



166166

DESCRIPTION OF THE INVENTION

MULTI LEVEL AUTOMATED CAR PARKING SYSTEM

Back ground of the invention

1. Prelude

5 Whereas multi level automatic car parking has become a basic infrastructure in the current economic development, besides the demand of fast and safe parking and retrieval, the over dimensional platform carriers, that too in large numbers, posed a challenge for handling and storage. There is a time gap between handling two successive cars. When a number of cars report simultaneously for parking as it happens during peak hours, the pressure on the system is so much
10 as to cause a virtual breakdown. Cars reporting for parking have to wait in queue causing irritation to clients besides creating traffic congestion. Similarly, when the requests for retrievals pour in heavily at the closing hours, the system becomes unmanageable and goes haywire. So far no workable solution has emerged with the result that the growth of the multi level automatic parking systems is hindered.

15 2. Prior Arts:

Description:

The prior art by the U.S. Patent 5, 024, 571 dated 18.06.1991 stipulates one elevator for every entry and exit. The prior art thus deploys quite a good number of elevators to answer the simultaneous requests for parking and delivery. This has limitations and further adversely affects cost
20 effectiveness and space saving. There are separate exit and entry points in the prior arts, and the transfer of platform carriers from exit to entry point is cumbersome. Some vague attempts have been tried by providing a multi-tier storage inside the elevator. Further guide rails in each parking slot throws big challenge for alignment and maintenance. The technology with endless chain drives, catching dog drives goes with a good number of linkages and hence with more failure points,
25 besides high maintenance prone.

The prior art by the US patent 3,984,012 dt. 5/10/1976 also deploys guiderails in each parking slot and suggests highly complicated technology to provide a sliding mechanism for bridging the gap between the guide ways on the parking slot and that on the transfer platform the pallets handling mechanism is cumbersome.



G00002

The prior art DE 93 053 67 brings out the demands on the system, but fails to suggest suitable means to achieve the results, especially peak-hour traffic management, suggestion of several units (7th paragraph as per translation) and suggestion of pallets handling by slide wagons in the same shaft as vertical conveyor are not cost effective. Again the stacking and reclaiming of pallets falls on the elevator which is not desirable for fast operations.

The prior art by our own patent no. 201913 (India) which stands as prior art, effectively solves the drawbacks and disadvantages of earlier prior arts in the areas of simplicity, space saving and compactness. Hence the system was limited to two wheelers of limited capacity where platform carriers are of manageable dimensions and weights and queuing two wheelers are of no serious consequence to traffic because of their size.

In fact none of the prior art patents describe a system which has the characteristics of speed, fault tolerance and low energy consumption required for a modern practical system. In short, handling of over-dimensional platform carriers in large numbers and the peak-hour pressure on the system remain unaddressed. Again redundancy or fault tolerance measures are not suggested. The fact that none of the patents have been commercialized so far, in spite of the heavy demand for the system is a serious question

3. Invention

This invention, therefore, is to overcome the drawbacks and disadvantages of the prior art systems and to offer multi level, automated car parking system in which the cars are stored into and retrieved from addressed slots automatically in simple, practical, safe, speedy, reliable, user-friendly and cost-effective manner, in which cars to be parked are simultaneously received, in which retrieved cars are placed for simultaneous delivery and in which the platform carriers are automatically put into use when required and stack piled when not in use.

4. Objective

The main object of the present invention is to provide a system in which cars are stored into and retrieved from addressed slots automatically in simple, practical, safe, speedy, reliable, user-friendly and cost-effective manner.

It is another object of the present invention to deploy more number of relatively less expensive transfer modules for simultaneous operations on all parking tiers for the optimum utilization of the highly expensive elevators and thereby ensure quick parking and retrieval.

It is another object of the present invention to provide a system for storage and handling of the over-dimensional heavy platform carriers automatically in safe, efficient, reliable, fast and cost effective manner to answer the present demands of 'fit and forget' trend.

5 It is another object of the present invention to open more entry/exit points to allow simultaneous placement of cars for parking/delivery without waiting.

It is another object of the present invention to relocate the entry and exit points with ease to meet the peak hour demands for effective user orientation.

