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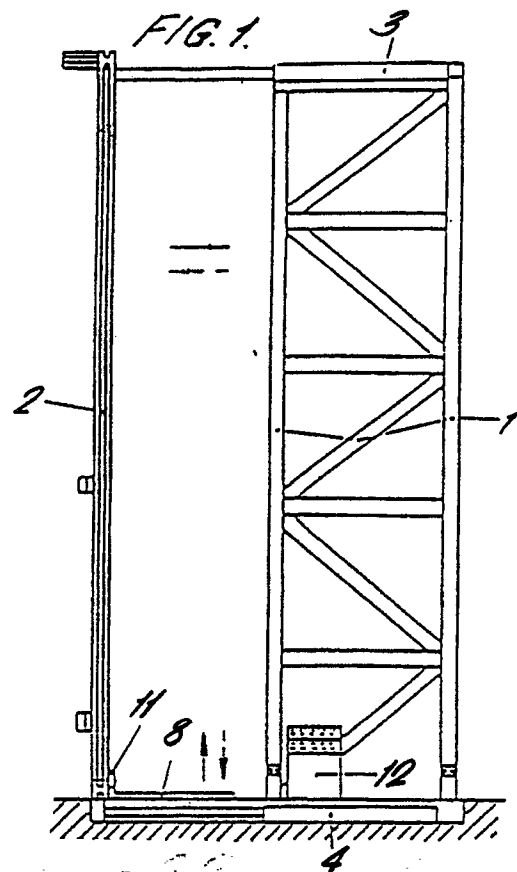
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(54) **Automobile vehicles stack parking system.**

(57) An automobile vehicles stack parking system comprises a fixed structure (1, 13, 21) which contains one or more vertical parking towers, with a number of vehicle parking places characterized by the fact that it is equipped with a movable structure (2, 14, 22) having stacking forks (8, 16, 26) that are movable vertically, the movable structure being horizontally movable.



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AUTOMOBILE VEHICLES STACK PARKING SYSTEM

This invention relates to an automobile vehicle stack parking system.

The ever growing numbers of automobiles in any developed country have corresponded almost always to an also ever growing headache not only for the drivers themselves but also to respective authorities, when either of them are confronted with the parking problem.

The lack of space in the generality of buildings, and the little available area in the places exclusively dedicated to car parks in face of the above referred automobile sales boom leads to the pressing need of finding some solution that permits to make more profitable, not only the free areas but also the volumes thereon.

The present invention provides an automobile vehicles stack parking system comprising a fixed structure which contains one or more vertical parking towers, with a number of vehicle parking places characterized by the fact that it is equipped with a movable structure having, stacking forks that are movable vertically, the movable structure being horizontally movable.

The parking system that is now offered, and as a consequence the stacking units corresponding to its practical execution can either be used in underground parking lots or in those located above ground level or also in those extending below and above ground.

As can be understood, in the private parking lots or in the public parking lots that are of great area and enough height, the use of the system in accordance with the present invention will permit the number of vehicles that can be parked on them to be increased.

The structures of the stacking units can be constructed for a variable number of vehicles and for vehicles of several dimensions.

The arrangement of the several stacking unit systems inside the available area can vary from case to case, in accordance with local requirements and conveniences, and with the side through which must be made the entrance and exit of vehicles.

The purpose of each movable structure of each stacking unit is to receive the vehicle, install it in an empty place, extract it from the said place and return it to the client.

The movable structure can be of two kinds: one that is supported at the top and at the base of the fixed structure, and the other that is only suspended from the upper part of the fixed structure, without any lower supporting means, thus avoiding the lower support wheels and thus also the problems inherent with the maintenance of respective

tracks exempt from detritus if there are any. So a supported movable structure and a suspended movable structure are here considered.

The fixed structures can be constituted by modules in order to make easier the transportation, assembling or transfer to another place.

The modular conception and construction allow for the settling in lateral mechanical gemination with the advantage of making easier the assembling and of reducing the common uprights.

In the case that the stacking units are provided with two towers each one of said towers can present the same number of parking places.

The movable structure corresponding to the fixed structure with one sole tower makes the horizontal approaching and withdrawing movements to and from the fixed structure in a perfectly balanced way preferably under the action of two hydraulic or pneumatic jacks fixed upon the upper part of the fixed structure, and two jacks of the same type mounted upon the lower part of said structure or only two jacks upon the lower part, the action of said jacks being controlled from a position where multi-purpose electronic control devices are provided.

All the parking places inside the fixed structure may be provided with a removable palette. Usually these palettes have oil drop collecting zones in order to prevent oil drops from landing upon the vehicle that is parked below, the palettes having also, usually, high frictional zones for the vehicles tyres to settle on, and near each one of the tops thereon there is a flexible pole or other auxiliary devices in order to ensure that the vehicle is well centered upon the palette.

Another possibility is that the palette be provided with guidance rails to guide the vehicle's wheels and with stop shoulders that allow the driver to know when the car has reached the correct position.

Also a possibility is detecting electronic devices that signal acoustically and by means of lights any eventual deviation even when this one refers to the large dimensions of the vehicle and/or of its exterior bulk.

The section of the profiles used to build each one of the stacking units, and obviously their dimensions are a function of the type of vehicle to each they are appointed to and of the number of vehicles to be stacked.

The hydraulic and electronic controls for the units can be individual or collective, i.e. placed on a sole control panel for each parking lot and if justified, having inclusively recourse to the utilization of closed circuit television, not only as control

auxiliaries but also as security and surveillance means.

The electronic control unit for the several steps necessary to the parking operation memorises the number of vacant or filled places inside the tower.

