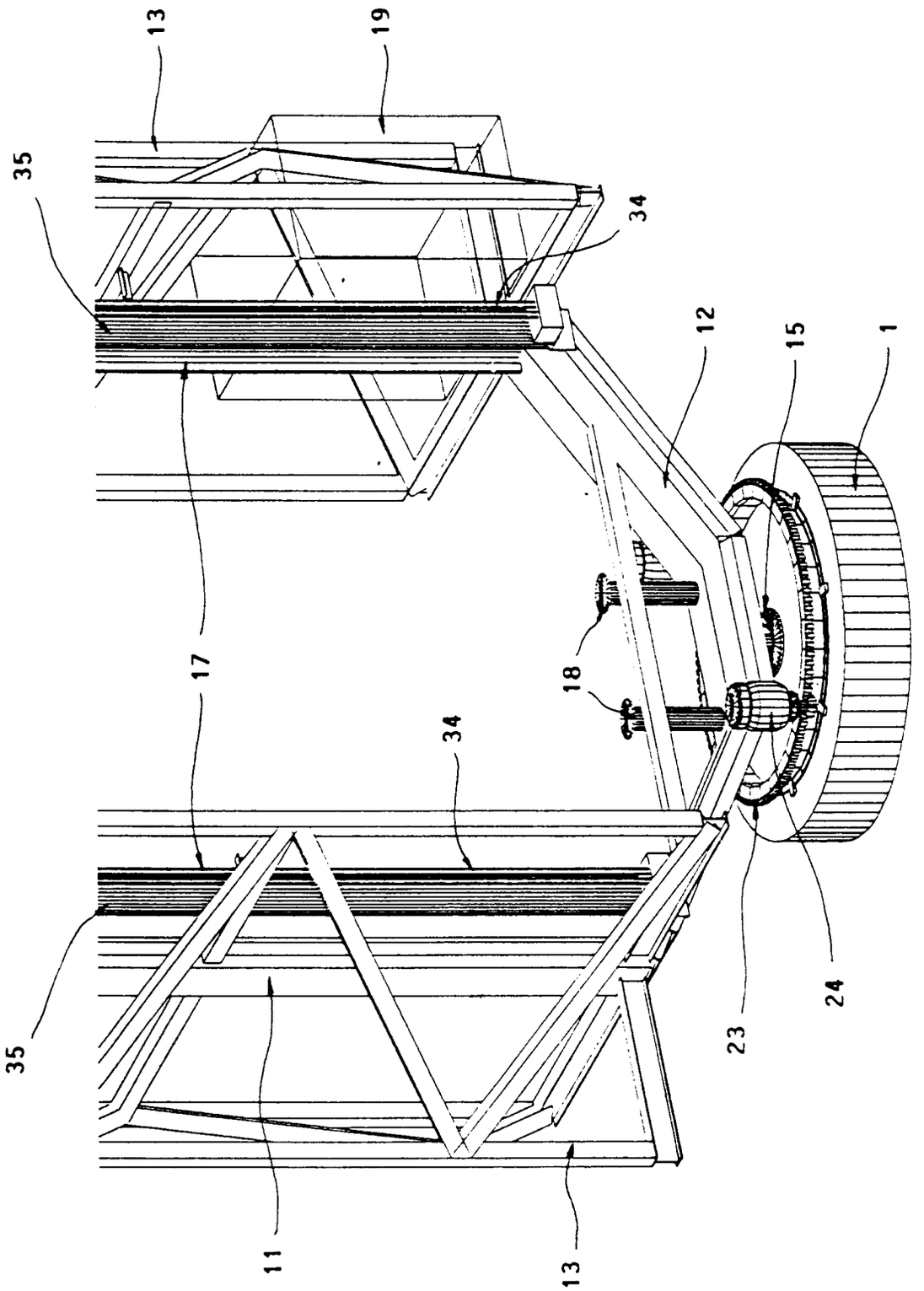


FIG. 7



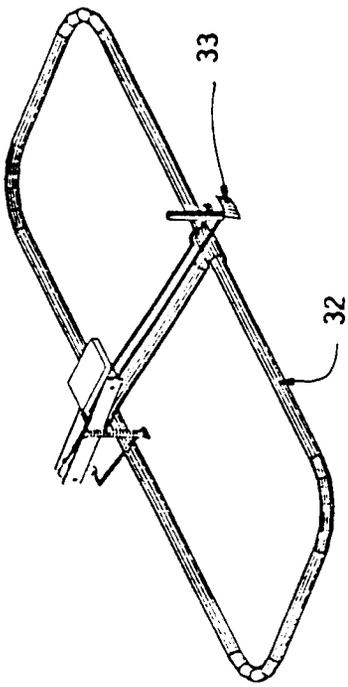


FIG. 9

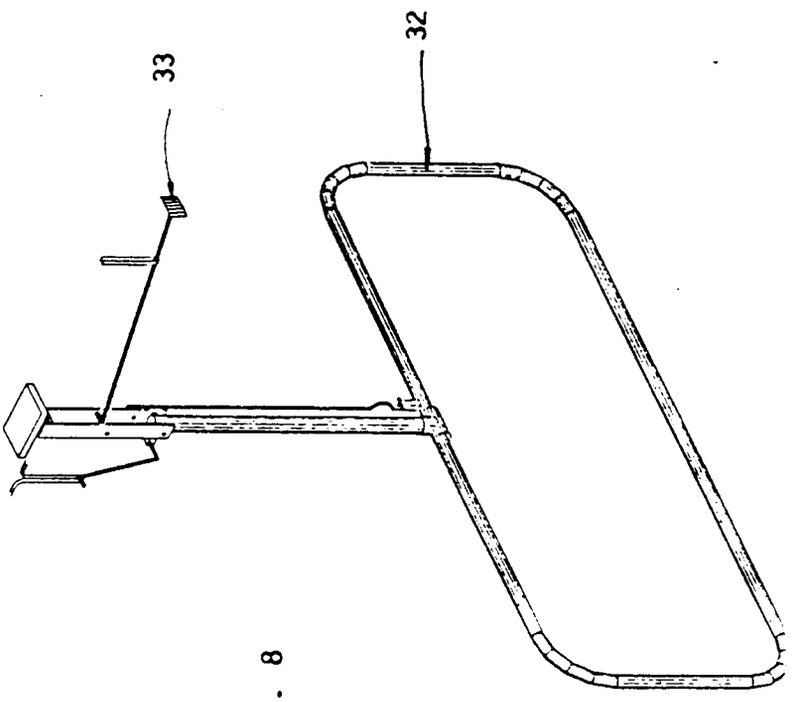
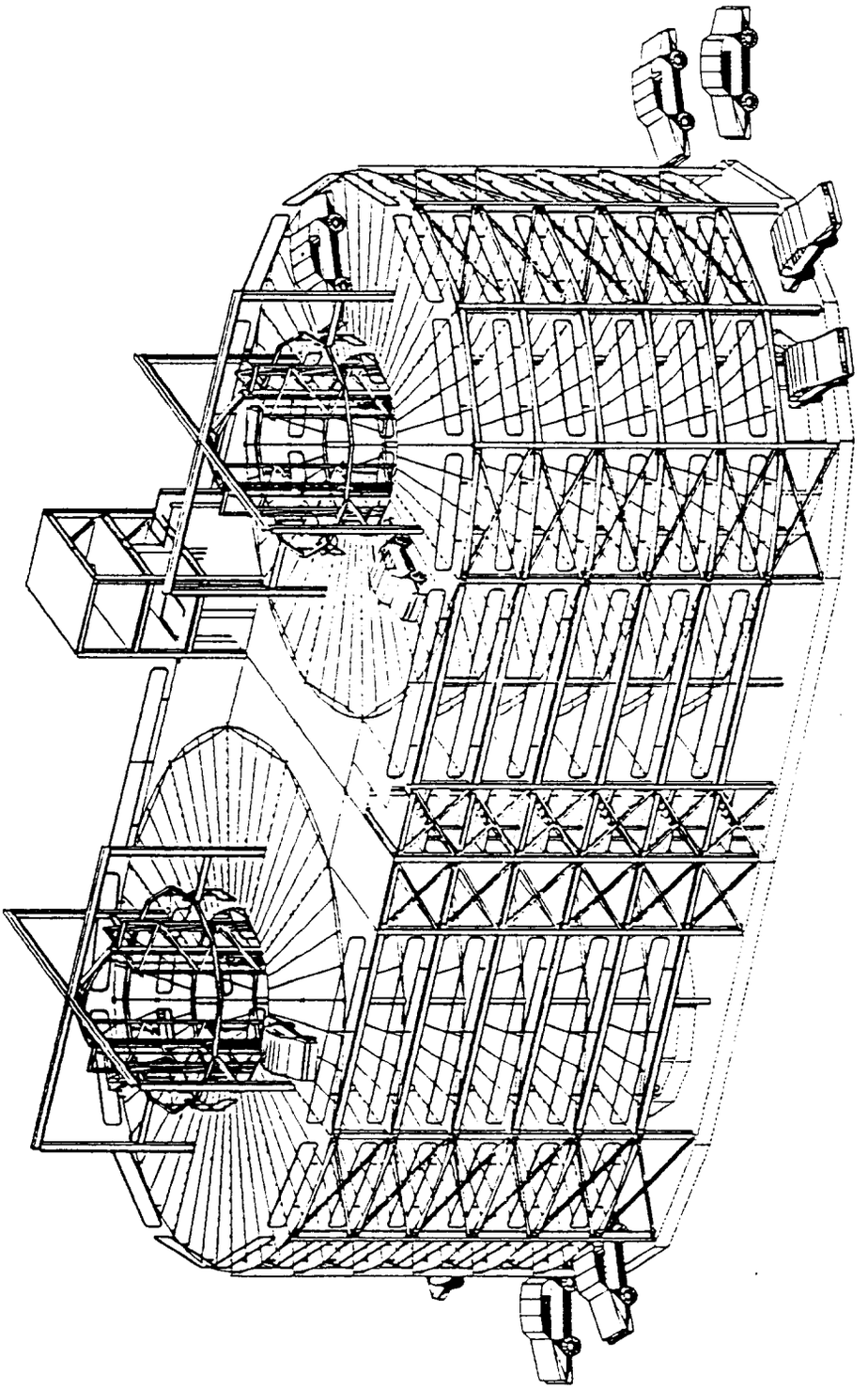