10 It is another object of the present invention to introduce a buffering system in between the reception /delivery and handling system and thus enable to receive a plurality of cars requiring parking, without wait and to park the cars without pressure and to process a plurality of retrieval requests and place a plurality of retrieved cars on the delivery station to enable the clients to take delivery of their cars without undue wait.

15 It is another object of the present invention to allow acceptance of cars for parking, parking, retrieval and delivery of retrieved cars, all simultaneously without operational hindrance to each other.

5. Salient Features:

The present invention

20 a) has a building structure with plurality of tiers ,one or two lowermost tiers exclusively meant for parking and delivery(hereafter termed parking/delivery stations) with more floor height than the rest of tiers and with plurality of entry and exit points both for cars and persons and rest of tiers for storage of cars(hereafter termed as parking tiers).

b) each parking tier has a runway at its centre with fixed track running along the line of parking and a number of parking slots on either side of the runway. Each parking tier has one or more transfer modules.

25 c) a transfer module is a steel structure frame and is like a trolley with wheels with independent drive and with reverse option. The transfer module has two levels; one at the top to carry platform carriers and second at a lower level to accommodate a fixed second track running transversely to the track on which it is moving and a power arm - type1

30 d) a power arm type-1 is a steel structure frame and is a trolley like structure with wheels with independent drive and with reverse option, moving transversely to the line of parking. The power arm- type1 is so positioned that it can move under the platform carrier .the power arm-type1 has an

electrically/hydraulically/magnetically operated lifting means to enable movement of power arm-type 1 beneath the platform carrier with car for pushing/pulling the platform carrier into/from the parking slots from either side. The lifting means has an electromagnet/hydraulic at both ends to make and break contact with the platform carrier to move.

- 5 e) Has one or more elevators oriented along the line of parking. Each elevator is capable of carrying one platform carrier with a car. This elevator is designed to move at a designed speed with load and at increased speed with no load to gain time. Each elevator has a fixed third track along the length and has a power arm-type 2 with independent drive and with reverse option running along the said third fixed track. The power arm-type 2 has a electro magnet at one end to make and break contact
- 10 with platform carrier. Also it has tapered arms to accommodate any minor misalignment between elevator and parking tiers. The purpose of this power arm-type 2 is to receive the platform carrier with car from reception and to position the same over the transfer module and vice versa.
- f) Have one or two slat conveyors in each parking/delivery stations. The slat conveyor is like a chain driven conveyor with number of flat wooden planks/ metal plates on top generally deployed
- 15 in sugar, fertilizer bagging and bottling industry; but is different in the construction
- 1) that between each two carrier plates one metal grating (hereafter termed as walkways) is provided. This walkway has the same length of the carrier plates but the width is less. This walkway allows persons to leave after parking car and to approach for taking delivery after retrieval.
 - 20 2) That the carrier plates and walkways have a sliding guide at each end that slide along the guide ways provided at both the sides to maintain the track
 - 3) The sliding guide provided with thrust bearings to take up thrust upon them while cars are driven over the platform carrier placed over the slat conveyor and to drive away the cars from platform carrier
 - 25 4) The guide ways at the sides are relieved at points where the platform carriers are moved into/from the elevator and at points where platform carriers are to be loaded/ unloaded on/from the slat conveyors.
 - 5) The conveyor carries the empty platform carrier on the return side. Rollers at the bottom of the return side and sliding guide at the end of plates of platform carriers
 - 30 keep them in position from falling in return side.

g) Plurality of platform carriers – platform carrier is a structure of steel and is a trolley like with wheels to carry one car; platform carriers are normally of single piece construction and platform carriers in our invention are formed by many assembled plates with hinged construction to facilitate placing and moving along a conveyor for automation purposes. The platform carrier has also a receptacle to match the tapered arms in the elevator power arm-2 to accommodate minor misalignment between two matching levels. This receptacle and tapered arm arrangement is an additional security to ensure proper alignment; this is avoided when encoders are fixed and level matching are otherwise assured.

h) Handling system for the platform carriers i.e. to place them on the slat conveyors when required from the storage and to stack pile them back from the slat conveyors when not required comprising of monorails, hoisting equipments, and lifting tackles.

i) A central plc controller to co-ordinate, command, supervise and monitor the operations of all the handling equipments, to display and guide the patrons at entrance as to which point they should choose for parking and delivery of their cars, as there are many points; this will avoid unproductive back and forth movement of cars and strain on the drivers; and to achieve the desired results safely and in time.