The above referred electronic unit works in association with periferic devices to be defined by the entity that manages the parking lot. Those periferic devices will constitute some means for the stocking of data such as: starting date-hour of the parking operation, position occupied by the vehicle inside the tower, identification of the tower, etc.

The magnetic or punched card which the client receives when leaving his vehicle to the parking unit functions, as can be understood, as a personal and untransmissible ticket for the withdrawing of the vehicle.

If wished an automatic collection system can be introduced that can function with currency or credit cards.

The elements that constitute the hydraulic system are protected against overload and bursting of tubes, said protection assuring the immobilisation of the system till an eventual manual operation, if that is considered as necessary.

The parking units can also be provided with equipment that allows the vehicles to be removed from the tower in case of occurrence of an interruption in the electric power supply, in which case the electronic equipment does conserve intact its data records for a rather long period of time.

The stacking forks which are part of the movable structures and of which their function is to carry upon them the palette with the automobile vehicle on it, go up and down by the action of preferably a jack or hydraulic or pneumatic winches fixed thereon.

As has been referred the stacking units can have one or two towers. In one example the movable structure has only one tower at one of its sides, and in the second example it has two towers, one at each side.

When the stacking units are located at both sides of the movable structure, this one, as it is double, is provided with stacking forks at both sides as can be well understood, and there may be hydraulic jacks or winches controlling the ascent and descent of the forks for each side.

The movable structures with their single or double set of forks move themselves horizontally, towards and away from the stacking units, under the action of devices that may be hydraulic or pneumatic.

All the above referred movements are damped at start by the introduction of a slope for acceleration and deceleration electronically controlled in the action of the electrovalves responsible for the regulation of the flow supplied to the several hydraulic

or pneumatic devices.

In the accompanying drawings:

Figure 1 is a complete side view of a unit of the vehicles stack parking system constituted by a tower for six vehicles and a supported movable structure;

Figure 2 is a whole plan view corresponding to Figure 1;

Figure 3 is a plan view of a palette;

Figure 4 is a rear view of the fixed structure of a unit as shown in Figure 1;

Figure 5 is a front view of the movable structure of a unit as shown in Figure 1;

Figure 6 is a complete front view of a unit of the vehicles stack parking system comprising a double tower for fourteen vehicles, and a suspended movable structure;

Figure 7 is a side view of the suspended movable structure of a unit as shown in Figure 6;

Figure 8 is a complete plan view corresponding to the view of Figure 6;

Figure 9 is a side view of a stacking unit with two towers, one at each side of the supported movable structure;

Figure 10 is a simplified representation of a stacking unit of the type shown in Figure 9, with all the places located above ground level;

Figure 11 is a simplified representation of a stacking unit of the type shown in Figure 9 with four of the 12 places located under ground; and

Figures 12, 13 and 14 are a plan view of three different ways for the disposition of the stacking units comprising a tower in accordance with the available area existing for that effect.

In its general lines the stacking unit that is constituted by one tower (Figures 1, 2, 4 and 5) comprises a fixed metal structure (1) and a supported movable metal structure (2).

The horizontal movement of the supported movable structure (2) is effected in a perfectly balanced way either in one direction or the other, by the action of double acting hydraulic jacks or winches (3) and (4).

Stacking forks (8) function inside the supported movable structure (2) and are acted upon by means of double acting jacks (9) anchored to profiled elements (10) connected to the structure, and that do act upon a straight bar (11) that interconnects and anchors the forks.

The control of the stacking unit is made from a control panel (12). Considering that in the resting situation the supported movable structure (2) is, for instance, with its forks (8) located under a palette (5) which has upon it a vehicle parked during the last parking operation, the command for a new parking operation determines the removal of structure (2) from structure (1), the descent or ascent of forks (8) to the level of the nearest vacant place,

the approaching movement of the movable structure (2) to the fixed structure (1), a slight uprising of the vacant palette by forks (8), the removal of movable structure (2) from the fixed structure (1), and descent of the forks with the palette put on them in order to receive the new vehicle, the ascent of the forks with said new vehicle upon the palette till slightly above the lateral and intermediate profiled support elements 6 and 7 where they put the vehicle upon.

In a general way the stacking unit constituted by a double tower (Figures 6, 7 & 8), comprises a fixed metal structure (13) and a suspended movable structure (14).

The horizontal movement of the suspended structure (14) is effected in a perfectly balanced and stable way, by the action of hydraulic actuators (15) (Figure 7) very quietly.

Stacking forks (16) that function inside the suspended movable structure (14) are actuated by means of hydraulic winches (17) anchored to the structure's upright (18), which winches do move inside vertical bars (19) (Figure 7) that constitute the legs of the suspended movable structure.

Suspended movable structure (14), because it presents an adequate form due to the fact of being suspended from upper part (20) of fixed structure (13) of the rolling cantilever bridge type, and of being intended to support important loads, has the freedom of horizontal motion that allows the closing in and drawing away movements of the movable structure relative to each one of the two towers that constitute a double tower.

The upper places (A) having some protection rails allow not only the parking of high box vehicles, allowing a space that otherwise would be only occupied by the hydraulic winches, to be profitably utilised.

The stacking units with two towers A and B each one of them located on opposite sides of a supported movable structure (Figure 9), comprise fixed structures (21) constituted by six places in each tower, and in each of the places there is the profiled supporting elements for the corresponding palette (5).

Movable structure (22) is rectangular in shape and presents at each of its corners a profiled element (23) that corresponds to the upper and lower parts of fixed structures (21) of the two towers by means of some wheels (24) which in conjunction with wheels (25) make possible the to and fro movement of the supported movable structure (22) relative to both towers.