FIG. 8

FIG. 10



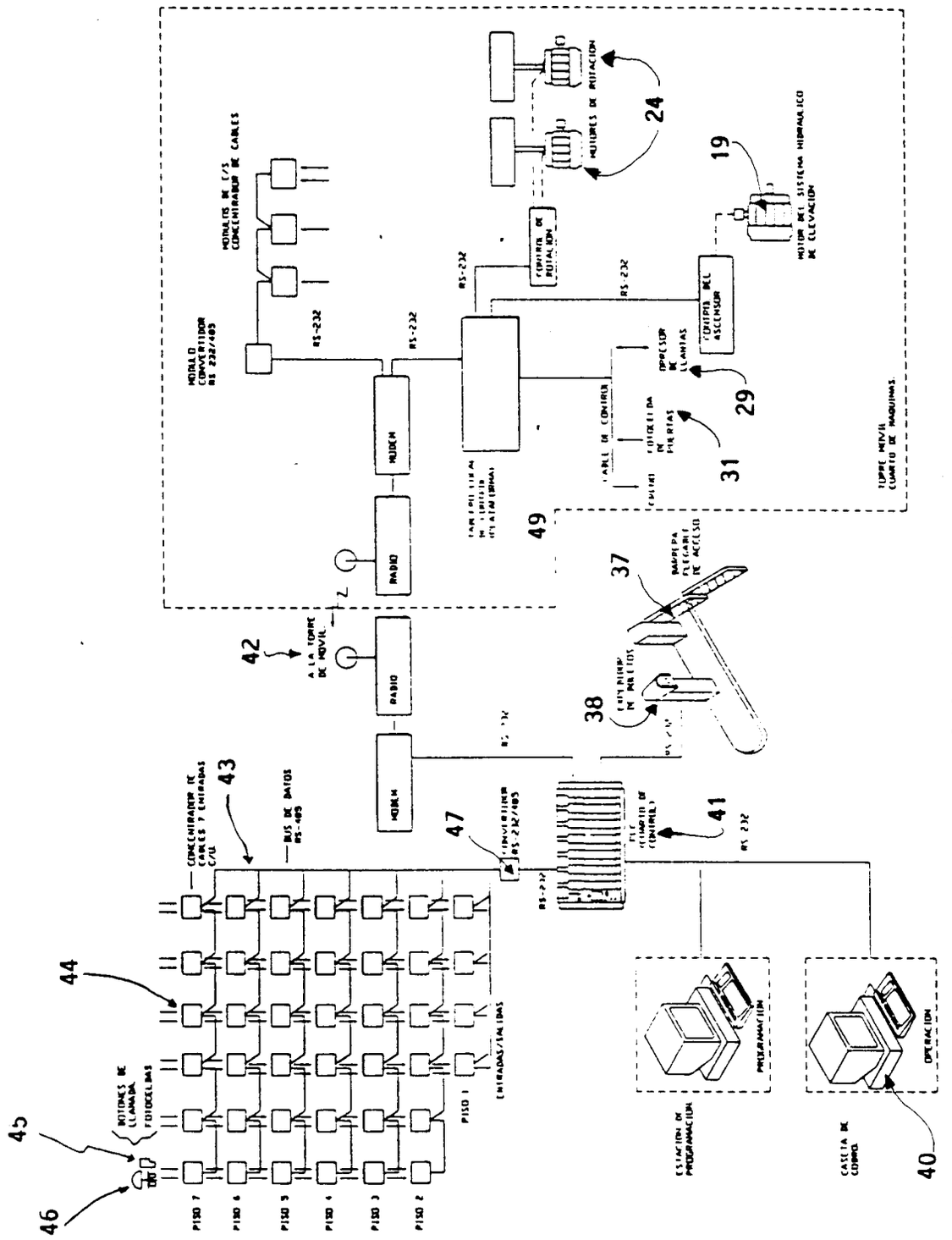

MODULOS DE E/S CONCENTRADOR DE CABLES
MODULO CONVERTIDOR RS 232/485
RS-232
MODEM
RADIO
A LA TORRE DE MOVIL
CONCENTRADOR DE CABLES Y ENTRADAS C/U
BUS DE DATOS RS-485
CONVERTIDOR RS-232/485
PLC (CONTROL DE CENTRAL)
ENTRADAS/SALIDAS
PISO 1
PISO 2
PISO 3
PISO 4
PISO 5
PISO 6
PISO 7
BOTONES DE LLAMADA FOTOCELDAS
ESTACION DE PROGRAMACION
PROGRAMACION
CASILLA DE CONTROL
OPERACION
MOTORES DE ROTACION
CONTROL DE ROTACION
MOTOR DEL SISTEMA HIDRAULICO DE ELEVACION
CONTROL DEL ASCENSOR
COMPRESOR DE LLANTAS
FOTOCELDA DE PUERTAS
PANEL DE CONTROL
TOPPE MOVIL CUARTO DE MAQUINAS
RAMPA PARA ELEVARSE DE ACCESO
ENTRADAS DE BOTONES
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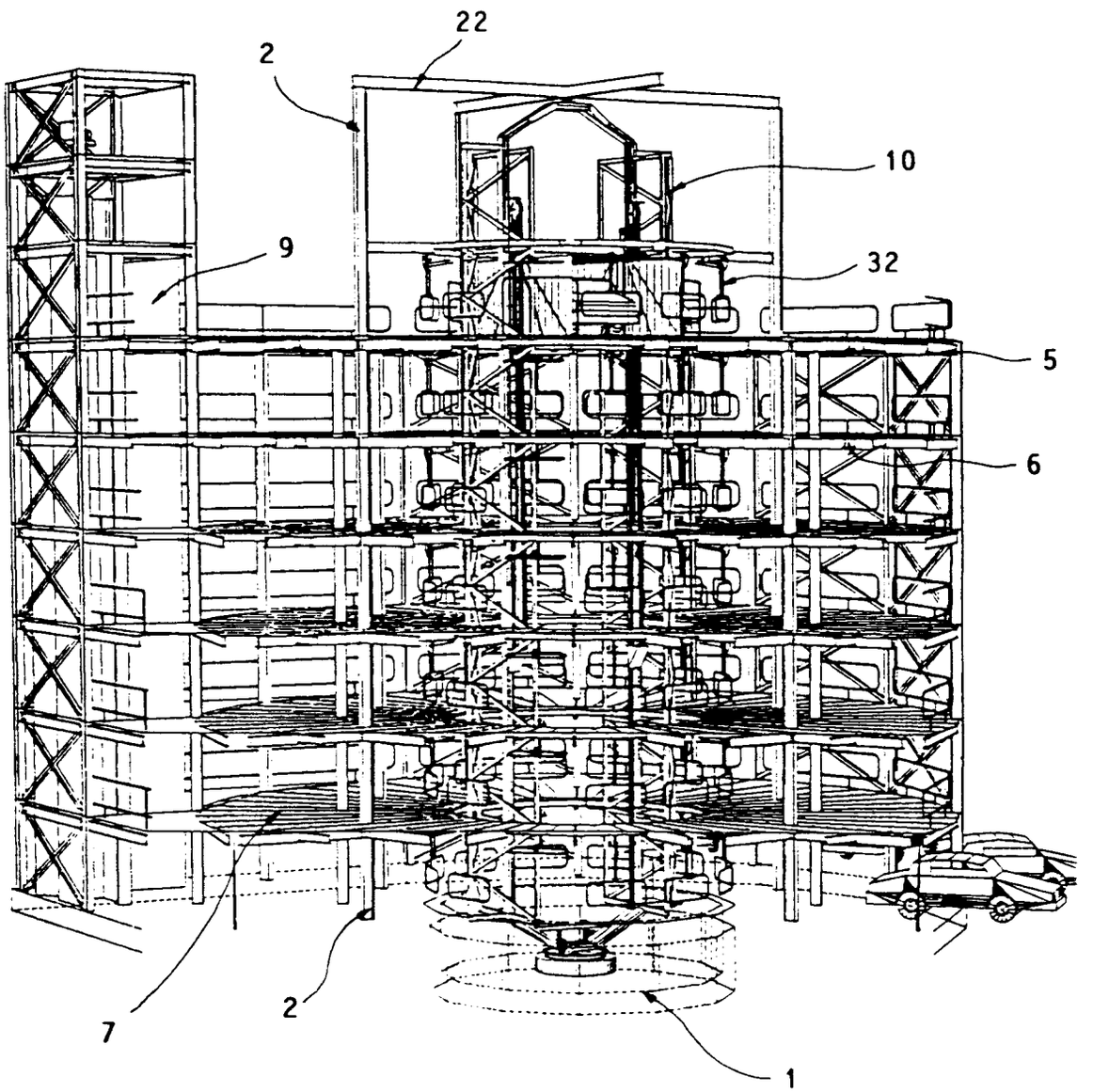
FIG. 11