6. Description of the Invention:

According to this invention, RCC /steel structures are erected to provide plurality of levels with two bottommost levels to serve as parking cum/and delivery stations with plurality of entry/exit points and other levels above to serve as parking tiers. The basement is generally reserved for delivery of cars and the ground floor is dedicated for receiving cars for parking under normal working conditions. Each tier has a plurality of parking slots on either side of a central way with fixed first tracks running along its entire length. Each tier has one or more transfer modules moving along the above fixed first track. Each transfer module has an independent drive with reversible option and runs along the said fixed first track. Each transfer module has a fixed second track running transversely and at a lower elevation than first track. Each transfer module has a power arm-1 with independent reversible option drive and moves along the said fixed second track on the transfer module. The said fixed second track on the transfer module runs at a lower elevation permitting free movement of the power arm-1 beneath the car placed on the transfer module, if required, without interfering. The power arm-1 has a lifting means to facilitate the above free movement and position itself to enable security means to make or break contact with the platform carrier and to push/pull

the platform carrier for parking/retrieval into/from the parking slots on any side of the parking tier. When two transfer modules at each tier are deployed one transfer module serves one elevator. However they are also programmed as a stand-by to each other as a redundant arrangement when required. They are electrically interlocked for a safe and efficient performance. In a system which has levels dedicated for receipt and delivery or receipt cum delivery of cars and which has two elevators space between the elevators at the dedicated floors is utilized for storing platform carriers. Each elevator has one power arm-2 with a reversible option drive to move along a fixed third track inside the elevator. Two slat conveyors are provided in front of elevators of the system that has dedicated levels for receipt and delivery. These conveyors are in line and are parallel to the line of parking. Reversible option motors drive these conveyors. The two numbers are for redundancy and for improving the efficiency of the system. The slat conveyors on their top have fixed walkways between two adjacent carrier plates which is meant to accommodate one platform carrier. The conventional concept of single piece platform carrier is changed and a new design of a platform carrier with a number of plates hinged together is introduced. This design permits better management of storage of platform carriers and mechanization of their handling. The sliding guides are provided on both ends of the plates forming platform carriers and walkways Guide rails run along the entire track-length of the conveyors except in front of elevators and at the point, where provision is made for a loading point of the platform carriers by the handling system. The sliding guides and guide rails maintain the platform carriers in position during movement besides absorbing thrusts during driving on/away of cars on/from the slat conveyors through thrust bearings,. The conveyors are supported throughout to prevent sagging of chain by weight and by the hinged construction. Independent mechanical handling systems (one each serving one slat conveyor) comprising monorail, hoisting equipment and designed lifting tackles are provided. The entire unit is and well illuminated and ventilated as per building codes.

7. Description of the system

The accompanying drawings are intended to provide further understanding of the invention and are incorporated in and constitute a part of the invention. The drawings illustrate an embodiment of the invention and together with the description illustrate principle of invention. The drawings should not be taken as implying any necessary limitation or the essential scope of the invention. The drawings are given by way of non limitative example to explain the nature of the invention. No attempts is made to show structural and construction details of the invention in more details than is

necessary for a fundamental understanding of the invention, the description taken with the drawings making apparent to those skilled in art how the several forms of the invention may be embodied in practice. For a more complete understanding of the instant invention reference is now made to the following description taken in conjunction with accompanying drawings as follows.

- 5 Figure 1 is the general view of the parking system
Figure 2 is the plan view of the basement where retrieved cars are delivered.
Figure 3 is the plan view of the ground floor where cars are received for parking.
Figure 4 is the plan view of a typical parking tier
Figure 5 is the schematic elevation of the system with slat conveyors and stacked
10 plat form carriers in position.
Figure 6 is the view AA showing the drive end of the slat conveyor.
Figure 7 is the view BB showing a portion of the slat conveyor.
Figure 8 is the view CC showing the non-drive end of the slat conveyor.
Figure 9 is the plan and elevation of a platform carrier.
15 Figure 10 is the schematic plan and elevation of the transfer module and a power arm type 1.
Figure 11 is the schematic plan and elevation of the elevator with a power arm type 2.
Figure 12 is the isometric view of the handling system for platform carriers.
Figure 13 is the flow chart for parking.
Figure 14 is the flow chart for retrieval.
20 The following are the component identification that are used to refer to the embodiments of the system:
1. Multi level automatic car parking system
2. Basement (delivery station)
3. Ground Floor (receiving station)
25 4. Parking tier
5. Entry points
6. Exit points
7. Parking slots
8. Transfer module track
30 9. Slat conveyor

