

{DESCRIPTION}

{Title of Invention}

OPERATION PANEL AND MECHANICAL PARKING FACILITY INCLUDING THE
SAME

{Technical Field}

{0001}

The present invention relates to a touch panel type operation panel and a mechanical parking facility including the operation panel.

{Background Art}

{0002}

In mechanical parking facilities provided in commercial facilities such as department stores or hotels, a manager performs a loading/unloading operation of vehicles of users. For example, in a tower mechanical parking facility including an elevator type conveyor, a manager confirms a loading/unloading state (an occupied state, a shape and a type of a pallet, presence or absence of charging equipment for an electric vehicle) on an operation panel, then inputs a pallet number using a numerical keypad, calls a required pallet and loads a vehicle, or calls a pallet of which a vehicle to be driven out is placed and unloads the vehicle from the pallet.

{0003}

A mechanical parking facility in which a user his/herself operates a touch panel of an interactive screen to perform a

loading/unloading operation rather than a manager performing the loading/unloading operation is disclosed in Patent Literature 1.

{Citation List}

{Patent Literature}

{0004}

{PTL 1}

Japanese Unexamined Patent Application, Publication No.
2002-174048

{Summary of Invention}

{Technical Problem}

{0005}

A conventional operation panel for a manager displays a loading/unloading state and various types of information using an LED or the like due to a restriction in size, thereby providing very poor visibility. In particular, in a tower mechanical parking facility having multiple levels, if loading/unloading states of all the levels are listed, a display of each level is very small and less visible. Thus, instead of viewing the display on the operation panel, a loading/unloading state is written by hand on a white board or a magnet is used on the white board for recording.

{0006}

Also, since a display unit for displaying the loading/unloading state is separate from an input operation

unit for calling a pallet, an input error may occur in an input operation to the input operation unit based on information on the display unit.

{0007}

To address the input error described above, there is a system in which a manager designates only a type of pallet corresponding to a type of vehicle, and a machine automatically selects the rest. However, the machine selects a pallet sequentially from a side closer to an entry level without considering a position of a lift (conveyor). Thus, it takes time to move the lift, increasing waiting time of a user.

{0008}

Also, the touch panel type operation panel disclosed in Patent Literature 1 and other conventional touch panel type operation panels are merely used for an input operation of loading/unloading or confirming safety or the like, and do not display, on a screen, information on a loading/unloading state or a position of a lift in a parking facility, in real time. Thus, a working state (such as a position of a lift or a working route) in the parking facility cannot be confirmed, and an operation which can minimize waiting time cannot be selected.

{0009}

For example, when loading a vehicle, there is an idea

that an empty pallet can be taken out from an empty space closest to a position where a lift is positioned and conveyed to an entry level to minimize waiting time of users, which cannot be performed by the conventional operation panel.

{0010}

The present invention is achieved in view of the above described situations, and has an object to provide an operation panel that can allow a loading/unloading state in a parking facility to be clearly grasped, increase operability to eliminate an input error, and further minimize a waiting time of a user, providing efficient operation in a mechanical parking facility operated by a manager, and the mechanical parking facility including the operation panel.

{Solution to Problem}

{0011}

To solve the above described problem, the present invention adopts the following solutions.

Specifically, the present invention provides an operation panel provided in a mechanical parking facility, for making a control device to perform a series of loading/unloading operations in the mechanical parking facility having a plurality of parking spaces, a conveyor for loading/unloading a vehicle into and from the parking space, and the control device that performs the loading/unloading operations using the conveyor, the operation panel comprising a touch panel

type operation display, wherein the operation display is configured to display an icon of each parking space in real time together with an empty/occupied state of each parking space, the operation panel is configured to make the control device perform the loading operation when the icon indicating empty is touched for loading, and the operation panel is configured to make the control device perform the unloading operation when the icon of a parking space in which a vehicle to be unloaded is parked is touched for unloading.