Supported movable structure (22) comprises stacking forks (26) provided with separate controlling and signaling means.

When there is a vacant place inside either tower of the parking unit, a green light located in a

convenient place will be lit informing the user of this fact. In this case the gate (not represented) that limits the admission and exit of vehicles is raised and under one of the sets of forks (26) there is a palette which is appointed to receive the vehicle to be parked.

The user drives his vehicle onto the palette, brakes it, puts the gears into neutral, switches off the engine, gets out of the vehicle and presses the button that starts the parking operation. When the button is pressed, photoelectric cells determine the dimensions of the vehicle and/or its load, and if these do not exceed the maximum values allowed for the vacant place, the above mentioned gate is lowered and the forks (26) rise to the vacant place and stop.

If we assume that the used palette pertains to an empty place in tower A the movable structure (22) then closes in to this tower, passes with the palette occupied by the vehicle slightly over the profiled supporting elements (not visible upon the figure), stops to permit the slight descent of forks (26) to deposit the palette with the vehicle on it over the referred profiled supporting elements.

Once the parking operation of the vehicle is executed, the movable structure (22) extracts a new palette by means of forks (26) and puts it at ground level for the next parking operation.

When a parking operation is in the course of execution the gate of the stacking unit is kept down i.e. in the position it had before the forks had started their raising motion, to avoid the entrance of a vehicle or person that might be damaged or injured by the motion of structure (22) or of forks (26) themselves. Thus the lifting of the gate will only take place when a new palette has been put at ground level, and all and any motion of the system has ceased.

If the photoelectric cells verify that the dimensions and/or the load of the vehicle to be parked exceed the admissible limits of the system, control is blocked, and a strong acoustical signal is heard and a light comes on informing the user that he must withdraw his vehicle.

The withdrawal of the vehicle is made by executing in reverse order the operations referred when its first positioning over the palette took place.

Figures 10 and 11 are examples of two possible ways of installation for the example of Figure 9, where respectively one shows the existence of 12 places located above ground level and the other that four of the 12 places are located under ground level. This solution with the tower being partially underground can happen too in the case of towers located at only one side of the movable structure.

Figures 12, 13, and 14 represent some examples of dispositions that can be adopted for several

stacking units. As an example, and accepting that each one of the units shown has a six place tower too, one would have for these examples total capacities of 30(5x6), 48(8x6) and 60(10x6) places, constituting thus an efficient use of respective areas and height.

It is important to note that, either in the case of stacking units with just one tower or in that of stacking units with two towers located each one at one side of the movable structure, the connection of a unit to the one laterally adjacent to it is made by means of screwing or, in a preferred embodiment, by the use of same lateral upright, which permits an excellent utilisation of material and the easy transportation of the structures for each of the units to the assembling place.

Claims

1. Automobile vehicles stack parking system comprising a fixed structure (1, 13, 21) which contains one or more vertical parking towers, with a number of vehicle parking places characterized by the fact that it is equipped with a movable structure (2, 14, 22) having stacking forks (8, 16, 26) that are movable vertically, the movable structure being horizontally movable.
2. Automobile vehicles parking system as claimed in Claim 1, characterised by the fact that it is equipped with a movable structure, with a generally rectangular form that presents at each of its corners a profiled element corresponding to the upper and lower parts of the fixed structures of both towers by means of guided ball bearings upon which they rest, and have the freedom of horizontal motion.
3. Automobile vehicles parking system as claimed in Claim 1 characterised by the fact that it is equipped with a movable structure with the general shape of an inverted "U", that it is supported for horizontal movement solely on the upper part of the fixed structure, being suspended without any lower support means.
4. Automobile vehicles parking system claimed in Claim 1, 2 or 3, characterised by the fact that the movable structure (22) is equipped with two sets of stacking forks (26) one at each side.
5. Automobile vehicles parking system as claimed in any preceding claim, characterised by the fact that in these movable structures the entrance and/or exit of vehicles in from either side for which reason some means is provided in order to make easier the correct positioning of the vehicles, either if the entrance is made through one side or the other.
6. Automobile vehicles parking system as claimed in any preceding claim, where the sectioning of