- 10. Walkways
- 11. Space for platform carrier
- 12. Return drum/Drive Drum
- 13. Drive Motor
- 5 14. Bearings
- 15. Support rollers
- 16. Guide rails for platform carriers
- 17. Transfer module
- 18. Transfer module drive
- 10 19. Power arm Type 1 (for transfer module) track
- 20. Power arm-Type 1 (for transfer module)
- 21. Power arm-Type 1 (for transfer module) drive
- 22. Power arm-Type 1 (for transfer module) magnetic security means.
- 23. Power arm-Type 1 (for transfer module) lifting means
- 15 24. Elevator
- 25. Power arm type 2 (for elevator) track in the elevator
- 26. Power arm type 2 (for elevator)
- 27. Power arm type 2 (for elevator) arms
- 28. Power arm type 2 (for elevator) support mounting brackets
- 20 29. Power arm type 2 (for elevator) magnetic security means
- 30. Platform carrier
- 31. Sliding guide
- 32. Platform carrier power arm receptacles
- 33. Platform carrier magnetic engagement means
- 25 34. Platform carrier storage area
- 35. Mono rail
- 36. Hoisting equipment
- 37. Lifting tackle
- 38. System controller
- 30 The system will now be described fully with the help of the figures accompanying the invention:

A general view of the parking system (Part 1, Fig.1) is shown. The basement (Part 2, Fig.2) of the parking facility is dedicated for delivery of the retrieved cars. Arrows in the basement at exit points (Part 6, Fig.2) show the direction of the movement of retrieved cars. The ground floor (Part 3, Fig.3) is similarly reserved for receiving cars reporting for parking. Arrows in the ground floor at entry points (Part 5, Fig.3) show the direction of the movement of cars reporting for parking. A typical parking tier (Part 4, Fig.4) is shown with cars in the parking slots (Part 7, Fig.4) and a transfer module (Part 17, Fig.4 & 10) with power arm-type 1 (Part 20, Fig.4 & 10) on the fixed first track (Part 8, Fig.4). Two elevators (Part 24, Fig 2,3, 4,5) are positioned with a gap to provide sufficient space to accommodate the return drums (Part 12, Fig.8) of the two slat conveyors (Part 9, Fig.2,3,5) in line and also provide storage space (Part 34 Fig.5, 12) for the platform carriers (Part 30, Fig.9, 4). Each elevator has a power arm type 2 (Part 26, Fig.11). This power arm type 2 has an independent drive with reversible option and moves along a fixed third track (Part 25, Fig.11) inside the elevator.

A transfer module (Part 17, Fig.4, 10) is a structural assembly unit with independent drive (Part 18, Fig.10) with reversible option. This transfer module runs along a fixed first track (Part 8, Fig.4) parallel to the parking slots (Part 7, Fig.4) in each parking tier (Part 4, Fig.4). A fixed second track (Part 19, Fig.10, 4) on the transfer module guides the movement of the power arm type 1 (Part 20, Fig.10) transversely to the movement of the transfer module (Part 17, Fig.4,10). This power arm type 1 has independent drive (Part 21, Fig.10). This power arm type 1 also has a lifting means to permit the movement of this power arm type 1 underneath the platform carrier and the car, if necessary, and to position the transfer module Power arm type 1 magnetic means to push/tow the platform carrier.

The slat conveyors (Part 9, Fig 2, 3) are driven by motors (Part 13, Fig 6) and drive drum (Part 12, Fig 6, 8). The drive and return drums are supported by thrust bearings (Part 14, Fig 6). Walkways (Part 10, Fig.2, 3) are permanently fixed on the top of the slat conveyors Part 9 between every two carrier plates (Part 11, Fig.2, 3) that accommodate platform carriers (Part 30, Fig.9). Guide rails (Part 16, Fig.7) run on the track along the slat conveyor to guide the movement of platform carriers (Part 30, Fig.9). Construction of platform carriers is shown in Fig.9. Support rollers (Part 15, Fig.7) are provided to prevent sagging due to weight and due to hinged construction. Safety interlocks and guards ensure highest safety to clients and cars.