{0012}

According to the operation panel with the above described configuration, the loading/unloading state in the parking facility is displayed on the touch panel type operation display, and thus a manager can view the operation display to clearly grasp the loading/unloading state in the parking facility. Then, the icon indicating empty is touched for loading, and the icon of the parking space in which the vehicle to be unloaded is parked is touched for unloading, thereby causing the control device to perform the loading operation or the unloading operation.

{0013}

Thus, there is no need to input a number of a parking space (pallet) for loading/unloading using a numerical keypad as is conventional, but the icon can be directly touched to cause the control device to start the loading/unloading

operation. This provides good operability, and reduces possibility of an input error.

{0014}

Also, in the operation panel according to the present invention having the above described configuration, a position and a movement of the conveyor are displayed in real time on the operation display using an icon together with the icon of the parking space.

{0015}

According to the operation panel having the above described configuration, in addition to the loading/unloading state in the parking facility, the position and the movement of the conveyor are displayed on the operation display. Thus, the loading/unloading state in the parking facility can be more clearly grasped to allow a quick loading/unloading operation.

{0016}

For example, for an elevator type mechanical parking facility, when an icon of a parking space indicating empty closest to a position of an icon of a conveyor is touched for loading, it is possible to reduce a time for the conveyor to take an empty pallet in the parking space, and allow the empty pallet to be conveyed to the entry level in a short time.

{0017}

Also, for example, for a vertical circulation type

mechanical parking facility, an icon of a parking space indicating empty closest to an entry level is touched for loading, which can minimize a time for an empty vehicle conveying cage to arrive at the entry level.

This can minimize a waiting time of a user, and allow an efficient operation.

{0018}

Also, in the operation panel according to the present invention having the above described configuration, the operation display is configured to display a part of the plurality of parking spaces, and to automatically scroll its screen in accordance with a movement of the conveyor.

{0019}

According to the operation panel having the above described configuration, for example, in a tower mechanical parking facility including multiple levels, loading/unloading states of all the levels are not listed, but loading/unloading states of several levels can be displayed at each time. Thus, even with a restriction in screen size of the operation panel, the display of each level can be enlarged to improve visibility and touch-operability. In addition to the automatic scrolling, manual scrolling may be allowed to further increase convenience.

{0020}

In the operation panel according to the present invention

having the above described configuration, the icon of the parking space indicates a type of a vehicle that can be parked in the parking space.

{0021}

According to the operation panel having the above described configuration, not only an ordinary vehicle, but also vehicles having special housing structures such as a high roof vehicle, a heavy vehicle, a low-floor vehicle, or a chargeable vehicle can be loaded into a parking space with an optimum structure at a time, thereby contributing to an efficient operation of the mechanical parking facility.

{0022}

In the operation panel according to the present invention having the above described configuration, the operation display is configured to display the number of vehicles that can be parked in the mechanical parking facility. This allows an empty state in the parking facility to be clearly grasped, and facilitates a loading/unloading operation by the manager.

{0023}

In the operation panel according to the present invention having the above described configuration, the operation display is configured to highlight an icon of the parking space as compared to other icons when the icon of the parking space is touched. This clarifies a position or a movement of the parking space into or from which the vehicle is to be

loaded/unloaded, and facilitates a loading/unloading operation by the manager.

{0024}

In the operation panel according to the present invention having the above described configuration, the operation display is configured to display a next screen which displays a screen for confirming whether the vehicle is to be loaded when the icon indicating loadable is touched for loading, and to display a next screen which displays a screen for confirming whether the vehicle is to be unloaded when the icon of the parking space in which a vehicle to be unloaded is placed is touched for unloading.

{0025}

According to the operation panel having the above described configuration, even if the icon is mistakenly touched, the operation can be corrected, thereby preventing the control device from being activated by a wrong instruction. This can increase operability and prevent such input errors.

{0026}

In the operation panel according to the present invention having the above described configuration, even during the loading/unloading operation, the screen can be changed to a reservation operation screen for a next loading/unloading reservation.