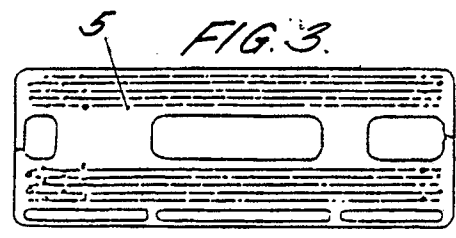
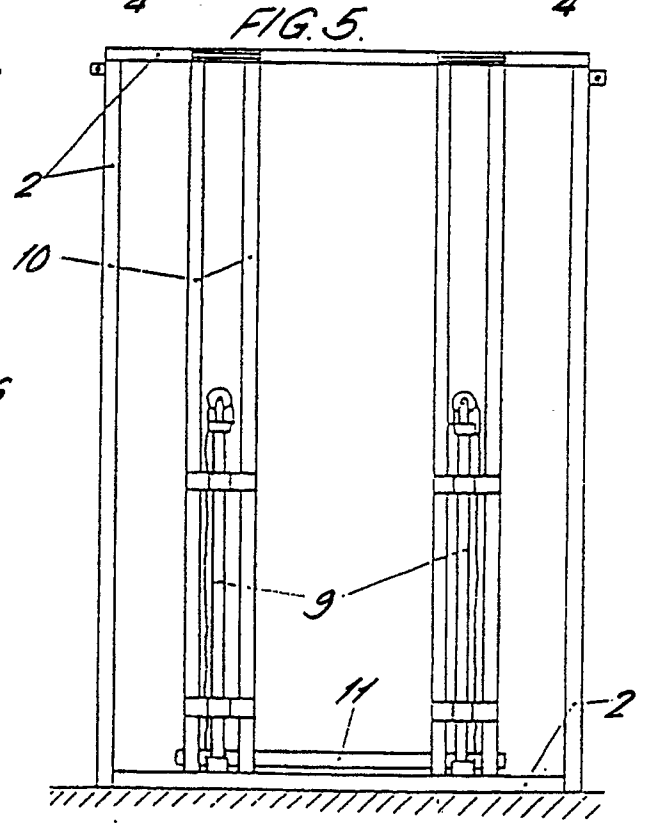
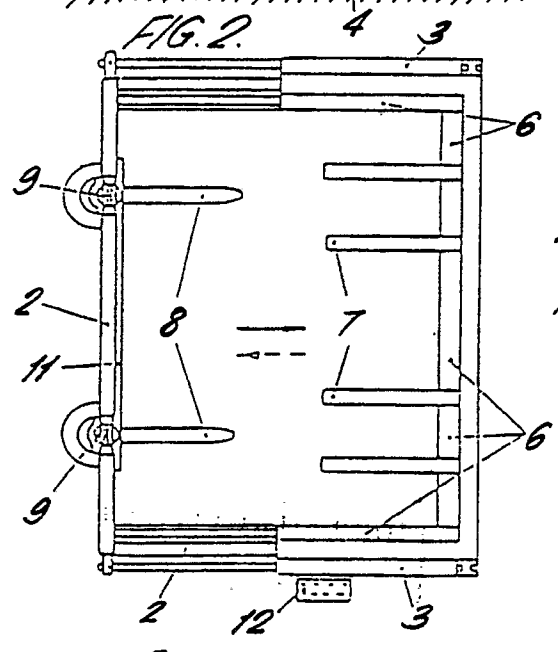
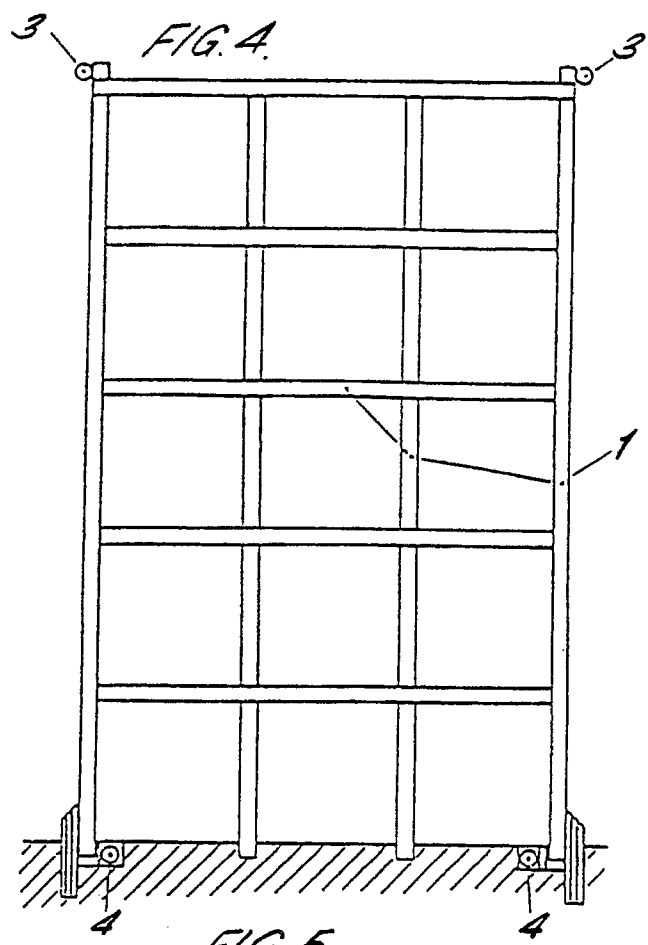
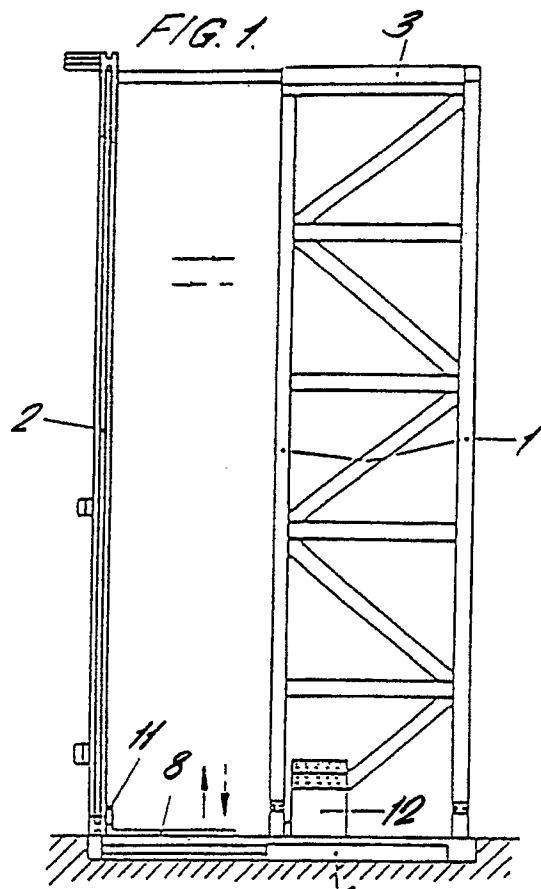
material and building details of each stacking system structures is determined by the number of places that the available vertical distance allows to adopt and to the dimensions and weight of vehicles it is intended to park in each tower characterised by the fact that the connection between the fixed metallic structures of a unit and the adjacent units when present is made by mechanical tightening and that its modular construction permits the lateral mechanical gemination of units set side by side by means of uprights common for each two systems.