Four sets of handling systems comprising monorail (Part 35, Fig.12), hoisting equipments (Part 36, Fig.12) and designed lifting tackles (Part 37, Fig.12), two in basement and two at ground level, are provided. All these embodiments of the system, viz, elevators, power arms type 2 in the elevators, slat conveyors, transfer modules, power arms type 1 in the transfer modules and the handling equipments, are programmed, controlled and monitored to work in tandem with each other to ensure continuous parking and retrieval operations by the system controller (Part 38, Fig.13, 14).

8. The operation of the system

The uniqueness of this invention lies in its easy adaptability to meet changing patterns in parking/retrieval demands. The operations of the system, under normal and peak hour conditions are described below:

Normal conditions:

Parking: Normal conditions apply when cars reporting for parking more or less match the retrieval requests. As a car reports at the reception, the system controller acknowledges receipt of the car, checks availability and allots a platform carrier and displays at entrance and directs the client to the correct entry point at the ground level. The client following the instructions drives the car onto the allotted platform carrier, parks, applies hand brakes, alights, locks the car and walks away along the walkway. This is repeated till the slat conveyor is full. When one slat conveyor is full, the system controller recognizes and directs the further reporting car to the other vacant slat conveyor. Obeying command from the system controller, the power arm type-2 in the elevator, moving on the fixed third track in the elevator, draws from the slat conveyor a platform carrier with the car immediately in front of it into the elevator. The elevator raises the car to the specified parking tier. On reaching the tier, the power arm type 2 in the elevator, moving on its fixed third track, pushes the platform carriers with the car onto the waiting transfer module which was commanded to wait in place by the controller. The transfer module, moving on fixed first track on the parking tier, carries the platform carrier with the car near to the designated slot. On reaching the destination, the power arm type1 in the transfer module positions itself to the right place and lift mechanism and electromagnet operates. Then the power arm type 1 moves along the fixed second track in the transfer module, pushing the platform carrier with the car into the allotted slot. The power arm type 1 after placing the car in the slot returns to its position on the transfer module. The slat conveyor moves forward to place the next platform carrier with the car in front of the elevator to continue the parking operations till all the remaining platform carriers with cars are cleared from the slat conveyor. Such

receiving and parking operations are alternated between the two slat conveyors on the ground floor. The whole thing is represented by a Flow Sheet (Fig.13) for clarity.

Retrieval: When a request for retrieval reaches the system controller, the system controller directs the transfer module in the specific parking tier to move along the fixed first track to reach the parking slot. On reaching, transfer module power arm type1 positions itself to the right place and lift mechanism operates and moves along the fixed second track in the transfer module towing the platform carrier with the particular car onto the transfer module. The transfer module, moving on the fixed first track, carries the platform carrier with the car to the waiting elevator. The power arm type 2 in the elevator, moving on its fixed third track, draws the platform carrier with the car into the elevator and the elevator descends to the delivery station. On reaching the delivery station, the power arm type 2 in the elevator pushes the platform carrier with the car onto the vacant space in the slat conveyor immediately in front of the elevator. The slat conveyor moves forward to place the retrieved car to the delivery point and to simultaneously position the next vacant space in the slat conveyor in front of elevator to continue the retrieval operations till retrieved cars occupy all the vacant spaces in the slat conveyor. The client, taking clue from the main system at entrance display, walks up to his car and drives away. Such delivery and retrieval operations are alternated between the two slat conveyors in the basement. The whole thing is represented by a Flow Sheet (Fig.14) for clarity.

Peak Hour Conditions:

Parking: At the start of the day, the demand for parking is at its peak. To cope with the situation, the system controller presses one or both of the slat conveyors in the delivery section into parking operations till the situation normalizes. The system controller takes additional care to coordinate among the slat conveyors for proper execution. By this arrangement, the capacity to handle parking requests is doubled.

Retrieval: Likewise, at the close of the day, the demand for retrieval is at its peak. To cope with the situation, the system controller presses one or both of the slat conveyors in the receiving section into retrieval operations till the situation normalizes. The system controller takes additional care to coordinate among the slat conveyors for proper execution. By this arrangement, the capacity to handle retrieval requests is doubled.