FIG. 12



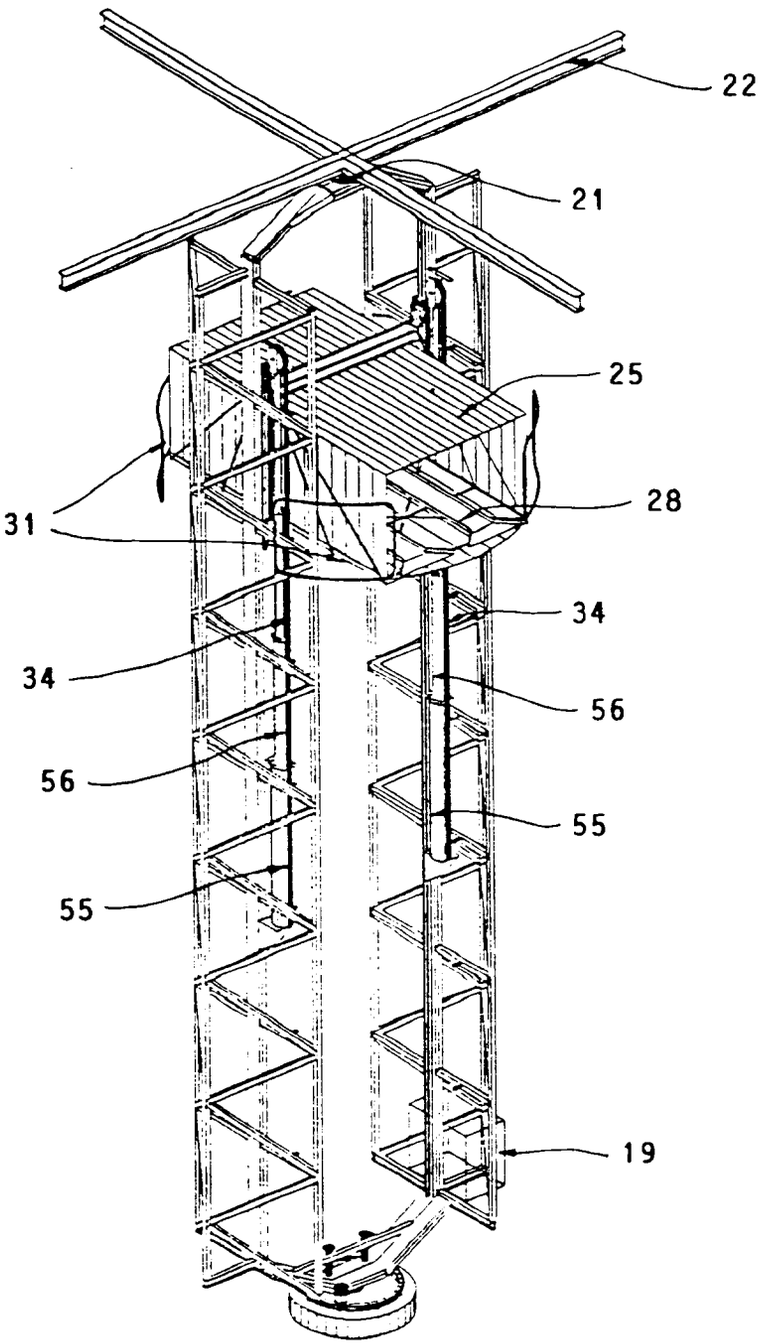


FIG. 13

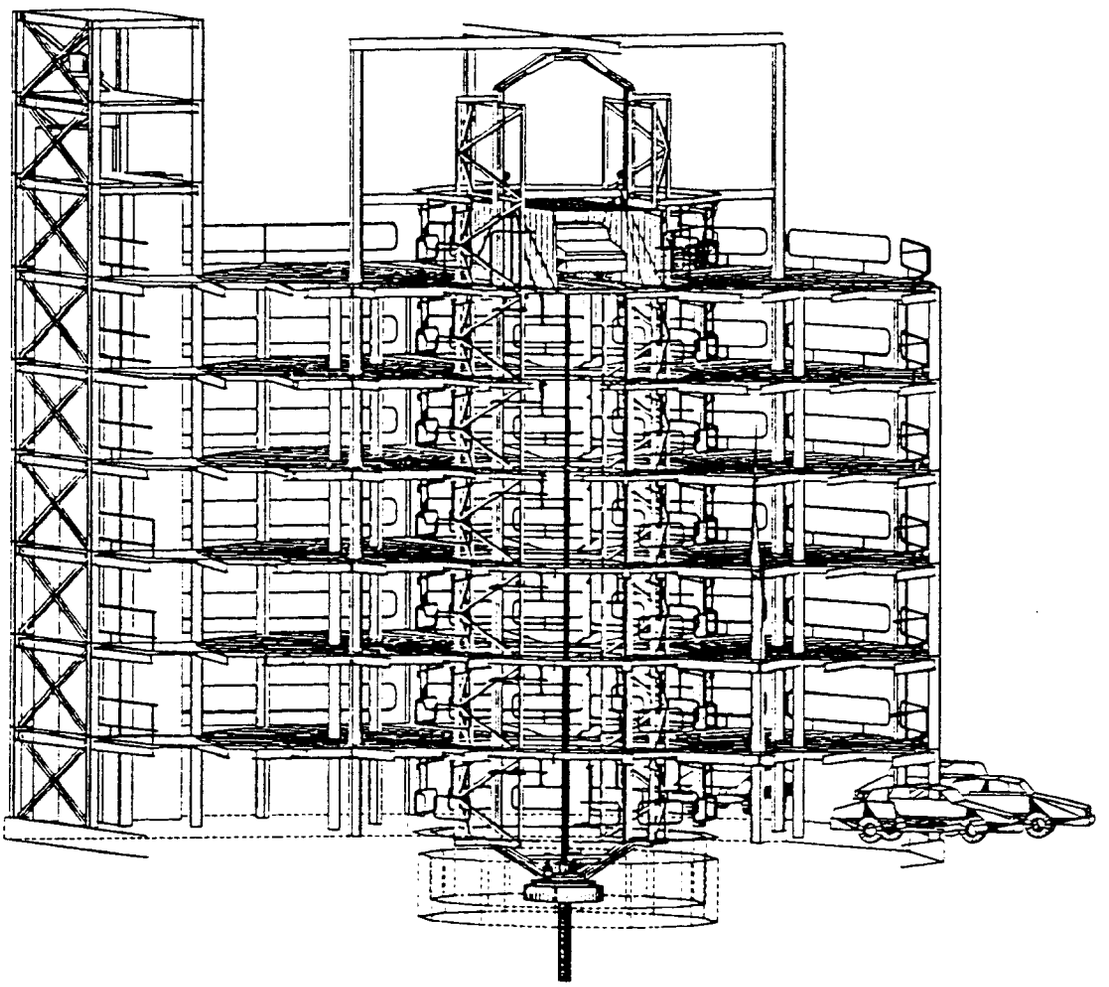


FIG. 14

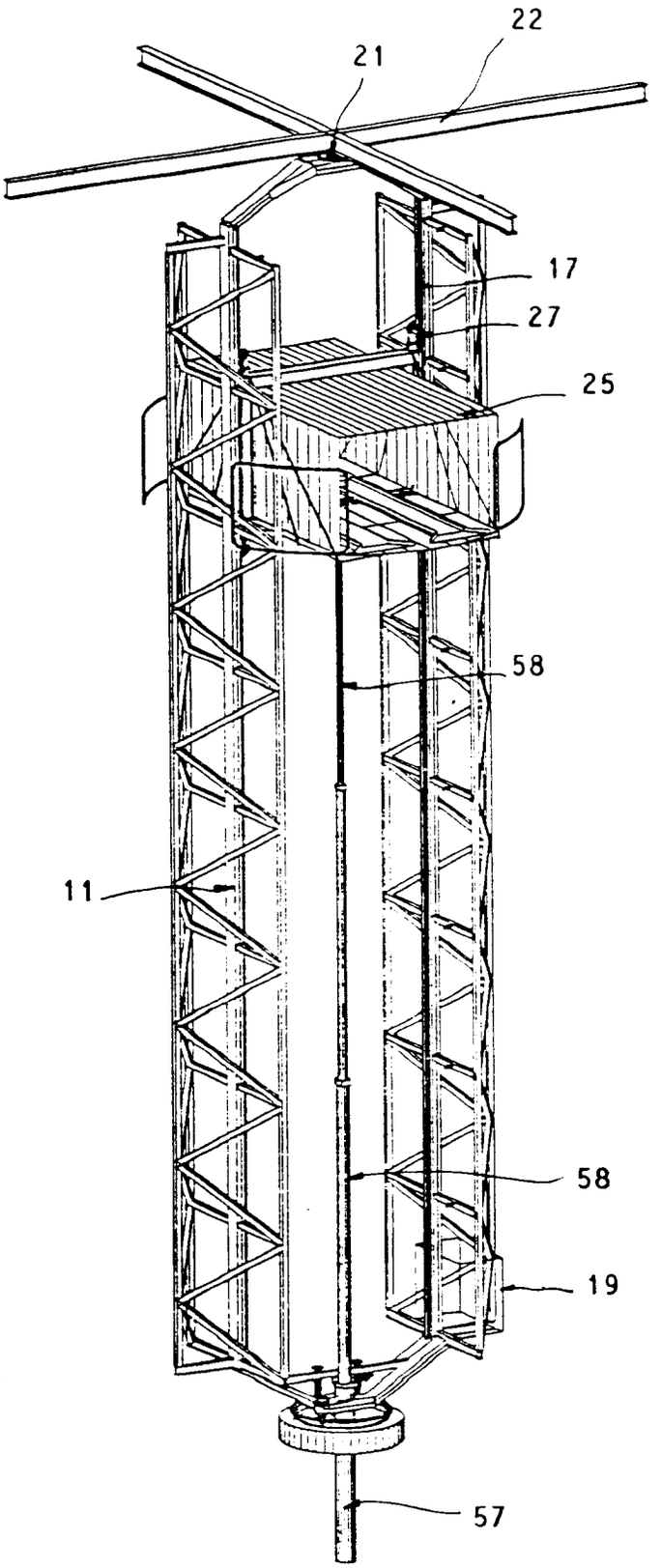


FIG. 15