7. Automobile vehicles parking systems as claimed in any preceding claim, characterised by the fact the movements of the structures are damped at starting and stopping by the introduction of an acceleration slope with electronic control in the action of the electrovalves responsible for the hydraulic/pneumatic organs.

8. Automobile vehicles parking system as claimed in any preceding claim characterised by the fact that the control of the several steps necessary to each parking operation and returning of vehicles is assured by an electronic unit that memorises the number of empty or occupied places and their position inside the towers.

9. Automobile vehicles parking system as claimed in any preceding claim, characterised by the fact that it possesses one or two protection bars according to the fact that the entrance of vehicles is made through one or both sides of it, and said protection bars are closed whenever the movable structure is in motion or absent from the entrance of vehicles level, said bars being controlled by an electronic circuit based on the use of photoelectric cells and respective luminous and acoustical periferic devices, which devices not only cooperate for the correct positioning of the vehicle but also permit to measure all its dimensions and compare them with the permitted dimensions and available inside the system, and the uppermost parking space of each tower can receive a vehicle of greater dimensions than the dimensions of the vehicles occupying the other stages although inside some limits.

10. Automobile vehicles parking system as claimed in any preceding claim, characterised by the fact that the palettes are usually provided with oil drops collecting zones to prevent oil falling onto the parked vehicle, high friction zones for the seating and guidance of vehicles' tyres, and two flexible poles and/or other means placed at each top of the palette in order to help the user putting its vehicle duly centered.