Handling (storage): Once the system controller recognizes full occupancy of the spaces in the delivery section of any slat conveyor, the system controller commands the handling system to come

into operation. The handling arrangement picks up the platform carrier immediately below its loading point, carries along the monorail and stacks alternately in two rows. The slat conveyor moves forward to bring the next platform carrier to be stored into the loading point. This operation continues till all the platform carriers in the slat conveyors are stacked.

- 5 **Handling (Loading):** Once the system controller recognizes full vacancy of the space in the receiving section of any slat conveyor, the system controller commands the handling system to come into operation. The handling arrangement picks up the platform carrier alternately from two storage rows, carries along the monorail and places on the slat conveyor in the vacant space immediately below the loading point. The slat conveyor moves forward to bring the next vacant
- 10 space into loading point for receiving next platform carrier. This operation continues till all the vacant spaces in the slat conveyor are loaded with platform carriers.

The system controller, comprising of plc, scanners and display stations, commands, controls, monitors and co-ordinates among the elevators, power arms type 2 in the elevator, transfer modules and power arms type 1 at each parking floor, slat conveyors at basement and ground level, handling

15 systems at four locations and the display at the entrance.

We claim:

1. A multi-level automated car parking unit, comprising a plurality of tiers,; each parking tier further comprising a central causeway , a plurality of addressed parking slots on both sides of
5 causeway , oriented in a line disposed along opposite walls of the parking tiers; a plurality of transfer modules; and a transfer module track having a first rail and a second rail, where the transfer module track is oriented parallel to the addressed parking slots; a plurality of platform carriers, the platform carriers with wheels fixedly attached to the bottom side; a plurality of elevators, the elevators having a shaft that is disposed through the plurality of tiers, the elevators
10 being vertically movable among the plurality of tiers; and a system controller.
2. The multi-level automated car parking unit of claim 1, which provides dedicated tiers for receipt and delivery of a plurality of cars , each car receiving and delivery tier further comprising a plurality of slot conveyors, the slot conveyors oriented parallel to a line of addressed parking
15 slots, the slot conveyors disposed within a trough in the car receiving and delivery tier, wherein the direction of the slot conveyors is reversible; a first and a second guide rail, the first and second guide rails being mounted along the trough in which the slot conveyor is disposed, the first and second guide rails being mounted on opposite sides of one another along the trough in which the slot conveyor is disposed, the first and second guide rails being vacated in front of a
20 plurality of elevators, the first and second guide rails being vacated in front of a loading and unloading point of the slot conveyors; and the platform carriers comprising a number of plates joined by a plurality of hinged joints , where the plates form a surface having a top side on which a car can be parked and carried and a bottom side disposed opposite the top side; a plurality of sliding brackets, the sliding brackets which when the platform carrier is inserted into the slot
25 conveyor interlock with the guide rails mounted within the trough in which the slot conveyor is disposed; a plurality of power arm receptacles, the power arm receptacles being disposed on an edge of the platform carrier facing an elevator when the platform carrier is in use; a plurality of magnetic couplers, the magnetic couplers being disposed on opposite edges of the platform carrier wherein the slot conveyors further comprise: a drum pulley; a drive motor; a plurality of

bearings; a plurality of support rollers; and the conveyor being disposed with a plurality of walkways alternated with a plurality of spaces for platform carriers.

3. The multi-level automated car parking unit of claim 1 and 2, wherein the transfer modules rest
5 upon the transfer module track, wherein the transfer modules further comprise: a transfer module drive, the transfer module being driven by the transfer module drive in either direction along the transfer module track; a power arm track fixedly mounted on the transfer module, the power arm track transversely disposed to the transfer module track, the power arm track having a first rail and a second rail; and a power arm type 1 resting upon the power arm track, and being driven by
10 the power arm type 1 drive in either direction along the power arm track; a first power arm type 1 coupling and a second power arm type 1 coupling, the said couplings operated by electrical/magnetic/hydraulic being disposed on opposite sides of the power arm type 1; and a power arm type 1 lift.