{0027}

According to the operation panel having the above described configuration, the next loading/unloading operation can be reserved without waiting for completion of the loading/unloading operation, thereby providing an efficient operation of the mechanical parking facility.

{0028}

In the operation panel according to the present invention having the above described configuration, the operation display is configured to display an immediate loading button in case the loading/unloading operation is not performed, the parking space includes one or more empty spaces, and the conveyor in an empty state is being at an entry level into which a vehicle to be parked drives, and the immediate loading button is touched to allow driving into the entry level.

{0029}

According to the operation panel having the above described configuration, when there is one or more empty space, and the conveyor in the empty state is being at the entry level, the immediate loading button is displayed. Thus, the manager can touch the immediate loading button to allow the vehicle to drive into the entry level without looking for an empty space by viewing or scrolling the operation display. This can increase operability, and minimize a waiting time of a user to provide an efficient operation.

{0030}

In the operation panel according to the present invention having the above described configuration, the operation display is configured to display an immediate unloading button in case the loading/unloading operation is not performed, and the conveyor in an occupied state is being at the entry level into which a vehicle to be parked drives, and the immediate unloading button is touched to allow the vehicle to be unloaded from the entry level.

{0031}

According to the operation panel having the above described configuration, when the conveyor in the occupied state is being at the entry level, the immediate unloading button is displayed. Thus, the manager can touch the immediate unloading button to unload the vehicle from the entry level without viewing or scrolling the operation display. This can increase operability, and minimize a waiting time of a user, providing an efficient operation.

{0032}

In the operation panel according to the present invention having the above described configuration, a direction of vehicle in a front-rear direction of the parked vehicle housed in the parking space is displayed.

{0033}

According to the operation panel having the above

described configuration, the manager can grasp the front-rear direction of the parked vehicle. Thus, for example, for unloading of a vehicle loaded rearward, an operation for reversing the direction can be reserved to provide an efficient operation of the parking facility.

{0034}

In the operation panel according to the present invention having the above described configuration, the operation panel is configured such that an unloading mode for unloading the parked vehicle housed in the parking space, and a turning mode for turning the parked vehicle to change its direction in a front-rear direction of the parked vehicle without unloading the parked vehicle are selectable.

{0035}

According to the operation panel having the above described configuration, for example, when the loading/unloading operation is not performed, the manager selects an icon of a parking space in which the vehicle is parked rearward to reverse the vehicle by the turning mode, thereby allowing the vehicle to be parked forward. Thus, the vehicle can be unloaded forward in unloading, thereby facilitating unloading, and further providing an efficient operation of the parking facility.

{0036}

The present invention also provides a mechanical parking

facility including an operation panel having any of the above described configurations.

{0037}

According to the mechanical parking facility having the above described configuration, since a loading/unloading state in the parking facility can be clearly grasped, operability can be increased to eliminate an input error, and further a waiting time of a user can be minimized to allow an efficient operation.

{Advantageous Effects of Invention}

{0038}

As described above, according to the operation panel and the mechanical parking facility including the operation panel of the present invention, in the mechanical parking facility operated by the manager, the loading/unloading state in the parking facility can be clearly grasped, good operability can be provided eliminating possibility of an input error, and further a waiting time of a user can be minimized to allow an efficient operation.

{Brief Description of Drawings}

{0039}

{Fig. 1}

Fig. 1 is a vertical sectional view of an elevator type mechanical parking facility of a first embodiment of an operation panel according to the present invention.

{Fig. 2}

Fig. 2 is a perspective view showing an entry level.

{Fig. 3}

Fig. 3 is a perspective view showing an operation panel.

{Fig. 4}

Fig. 4 is a block diagram showing a schematic configuration of a control system.

{Fig. 5}

Fig. 5 shows an initial screen of an operation display.

{Fig. 6}

Fig. 6 shows a screen in selecting a type of a vehicle.

{Fig. 7}

Fig. 7 shows a screen for confirming a type of a vehicle to be loaded.

{Fig. 8}

Fig. 8 shows a screen displaying pallet arrival time.