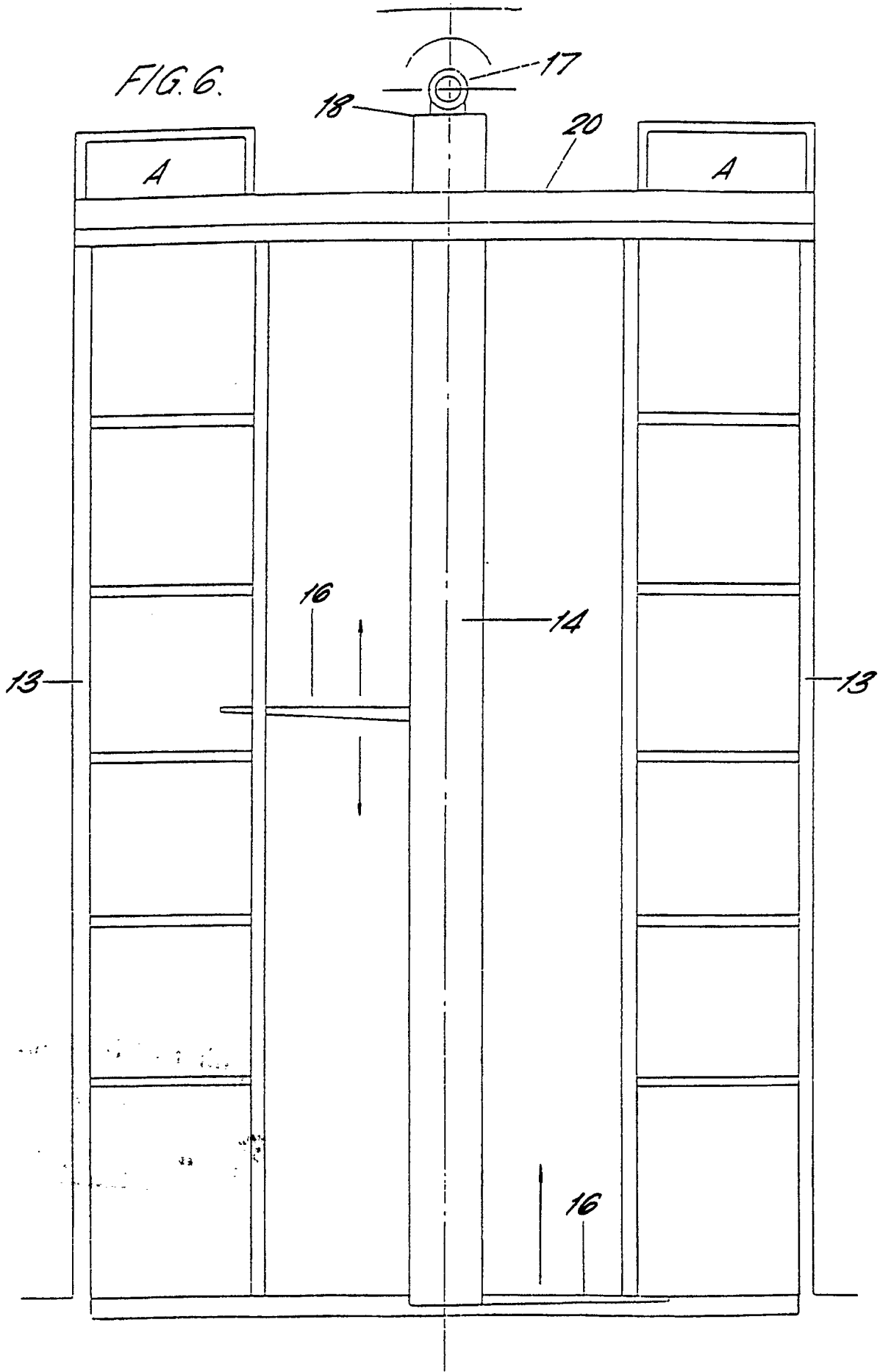
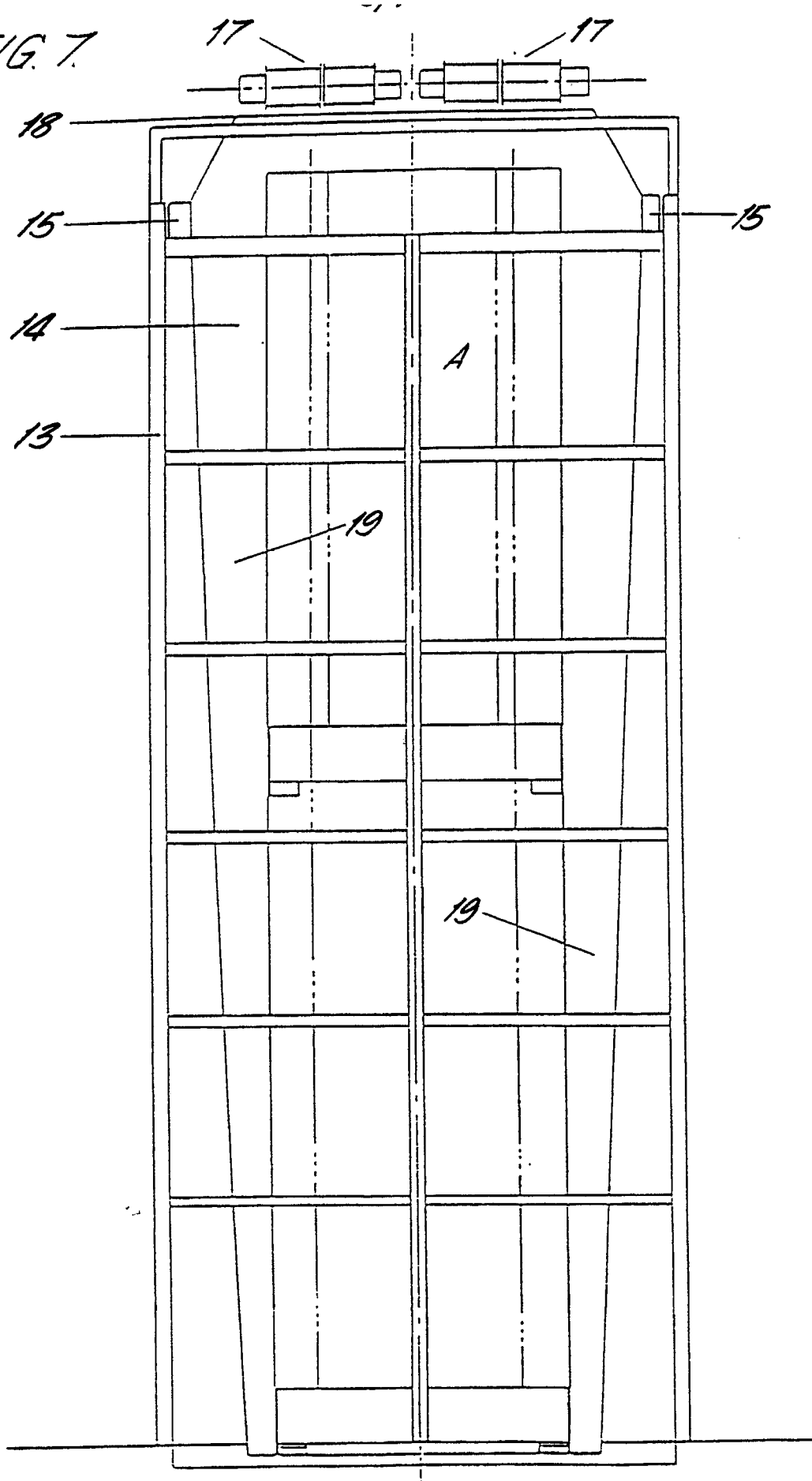
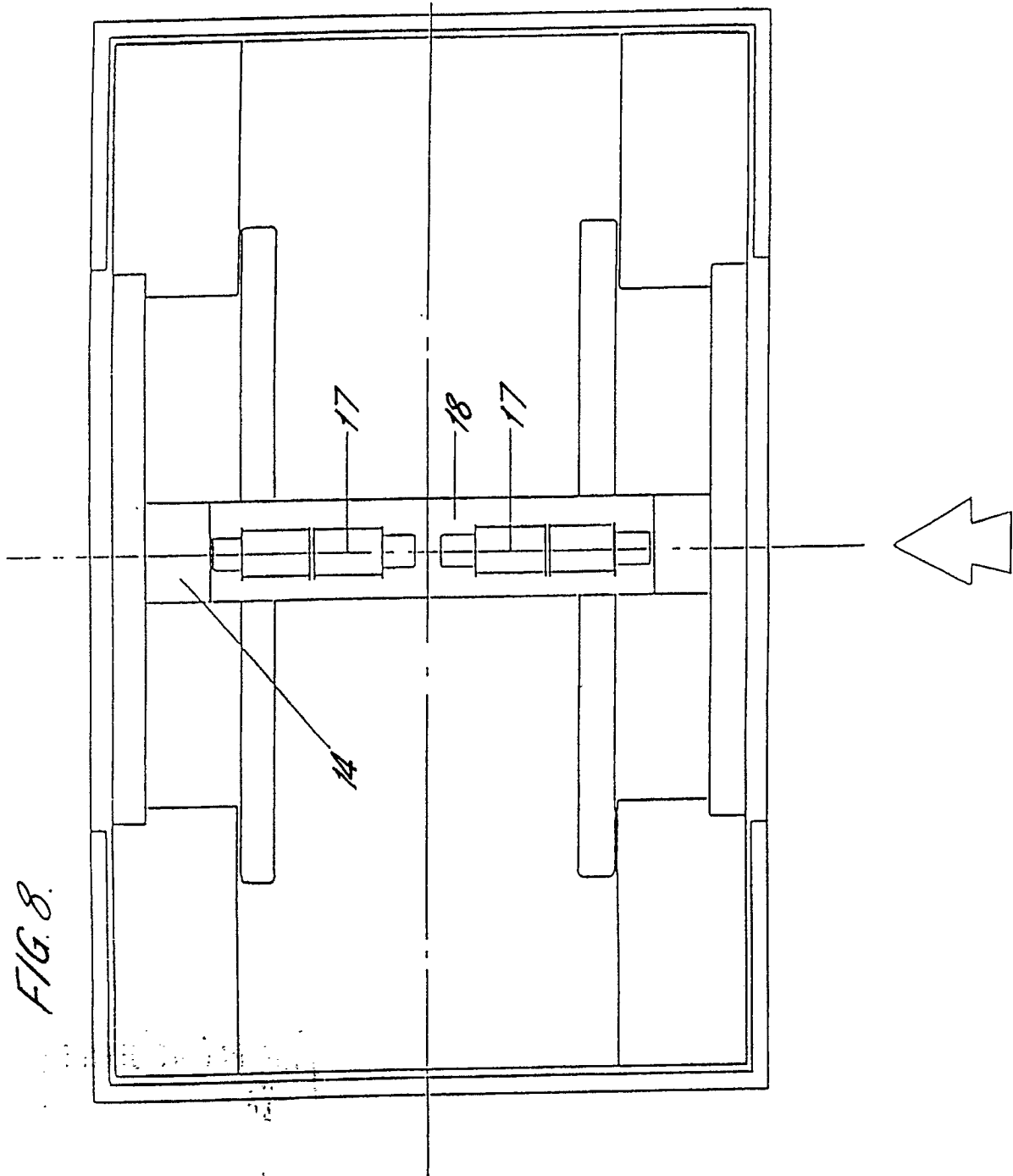