15 4. The multi-level automated car parking unit of claim 2, wherein tiers are dedicated for receipt and delivery and where the space between two elevators in such dedicated tiers are further dedicated for storage of platform carriers and wherein the platform carriers are formed by a plurality of plurality of plates with hinged joints and where the plates form a surface having a top side on which a car can be parked and carried and a bottom side disposed opposite the top side; a
20 plurality of sliding brackets, the sliding brackets which when the platform carrier is inserted into the slat conveyor interlock with the guide rails mounted within the trough in which the slat conveyor is disposed; a plurality of power arm receptacles, the power arm receptacles being disposed on an edge of the platform carrier facing an elevator when the platform carrier is in use; a plurality of couplers, the couplers being disposed on opposite edges of the platform carrier ,
25 and the storage area further comprises mono rail; a plurality of hoisting equipment; and a lifting tackle.

5. The multi-level automated car parking unit of claim 2, wherein the lowermost car receiving and delivery tier is a basement, the basement further comprising a location for a plurality of cars
30 to be delivered, the basement having a plurality of exit points.

6. The multi-level automated car parking unit of claim 2, wherein the car receiving and delivery tier immediately above the basement is a ground tier, the ground tier further comprising a location for receiving a plurality of cars to be parked, the ground tier having a plurality of entry points.

7. The multi-level automated car parking unit of claim 1 and 2, wherein the elevator further comprises:

a power arm type 2, the power arm type 2 further comprising: an power arm type 2 mechanical/hydraulic/magnetic operated coupler, disposed on a side of the power arm type 2 facing a transfer module; a power arm type 2 drive, the power arm type 2 being driven by the power arm type 2 drive in either direction along the power arm type 2 track; a plurality of power arm type 2 mounting brackets, disposed on the same side of the power arm type 2 as the power arm type 2 coupler; and a plurality of tapered power arm type 2 protrusions, the tapered power arm type 2 protrusions disposed on top of and supported by the power arm type 2 mounting brackets, the tapered power arm type 2 protrusions engaging the power arm receptacles of a platform carrier; and an power arm type 2 track, the power arm type 2 track having a first rail and a second rail, the power arm type 2 track being fixedly mounted to a tier of the elevator, and the power arm type 2 track transversely disposed to the transfer module track.

8. A method of using the multi-level automated car parking unit of claim 2 comprising the steps of:

determining, using software encoded in a non-transitory computer readable media, that a platform carrier is needed at a slat conveyor;

transferring a platform carrier from a storage area of a car receiving and delivery tier to a slat conveyor, further comprising the steps of:

moving the hoisting equipment over a stack of platform carriers in the storage area;

lowering the hoisting equipment;

grasping a platform carrier with the hoisting equipment;

raising the hoisting equipment; moving the hoisting equipment over an empty position of a slat conveyor;

lowering the hoisting equipment with the platform carrier onto the empty position of a slat conveyor;

5 releasing the platform carrier from the hoisting equipment;

raising the hoisting equipment; operating the slat conveyor to move the platform carrier to engage the sliding brackets of the platform carrier with the guide rails along the trough in which the slat conveyor is disposed; and

returning the hoisting equipment to a position over a stack of platform carriers in the storage area.

10

9. A method of using the multi-level automated car parking unit of claim 2 comprising the steps of:

determining, using software encoded in a non-transitory computer readable media, that a platform carrier at a slat conveyor is needed to be stored in a storage area;

15

transferring a platform carrier from a slat conveyor to a storage area of a car receiving and delivery tier,

further comprising the steps of :operating the slat conveyor to move the platform carrier to a transit point of the slat conveyor;

20

moving the hoisting equipment over the transit point of the slat conveyor;

lowering the hoisting equipment over the slat conveyor;

grasping a platform carrier with the hoisting equipment;

raising the hoisting equipment and the platform carrier;

moving the hoisting equipment over a stack of platform carriers in the storage area;

25

lowering the platform carrier onto a stack of platform carriers in the storage area;

releasing the platform carrier from the hoisting equipment; and

raising the hoisting equipment.