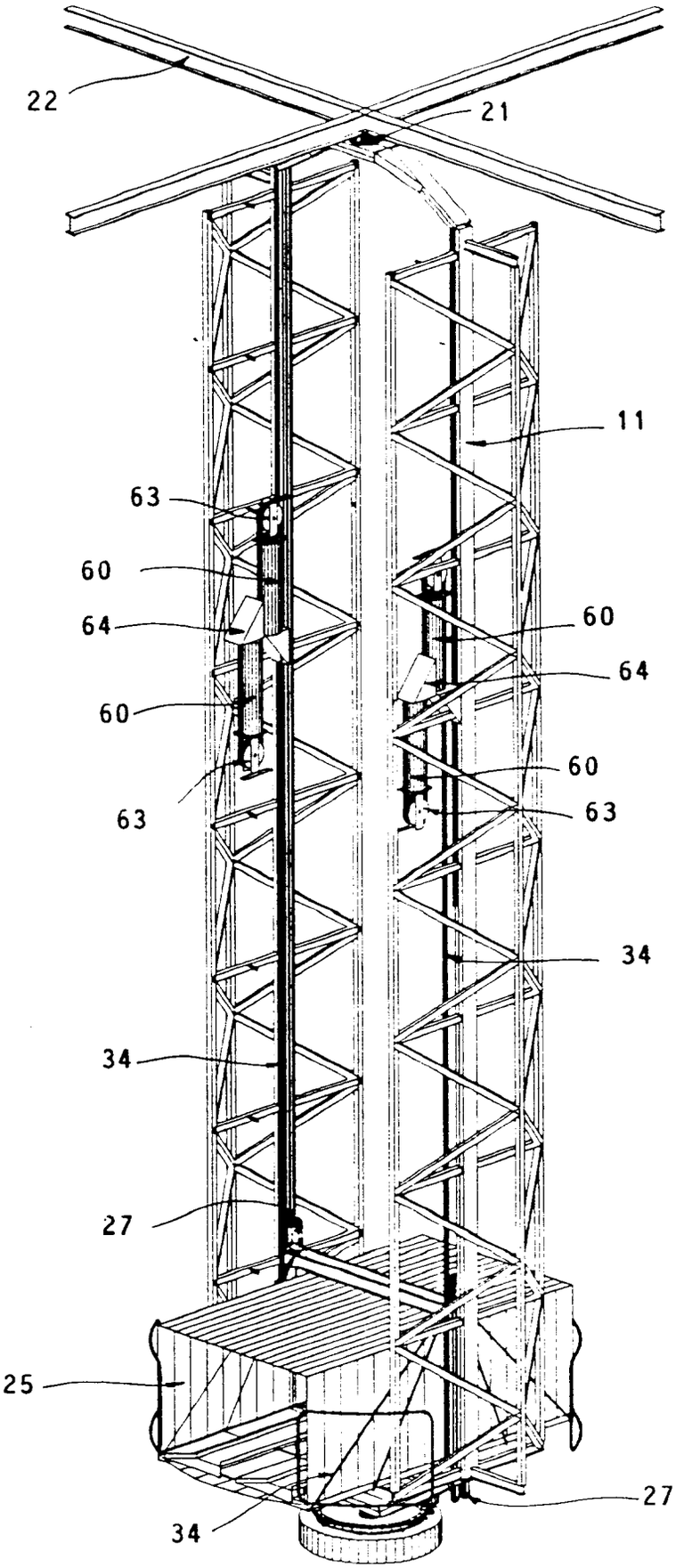


FIG. 16

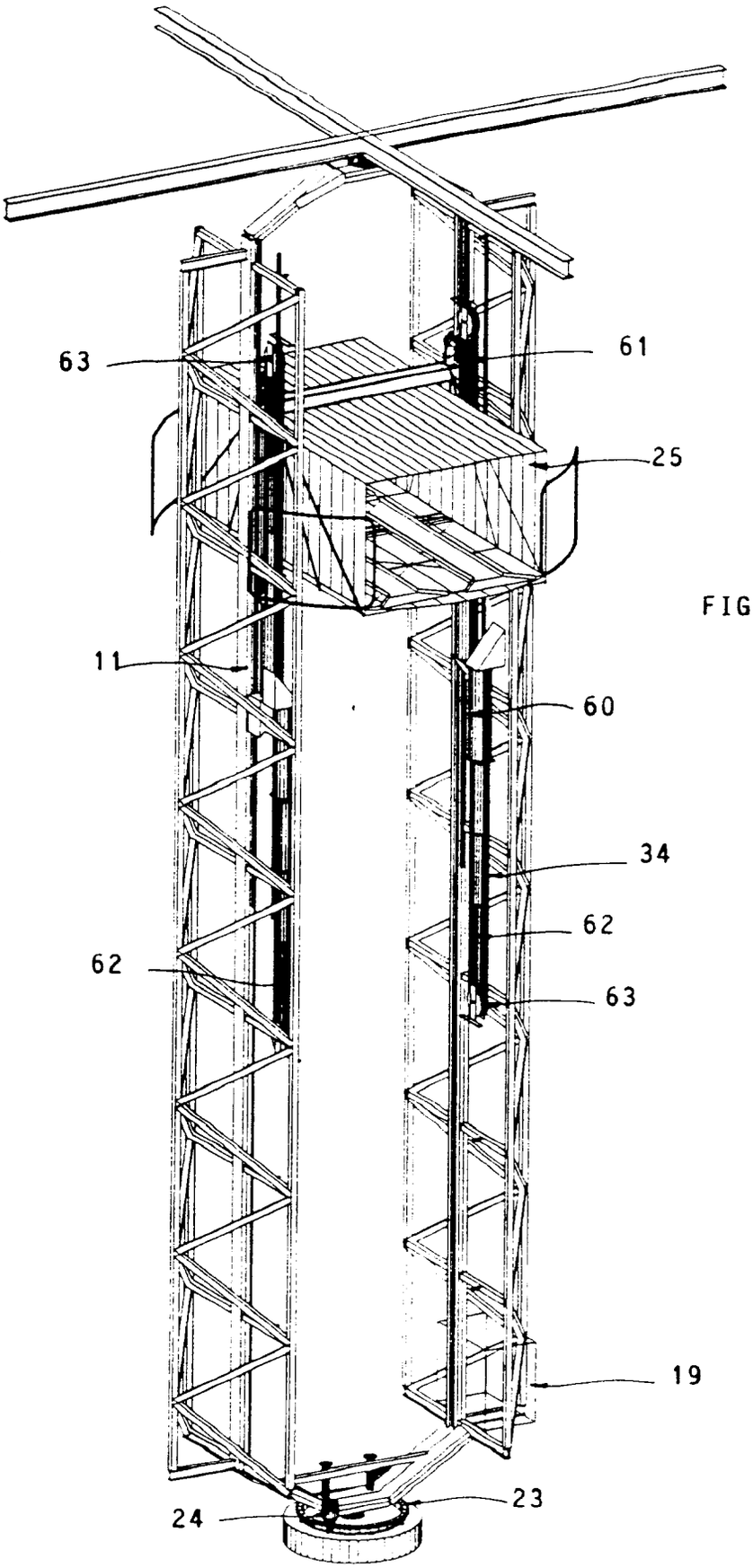


FIG. 17

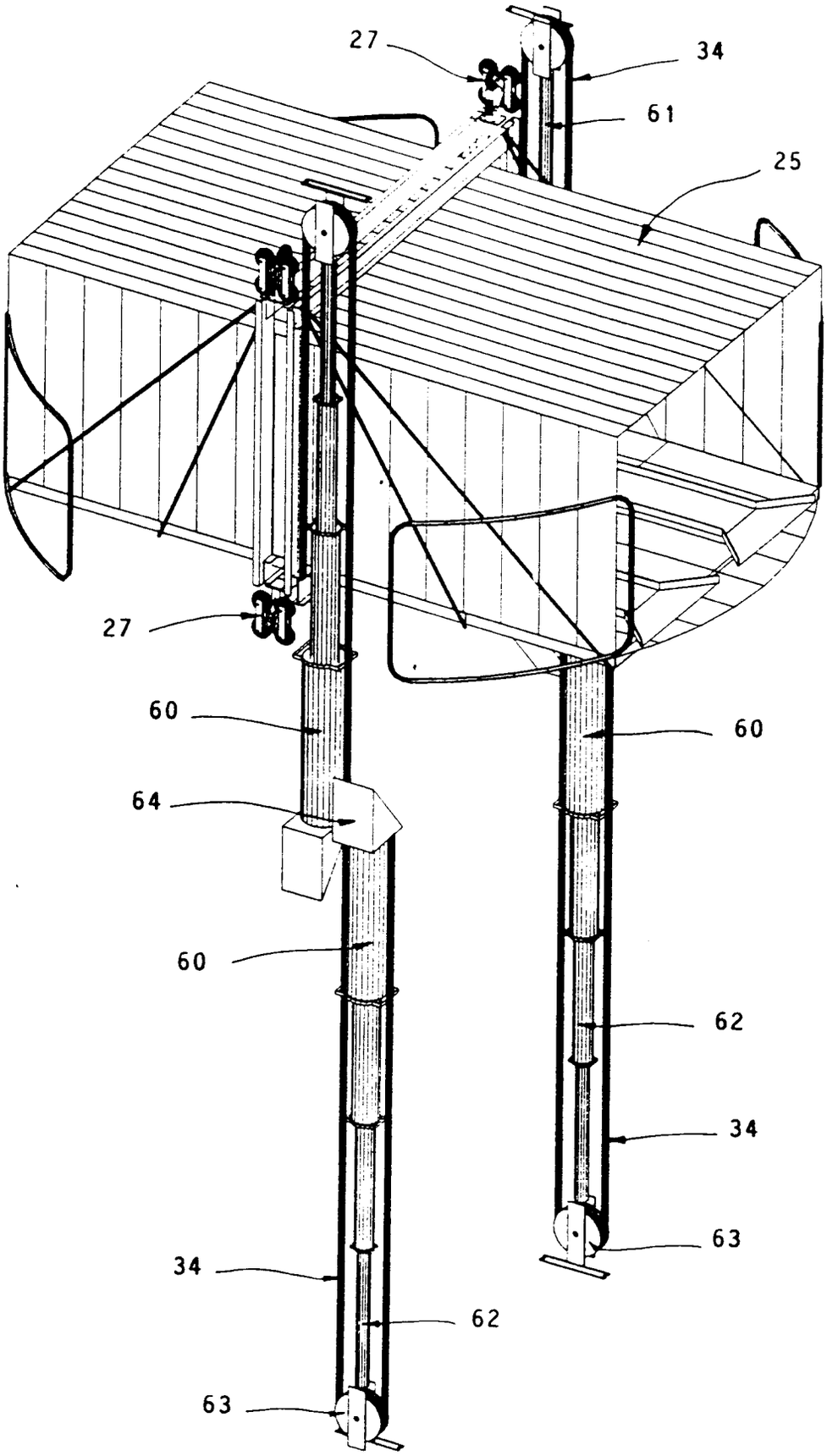
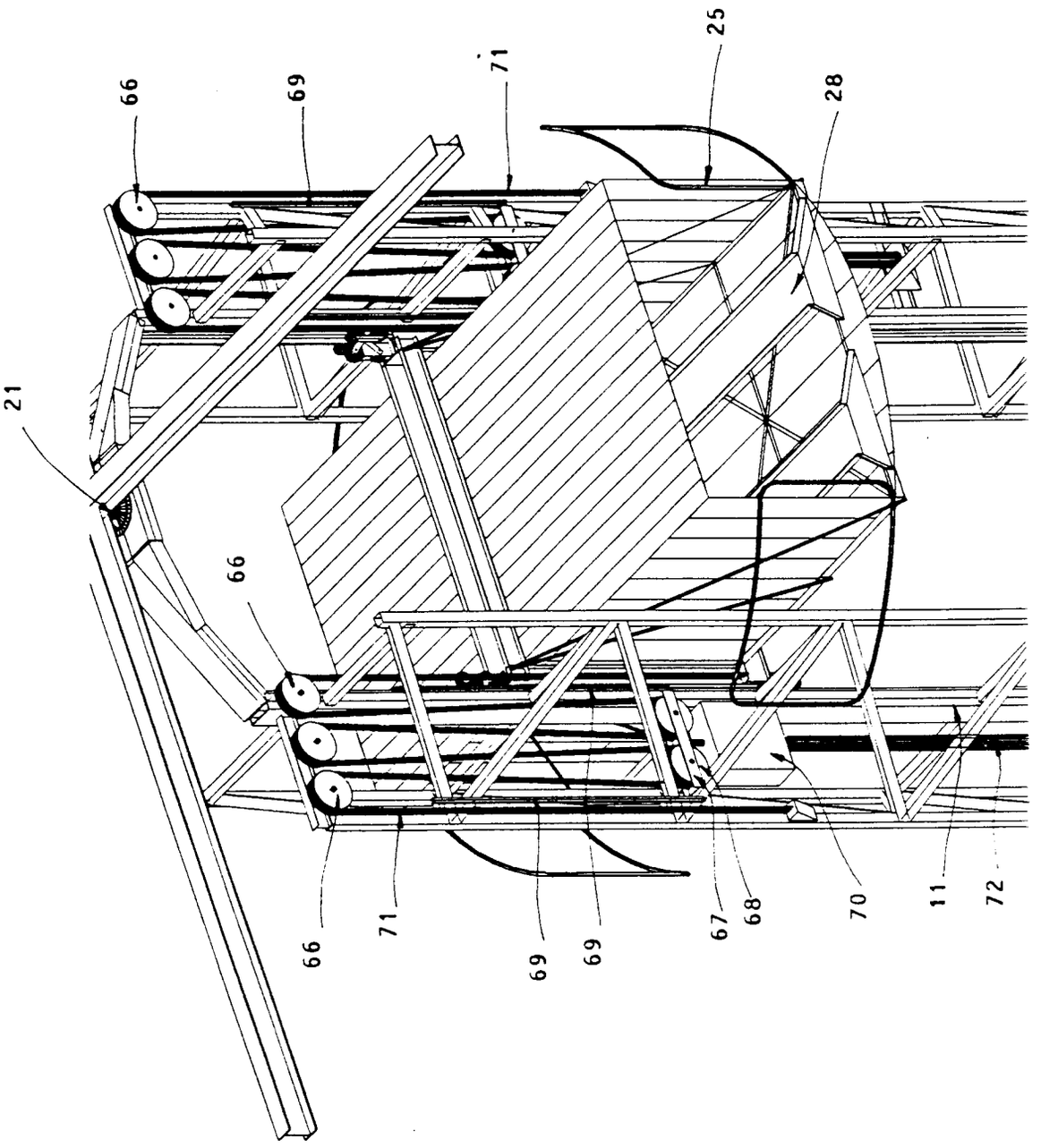