FIG. 7.





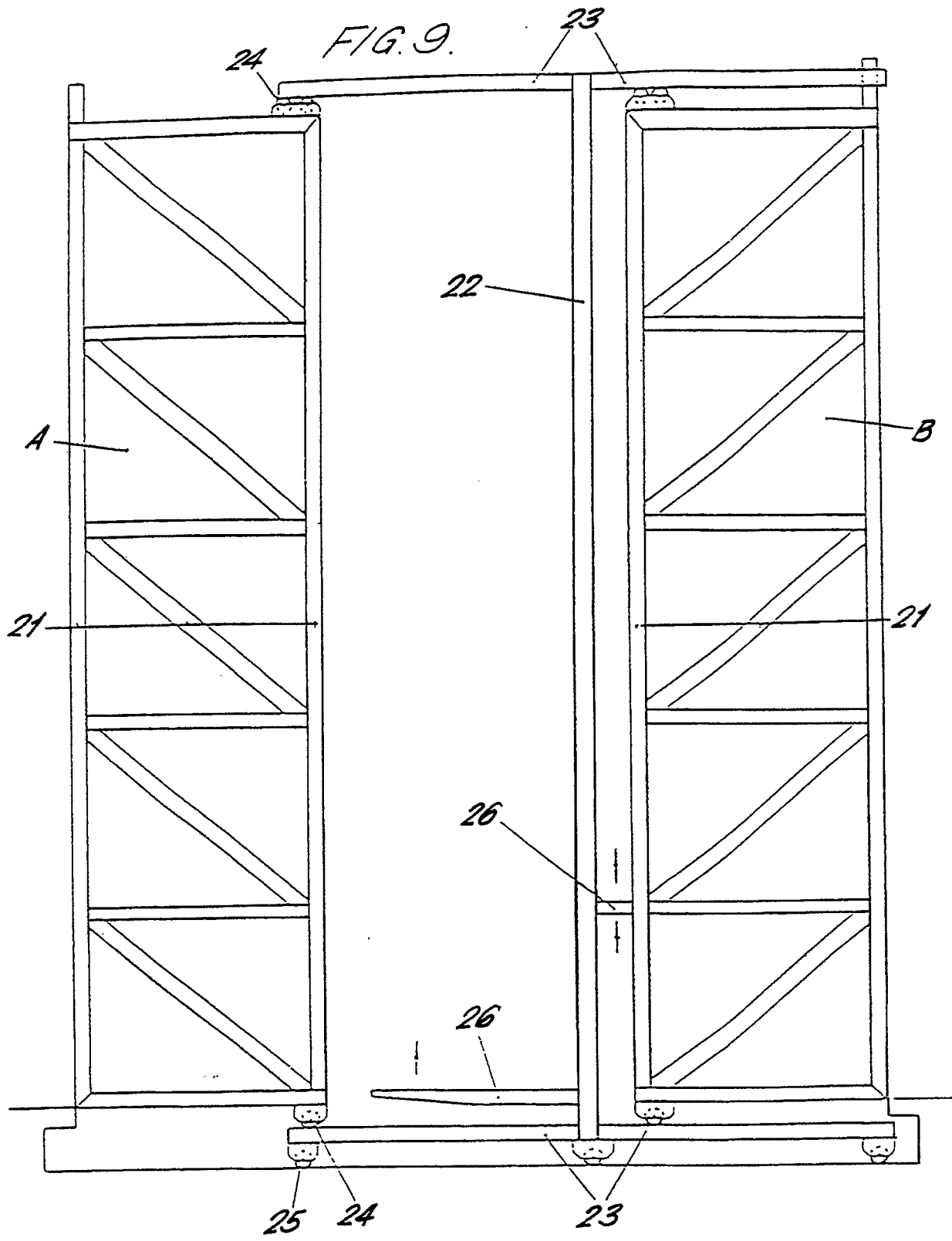


FIG. 10.