10. A method of using the multi-level automated car parking unit of claim 2, comprising the steps of
- receiving a car on top of a platform carrier on the slat conveyor;
- determining, using software encoded in a non-transitory computer readable media, an empty
- 5 addressed parking slot on a particular parking tier;
- operating the slat conveyor to move the platform carrier and the car on top of the platform carrier in front of an elevator;
- summoning the elevator;
- waiting for the arrival of the elevator;
- 10 operating the power arm type 2 drive to move the power arm type 2 adjacent to the platform carrier such that the tapered power arm type 2 protrusions engage the platform carrier at the power arm receptacles of the platform carrier;
- engaging the power arm type 2 coupler to magnetically/mechanically/hydraulically couple the power arm type 2 with the coupler of the platform carrier;
- 15 operating the power arm type 2 drive to move the power arm type 2 into the elevator,
- pulling the platform carrier and the car on top of the platform carrier into the elevator;
- operating the elevator to raise it to a parking tier;
- summoning a transfer module of the parking tier;
- waiting for the arrival of the transfer module of the parking tier;
- 20 operating the power arm type 2 drive to move the power arm type 2 towards a transfer module of the parking tier,
- pushing the platform carrier and the car on top of the platform carrier onto the transfer module;
- disengaging the power arm type 2 coupler,
- decoupling the power arm type 2 from the coupler of the platform carrier;
- 25 operating the power arm type 2 drive to move the power arm type 2 into the elevator,
- disengaging the tapered power arm type 2 protrusions from the power arm receptacles of the platform carrier;
- operating the transfer module drive to move the transfer module in front of the empty addressed parking slot of the parking tier;

- operating the power arm type 1 drive to move the power arm type 1 below the platform carrier to a position opposite the empty addressed parking slot of the parking tier;
operating the power arm type 1 lift to raise the power arm type 1;
engaging the transfer module power arm coupler to magnetically/mechanically/hydraulically
5 couple the power arm type 1 with the coupler of the platform carrier;
operating the power arm type 1 drive to move the power arm type 1 and push the platform carrier and the car on top of the platform carrier into the empty addressed parking slot of the parking tier;
disengaging the power arm type 1 coupling, to decouple the power arm type 1 from the coupler
10 of the platform carrier;
operating the power arm type 1 drive to move the power arm type 1 away from the platform carrier; and
operating the power arm type 1 lift to lower the power arm type 1.
- 15 11. A method of using the multi-level automated car parking unit of claim 14, comprising the steps of:
determining, using software encoded in a non-transitory computer readable media, an addressed parking slot on a particular parking tier from which a car is to be retrieved;
operating the transfer module drive of a transfer module of the particular parking tier from which
20 the car is to be retrieved to move the transfer module in front of the addressed parking slot of the particular parking tier from which the car is to be retrieved;
operating the power arm type 1 lift to raise the power arm type 1;
operating the power arm type 1 drive to move the power arm type 1 towards a platform carrier and a car on top of the platform carrier in the addressed parking slot;
25 engaging a power arm type 1 coupling to magnetically/mechanically/hydraulically couple the power arm type 1 with a coupler of the platform carrier;
operating the power arm type 1 drive to move the transfer module power arm and pull the platform carrier and the car on top of the platform carrier onto the transfer module;
disengaging the power arm type 1 coupling, to decouple the power arm type 1 from the coupler
30 of the platform carrier;

- operating the power arm type 1 lift to lower the power arm type 1;
- operating the transfer module drive to move the transfer module in front of the elevator;
- summoning the elevator;
- waiting for the arrival of the elevator;
- 5 operating the power arm type 2 drive to move the power arm type 2 towards the transfer module such that the tapered power arm type 2 protrusions engage the platform carrier at the power arm receptacles of the platform carrier;
- engaging the power arm type 2 coupler to magnetically/mechanically/hydraulically couple the power arm type 2 with the coupler of the platform carrier;
- 10 operating the power arm type 2 drive to move the power arm type 2 into the elevator, pulling the platform carrier and the car on top of the platform carrier into the elevator;
- operating the elevator to lower it to the basement;
- operating a slat conveyor of the basement to place an empty space for a platform carrier of the slat conveyor in front of the elevator;
- 15 operating the power arm type 2 drive to move the power arm type 2 towards the slat conveyor of the basement,
- pushing the platform carrier and the car on top of the platform carrier into the empty slot of the slat conveyor;
- disengaging the power arm type 2 coupler, decoupling the power arm type 2 from the coupler of
- 20 the platform carrier ;
- operating the power arm type 2 drive to move the power arm type 2 into the elevator,
- disengaging the tapered power arm type 2 protrusions from the power arm receptacles of platform carrier;
- operating the slat conveyor to move the platform carrier in front of an exit point and;
- 25 signaling that the car on top of the platform carrier is ready for retrieval by a driver.