FIG. 18

FIG. 19



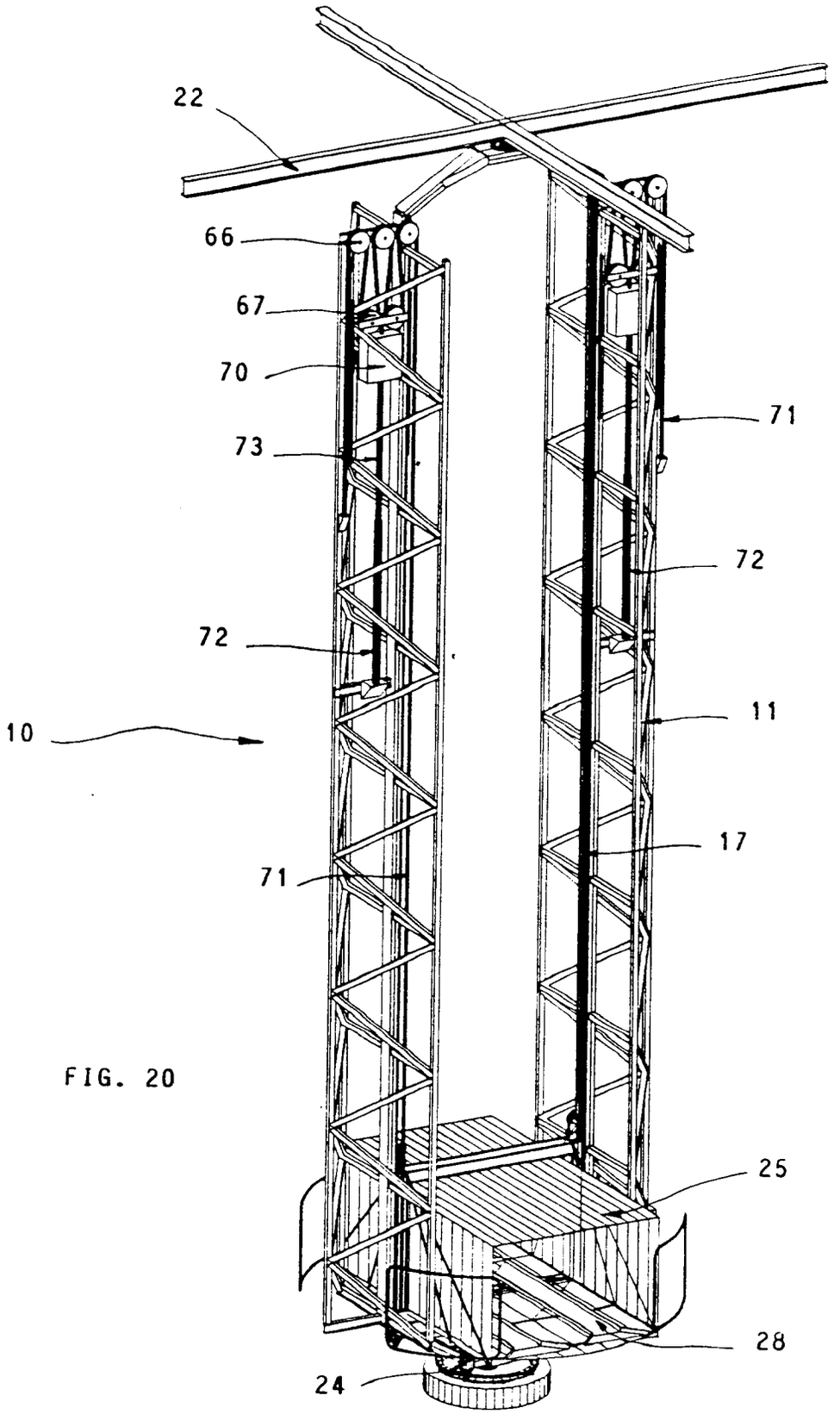


FIG. 20

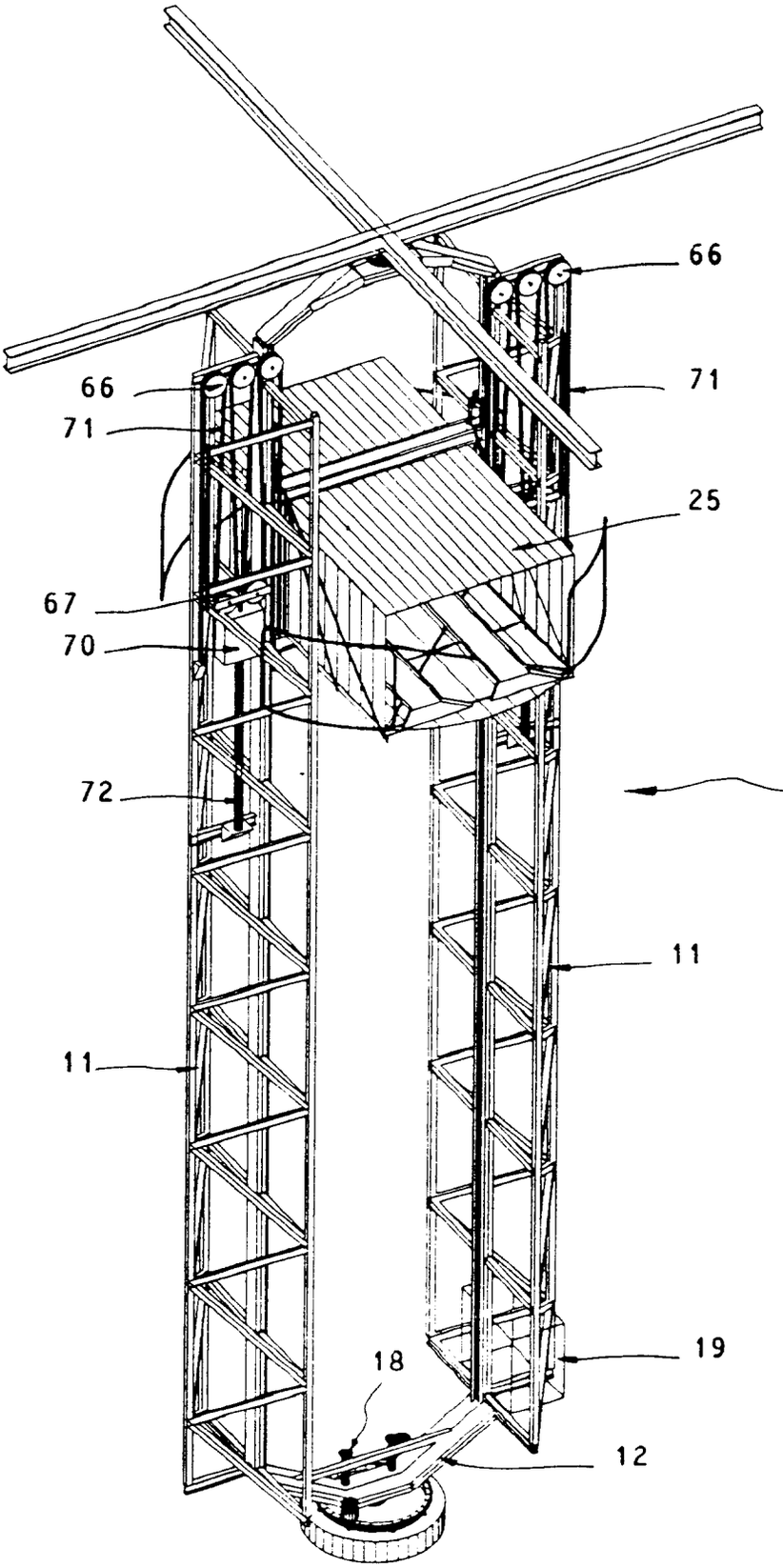
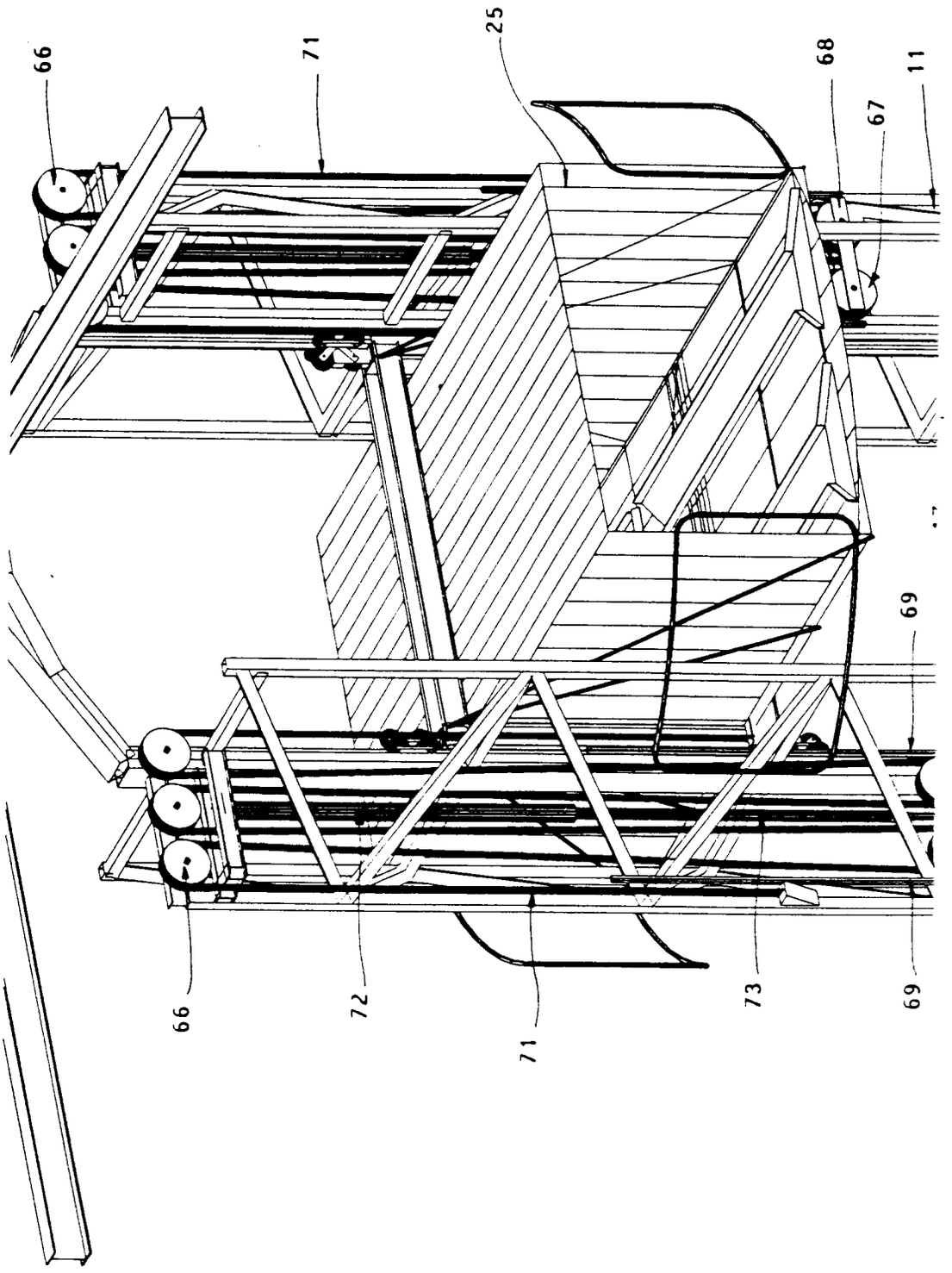