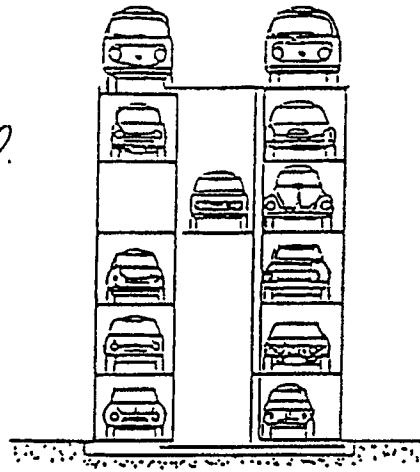


FIG. 11.

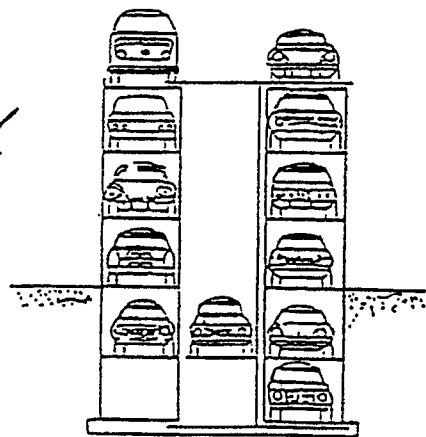


FIG. 12.

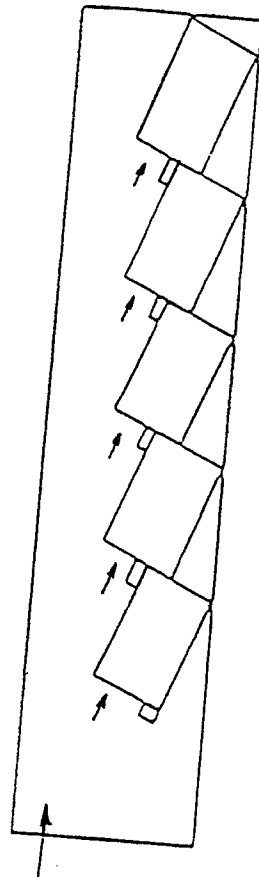


FIG. 13.

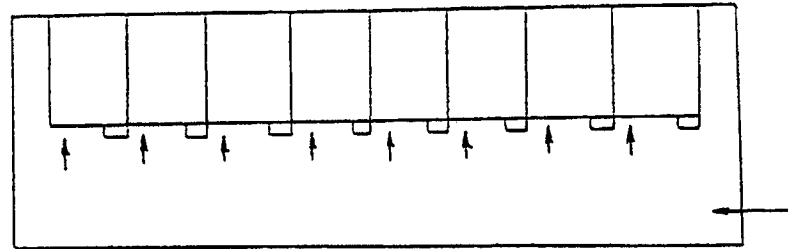
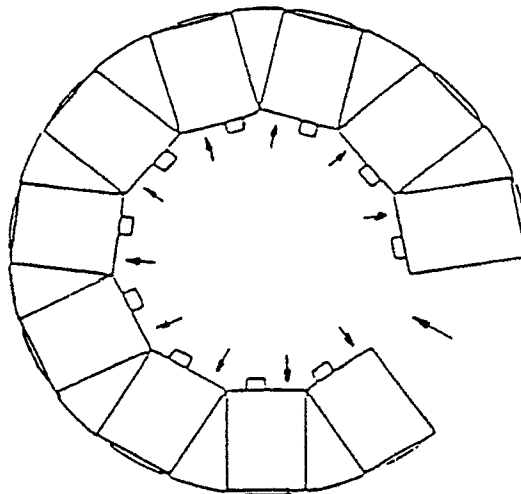


FIG. 14.





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	WO-A-8 808 476 (B.T.C.S. S.R.L.) * Abstract; page 2, line 21 - page 3, line 27; figures 2-9 * - - - -	1,2,4-8	E 04 H 6/22
Y		10	
Y	EP-A-0 028 541 (EATON-KENWAY INC.) * Page 6, line 8 - page 7, line 22; figures 2,3 * - - - -	10	
X	GB-A-2 166 721 (COMAU S.p.A.) * Page 1, line 69 - page 2, line 87; figures 3-5 * - - - -	1,2,4,6-9	
A	US-A-2 816 624 (ASHEIM & MAYER) * Column 4, lines 37-62; figures 1,2 * - - - -	1-3	
A	DE-A-2 404 057 (D. GRÜNIG) * Page 7, paragraph 4 - page 8, paragraph 4; figures * - - - -	1,5-9	
A	NL-A-7 011 111 (G. KUIPER) * Figures II-V * - - - -	2	
A	FR-A-1 363 135 (R. MONTANEDE) * The whole document * - - - - -	6-8	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
The present search report has been drawn up for all claims			E 04 H
Place of search		Date of completion of search	Examiner
The Hague		08 November 90	KAPPOS A.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention</p> <p>E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons</p> <p>..... &: member of the same patent family, corresponding document</p>			