FIG. 21

FIG. 22



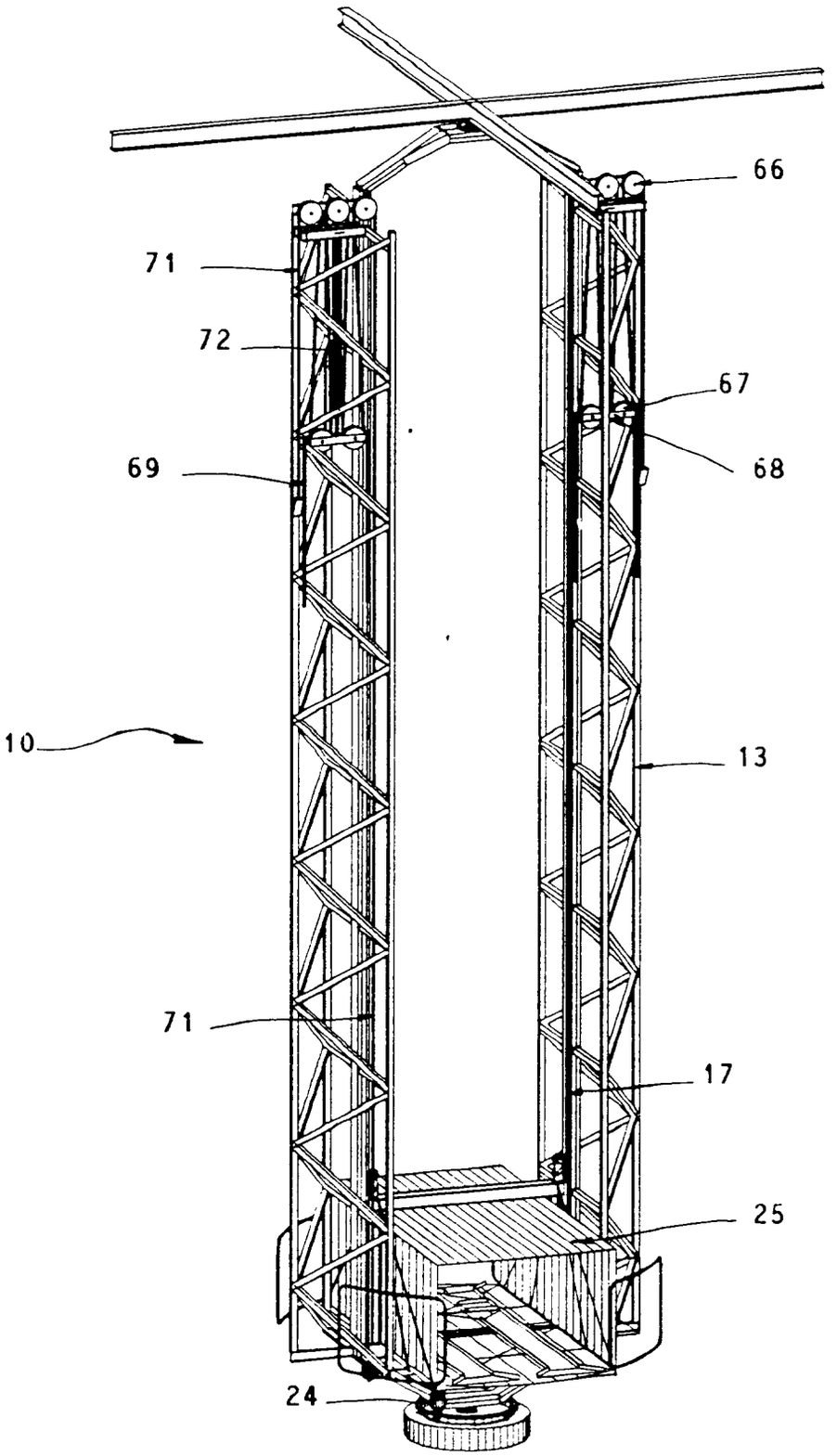


FIG. 23

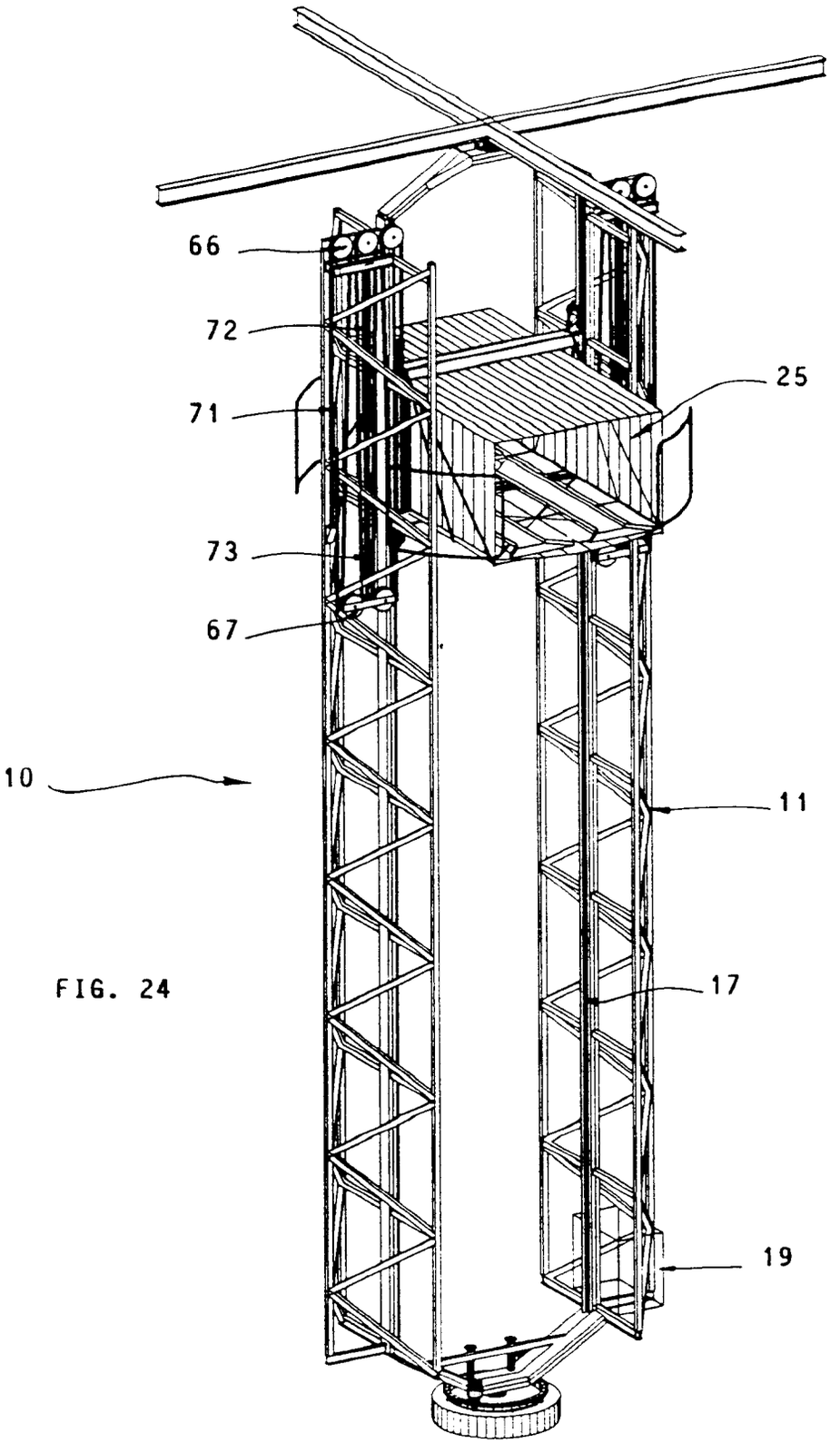


FIG. 24

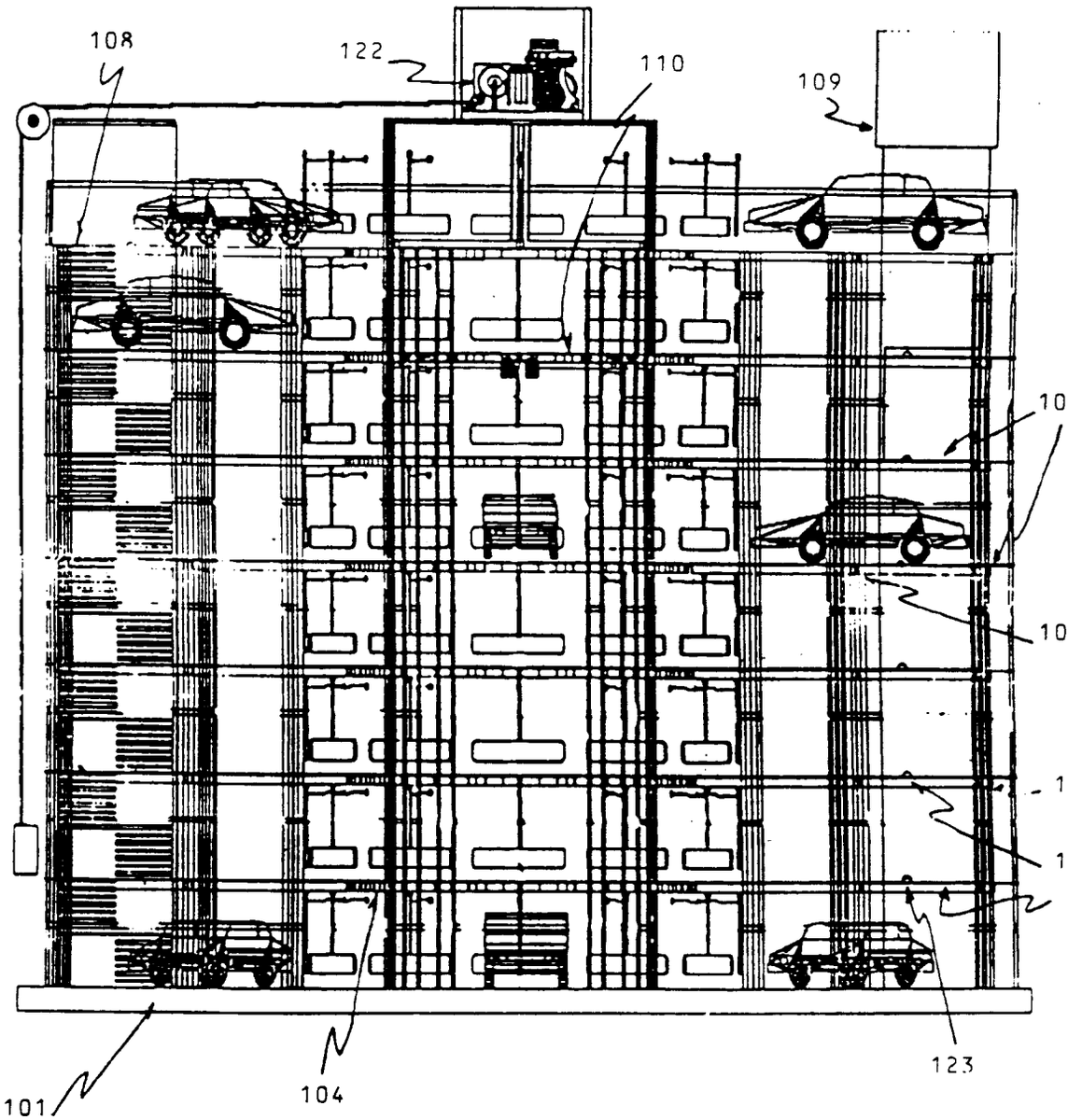


FIG. 25

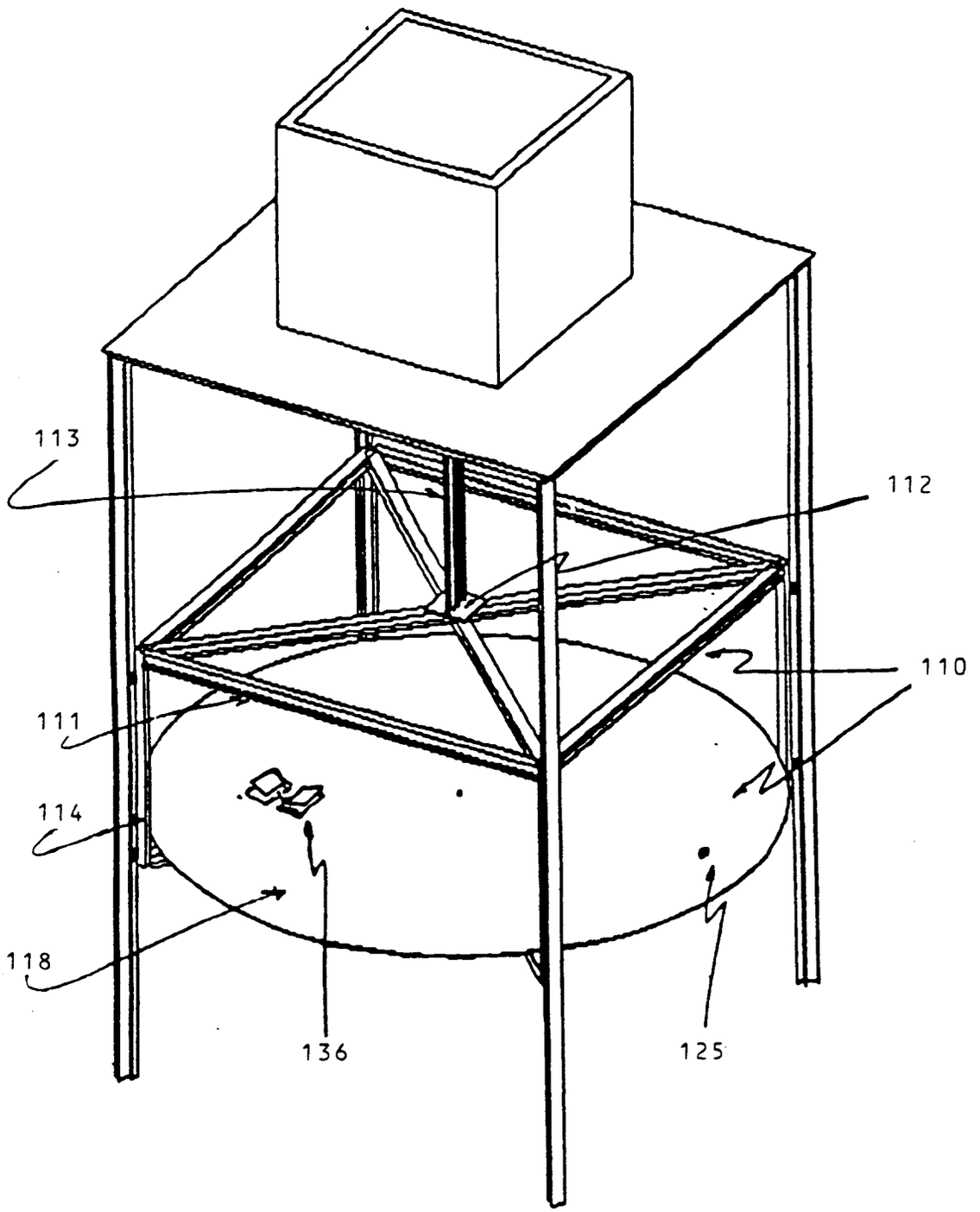


FIG. 26

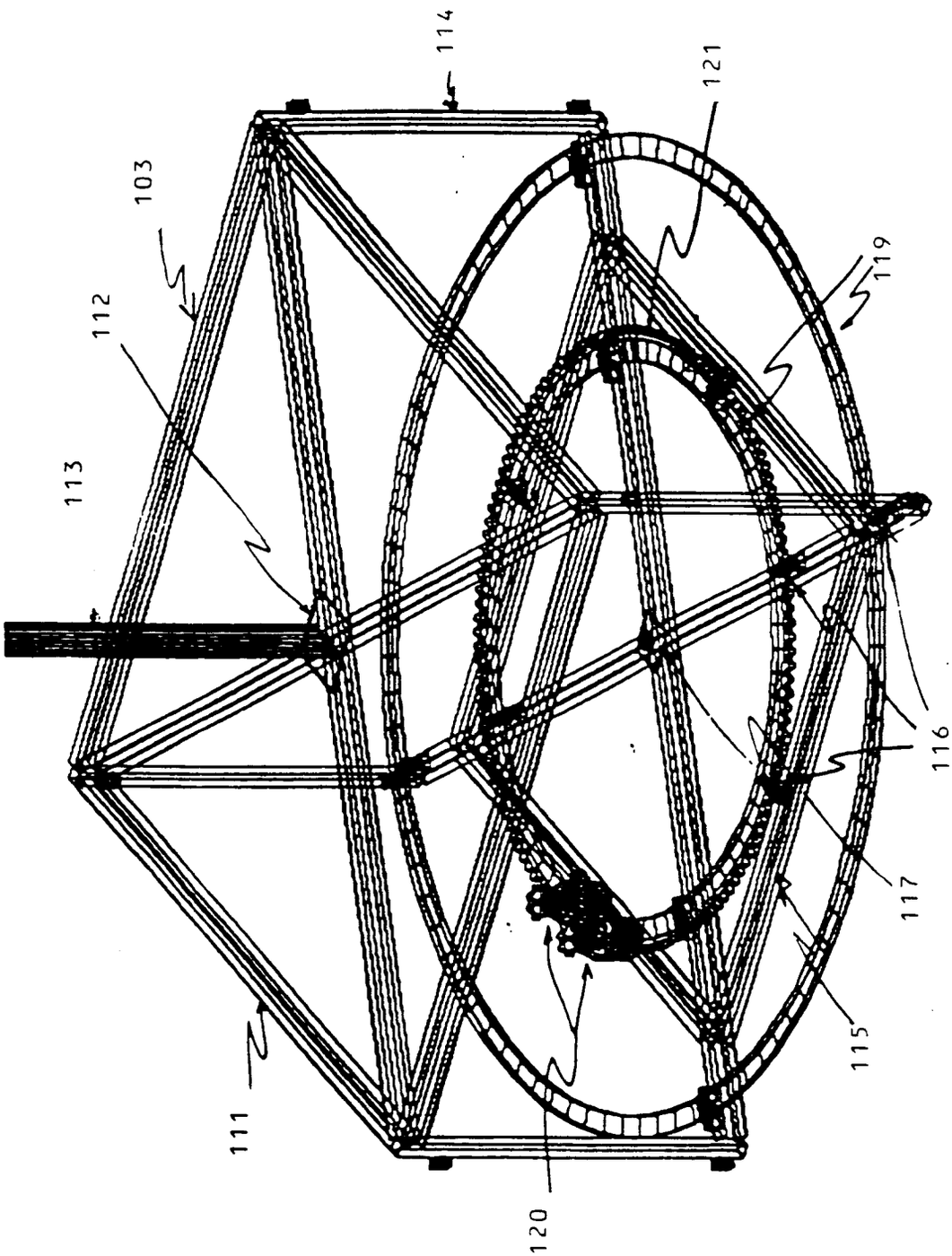


FIG. 27

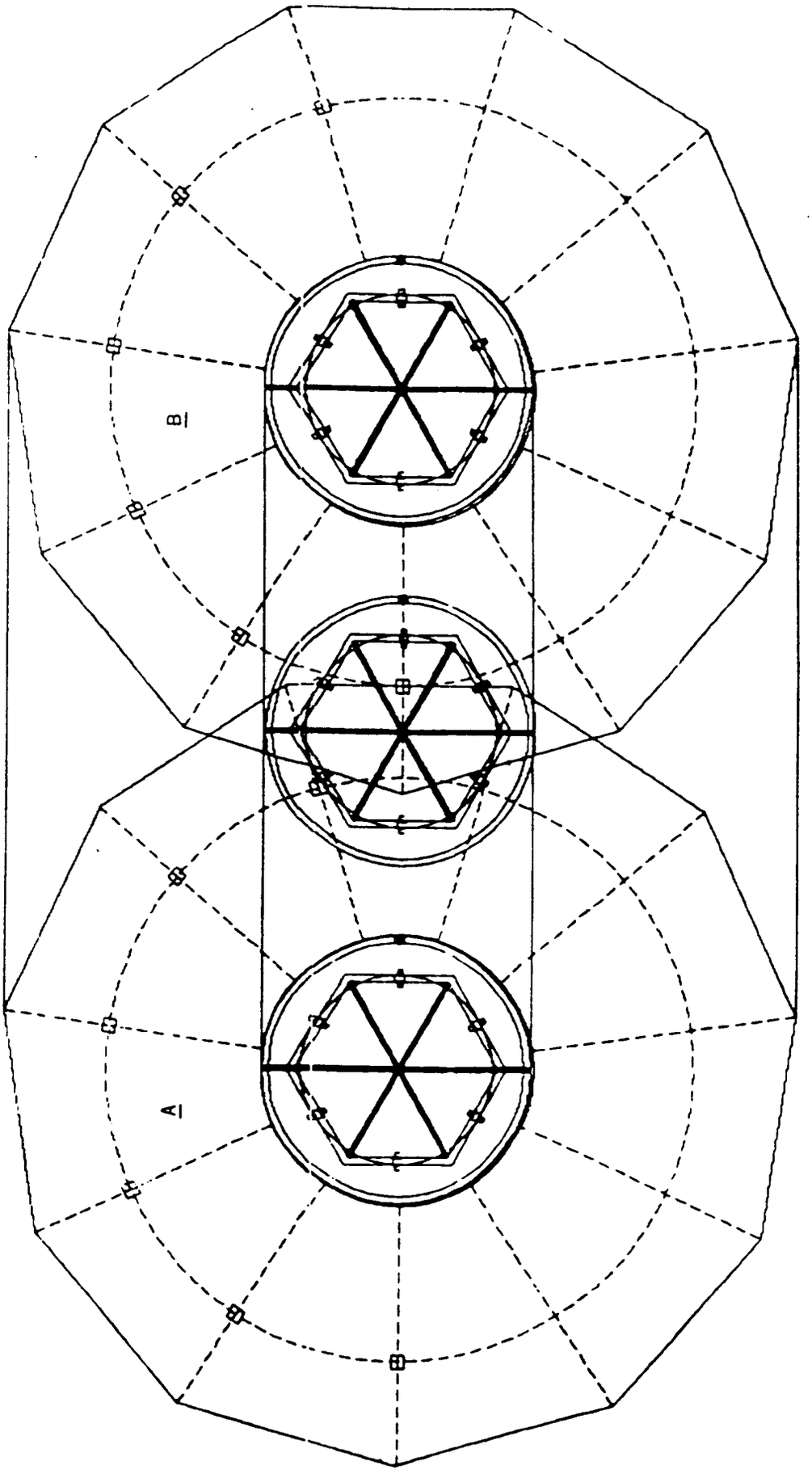


FIG. 28

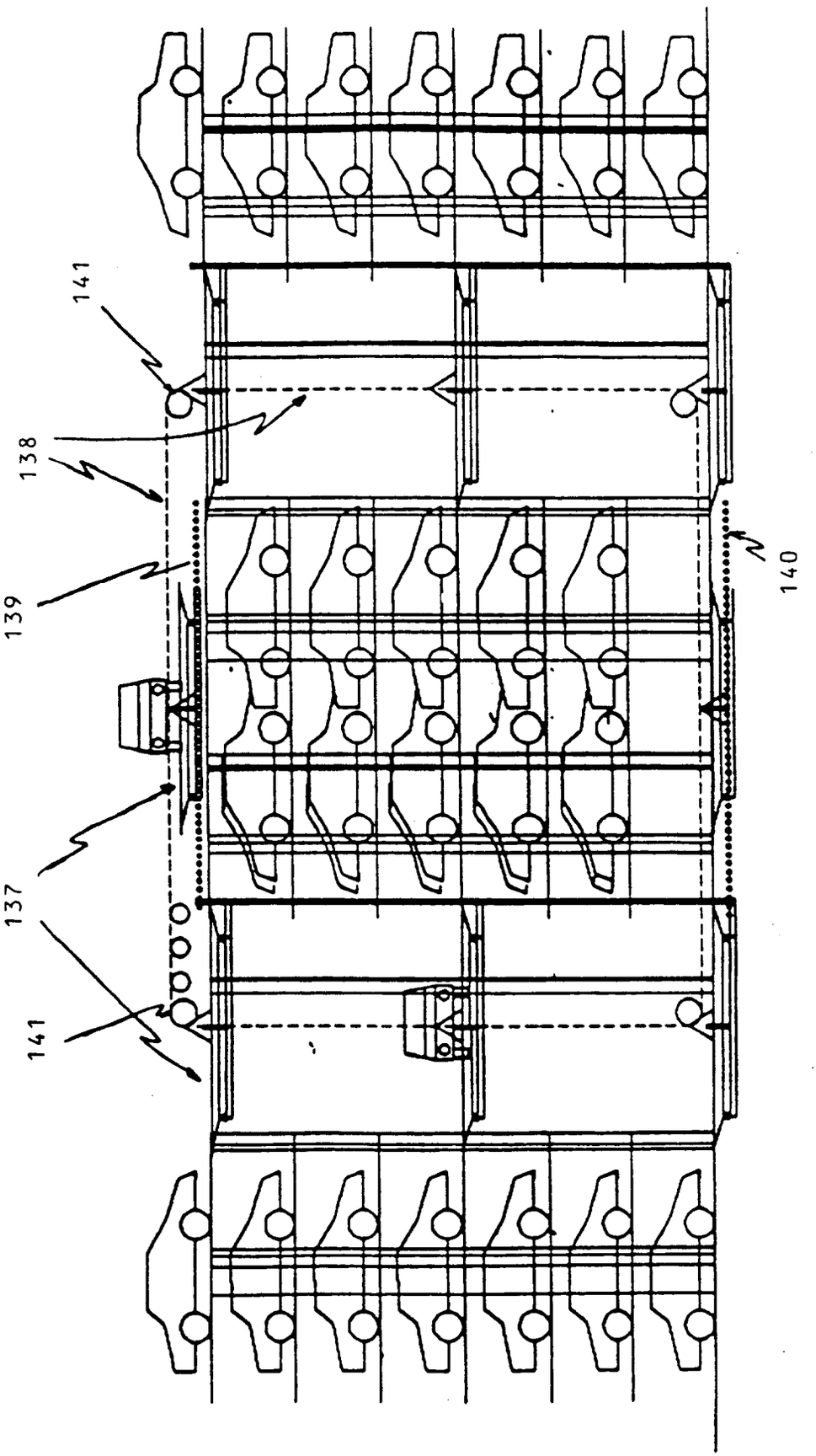


FIG. 29

FIGURA 30

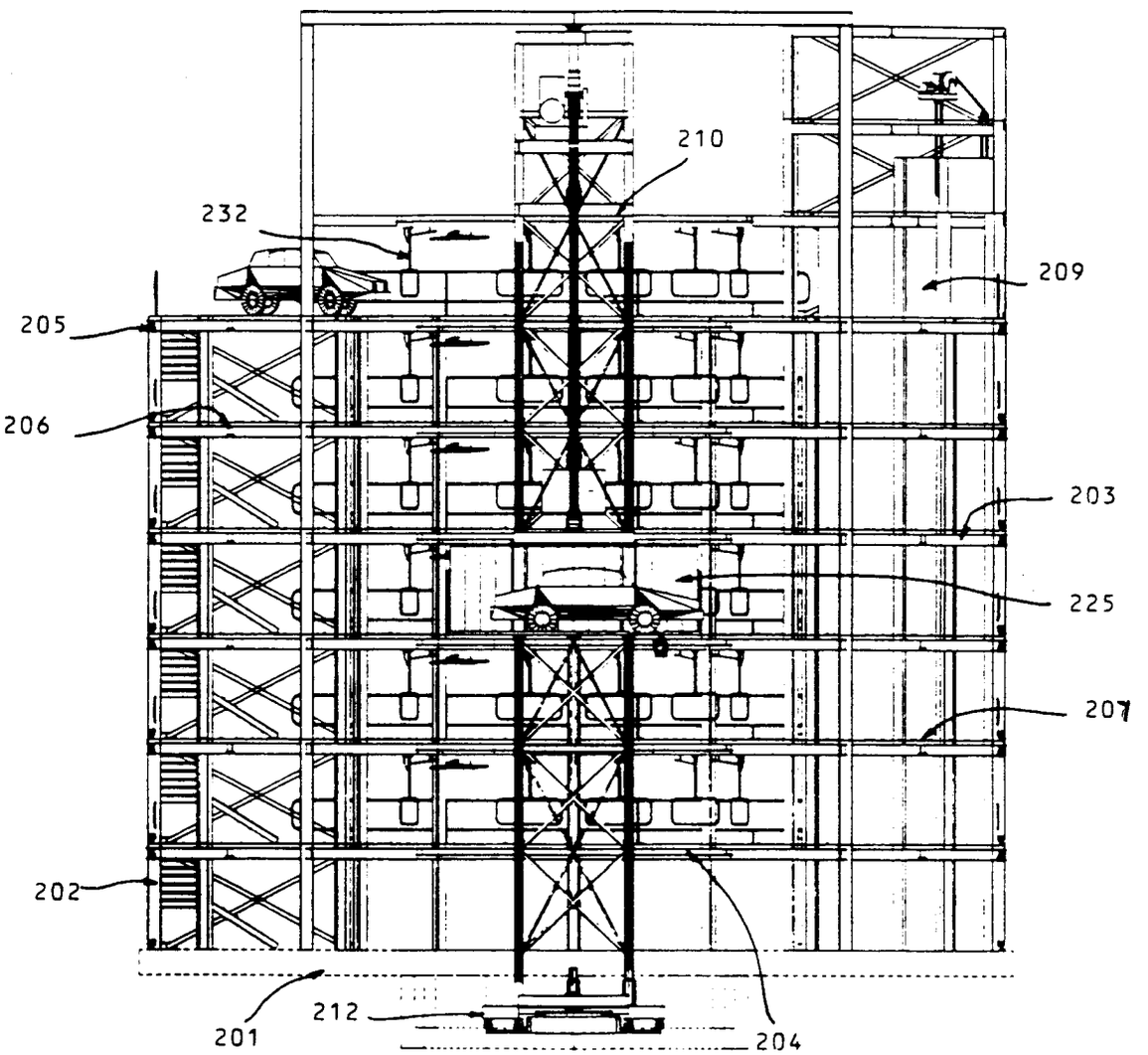
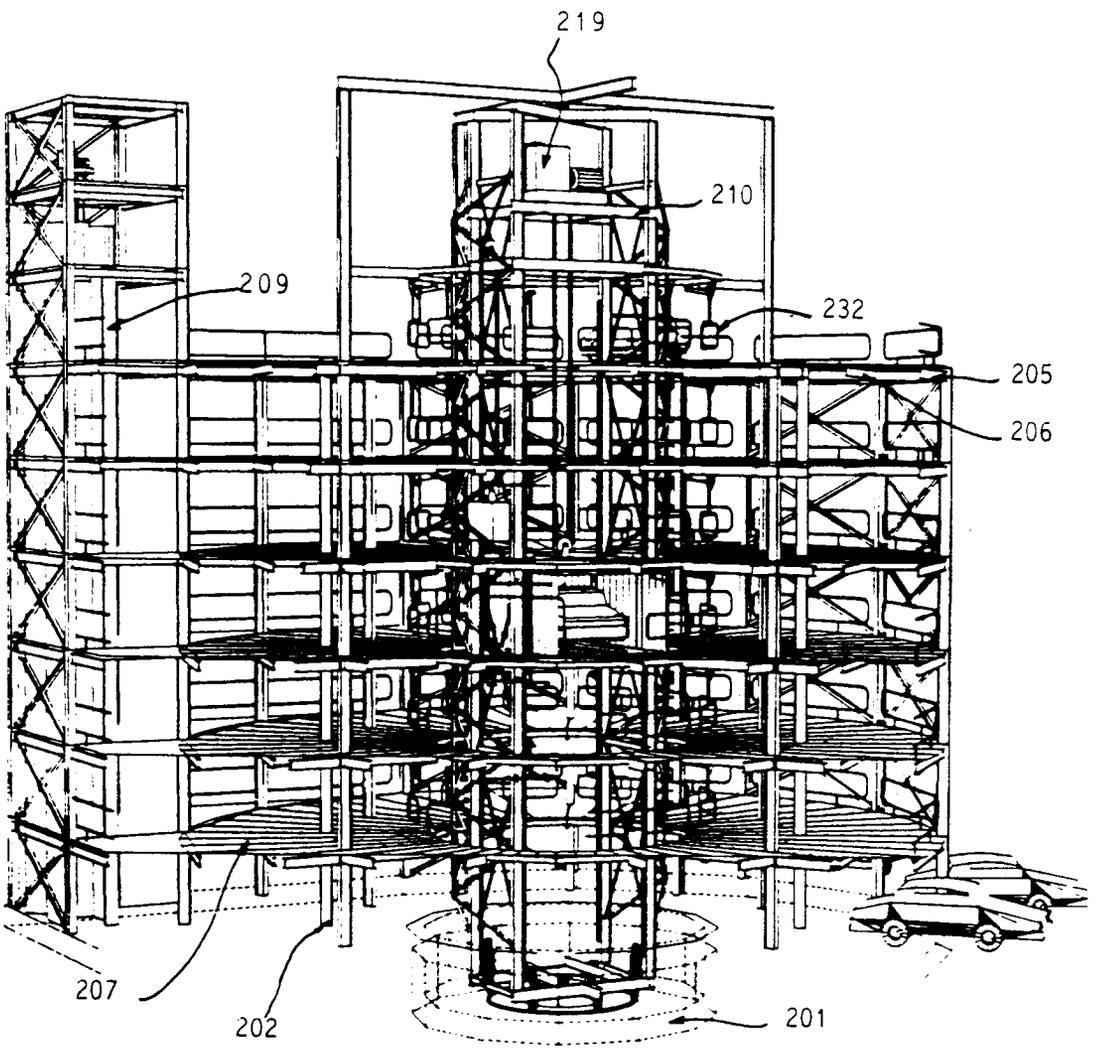


FIGURA 31



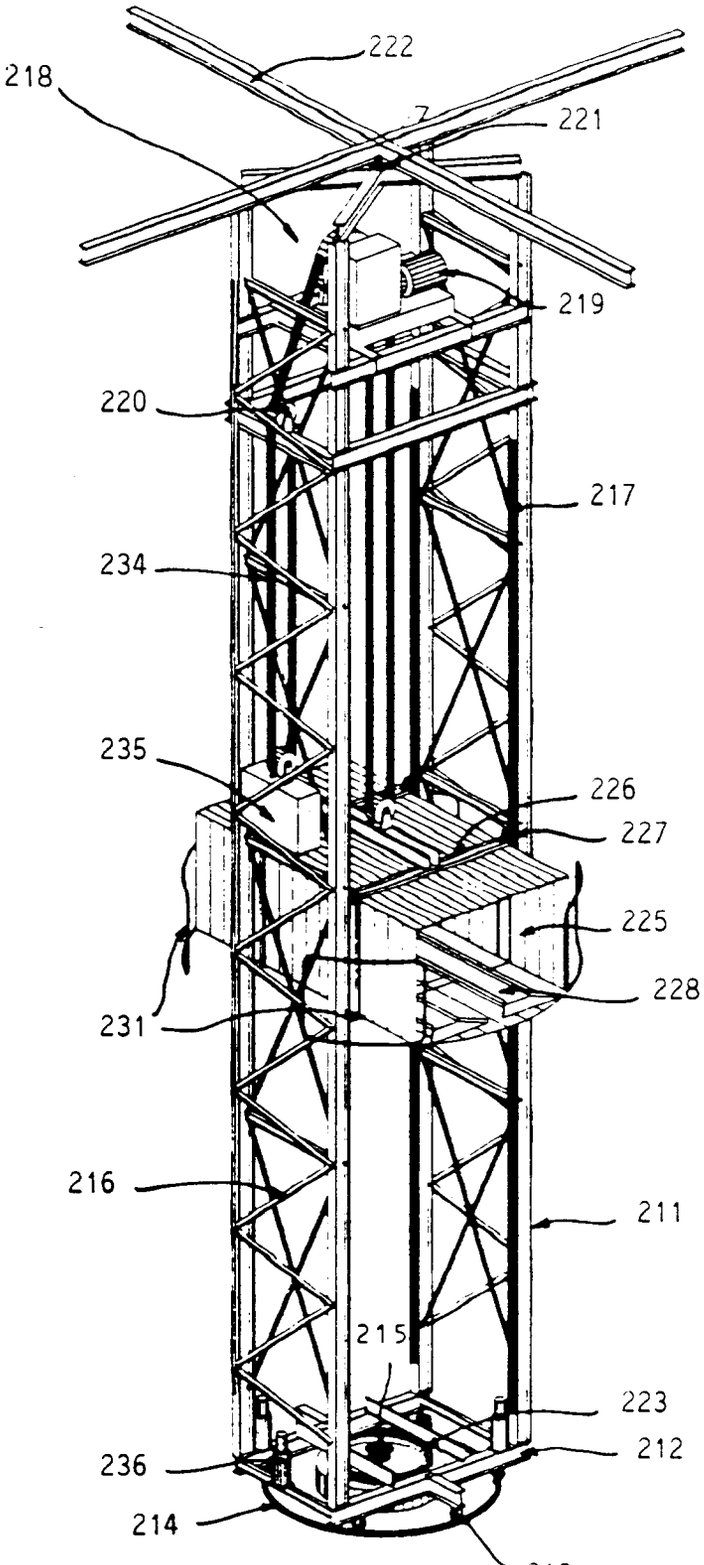

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FIGURA 32

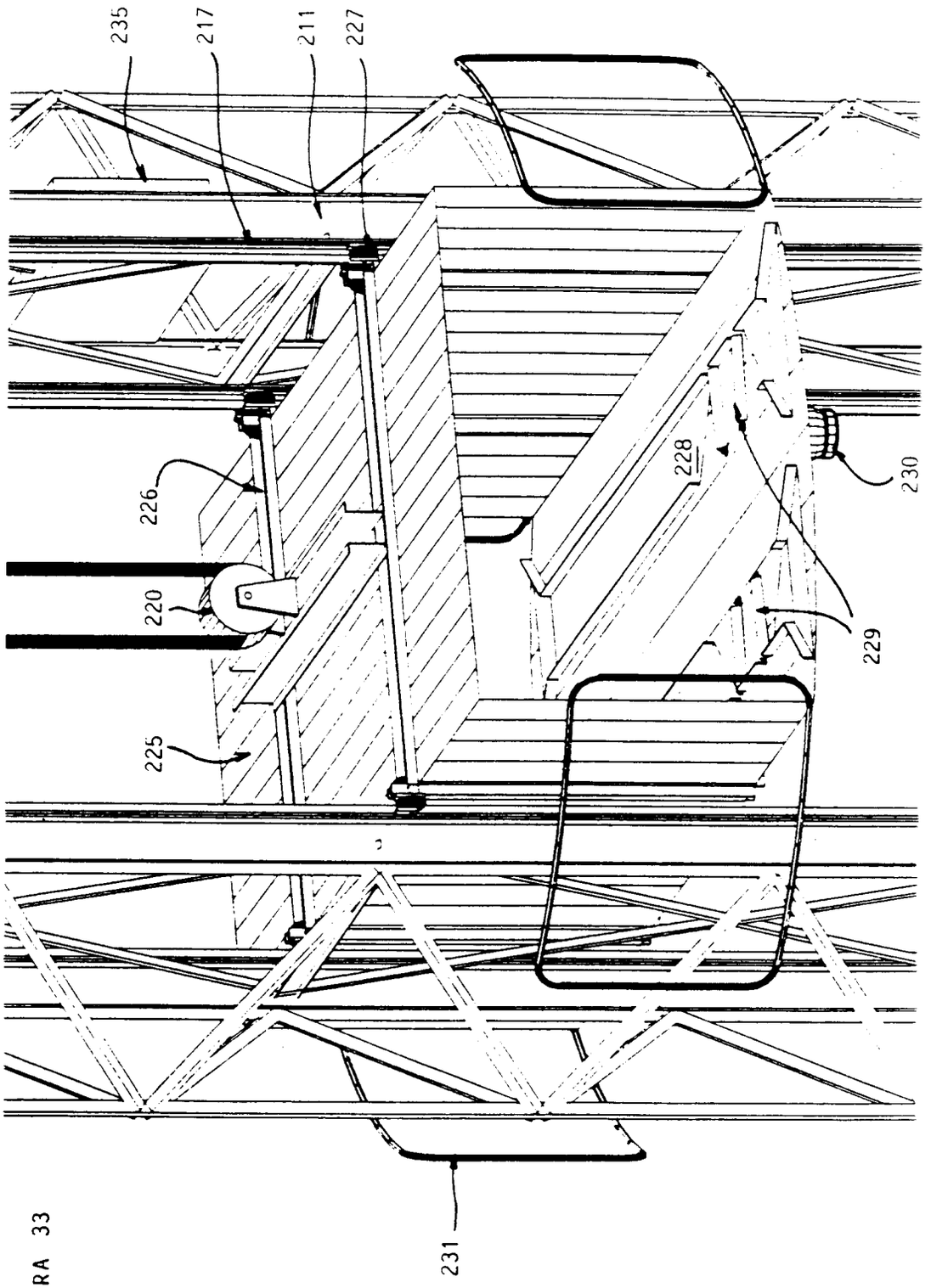

FIGURA 33

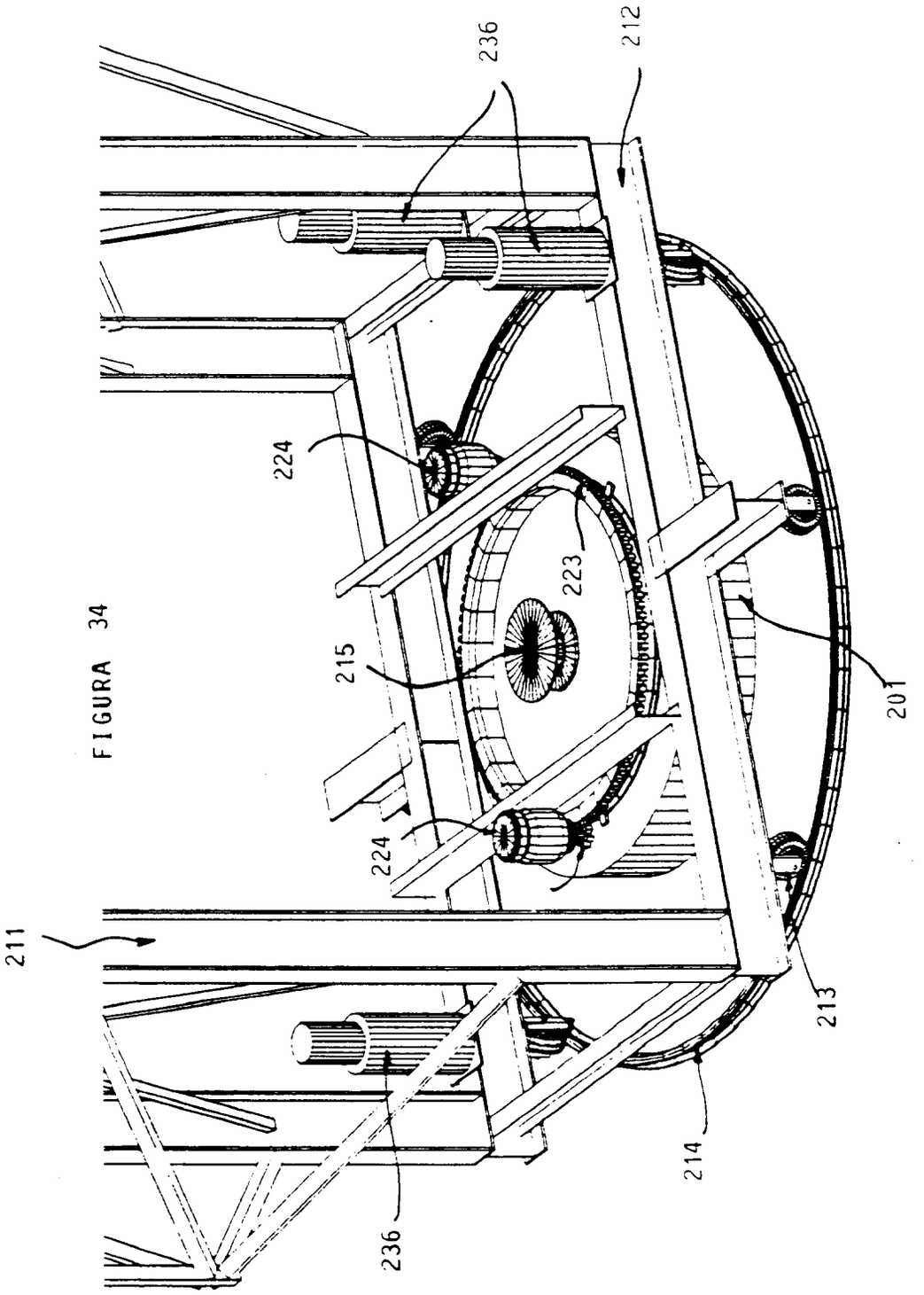

FIGURA 34

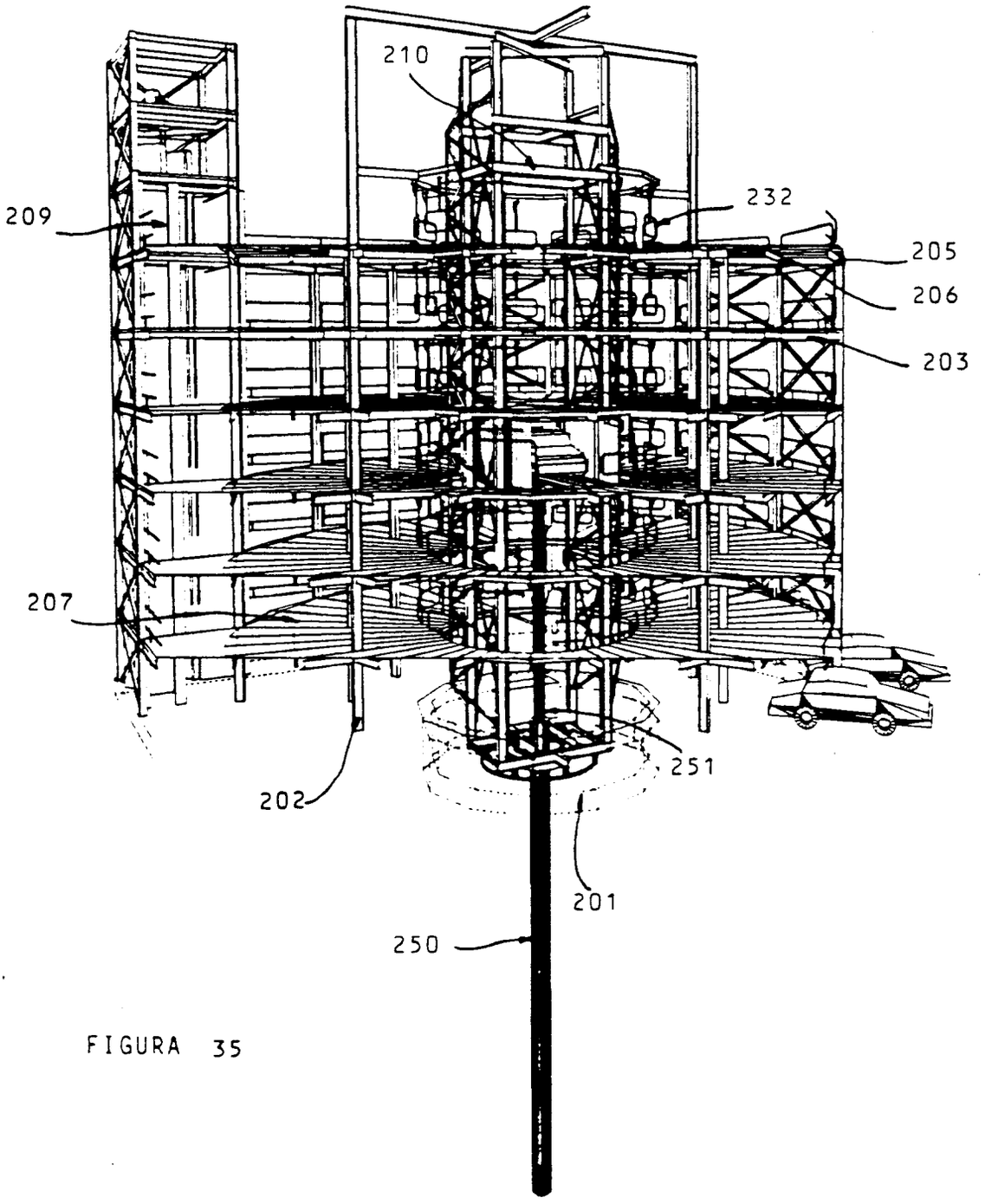

FIGURA 35

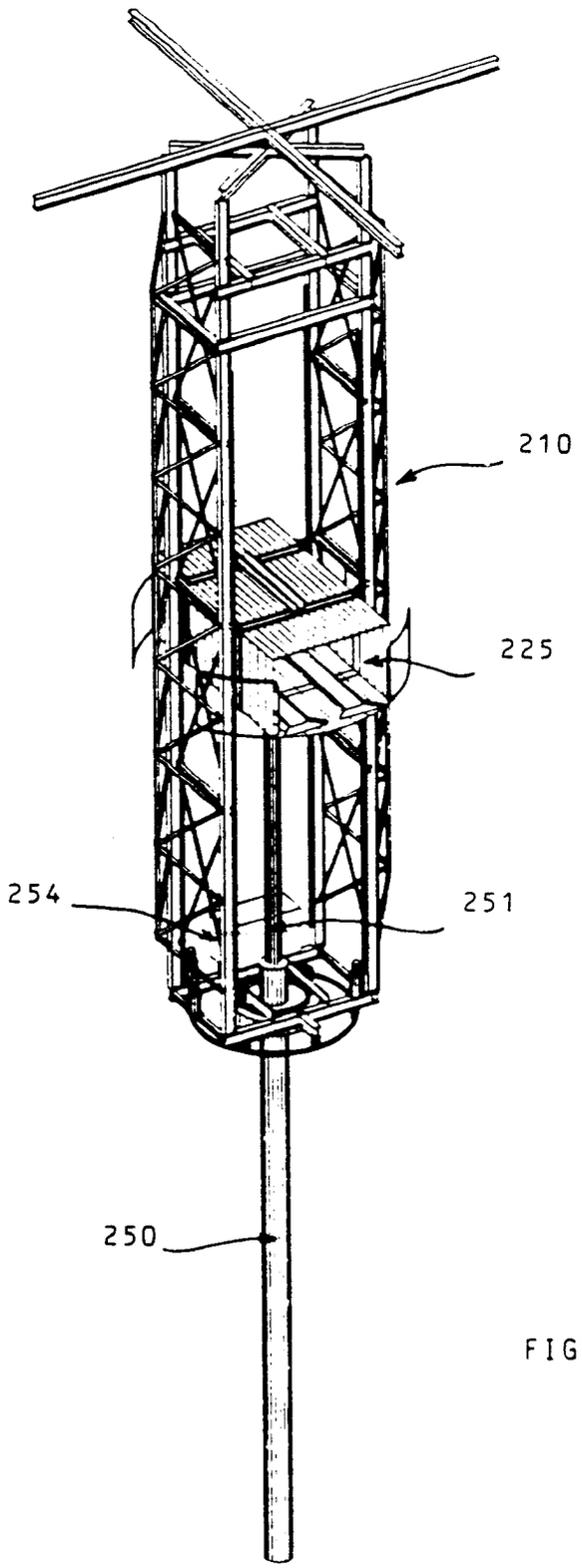

FIGURA 36

FIGURA 37