{Fig. 9}

Fig. 9 shows a reservation input screen.

{Fig. 10}

Fig. 10 shows a reservation display screen.

{Fig. 11}

Fig. 11 shows a screen for instructing to load.

{Fig. 12}

Fig. 12 shows a screen for instructing to confirm safety in a parking facility.

{Fig. 13}

Fig. 13 shows a screen for instructing to close a door.

{Fig. 14}

Fig. 14 shows a screen during housing.

{Fig. 15}

Fig. 15 shows an initial screen.

{Fig. 16}

Fig. 16 shows a screen of a loading state.

{Fig. 17}

Fig. 17 shows the screen of the loading state.

{Fig. 18}

Fig. 18 shows a screen for confirming a type of a vehicle to be loaded.

{Fig. 19}

Fig. 19 shows a screen of a loading operation state.

{Fig. 20}

Fig. 20 shows the screen of the loading operation state.

{Fig. 21}

Fig. 21 shows the screen of the loading operation state.

{Fig. 22}

Fig. 22 shows the screen of the loading operation state.

{Fig. 23}

Fig. 23 shows a screen for instructing to load.

{Fig. 24}

Fig. 24 shows a screen for instructing to confirm safety.

{Fig. 25}

Fig. 25 shows a screen for instructing to close a door.

{Fig. 26}

Fig. 26 shows a screen during housing.

{Fig. 27}

Fig. 27 shows a screen of a housing operation state.

{Fig. 28}

Fig. 28 shows an initial screen.

{Fig. 29}

Fig. 29 shows a screen of a loading state.

{Fig. 30}

Fig. 30 shows the screen of the loading state.

{Fig. 31}

Fig. 31 shows a screen for confirming a type of a vehicle to be unloaded.

{Fig. 32}

Fig. 32 shows a screen of an unloading operation state.

{Fig. 33}

Fig. 33 shows the screen of the unloading operation state.

{Fig. 34}

Fig. 34 shows the screen of the unloading operation state.

{Fig. 35}

Fig. 35 shows the screen of the unloading operation

state.

{Fig. 36}

Fig. 36 shows a screen for instructing to unload.

{Fig. 37}

Fig. 37 shows a screen for instructing to close a door.

{Fig. 38}

Fig. 38 shows an initial screen.

{Fig. 39}

Fig. 39 shows the following various charge state marks indicated as icons for a chargeable vehicle: (a) showing a mark indicating that the vehicle can be charged; (b) showing a mark indicating that the vehicle cannot be charged; (c) showing a mark indicating that the vehicle is being charged; (d) showing a mark indicating that charging has completed; (e) showing a mark indicating that charging has failed; and (f) showing a mark indicating that a nighttime power supply is being used.

{Fig. 40}

Fig. 40 shows a state where an immediate loading button can be operated.

{Fig. 41}

Fig. 41 shows a state where the immediate loading button cannot be operated.

{Fig. 42}

Fig. 42 shows another example of the immediate loading

button.

{Fig. 43}

Fig. 43 shows a state where the immediate unloading button can be operated.

{Fig. 44}

Fig. 44 is a vertical sectional view of a vertical circulation type mechanical parking facility of a second embodiment of the present invention.

{Fig. 45}

Fig. 45 is a vertical sectional view of a mechanical multilevel parking facility taken along the line XLV-XLV in Fig. 44.

{Fig. 46}

Fig. 46 shows a screen of a loading state.

{Fig. 47}

Fig. 47 shows the screen of the loading state.

{Fig. 48}

Fig. 46 shows the screen of the loading state.

{Fig. 49}

Fig. 49 shows a state where a No. 9 cage is selected.

{Fig. 50}

Fig. 50 shows a selection screen of unloading, turning, and stop.

{Fig. 51}

Fig. 51 shows a screen of a turning operation state.

{Fig. 52}

Fig. 52 shows the screen of the turning operation state.

{Fig. 53}

Fig. 53 shows a screen of an unloading operation state.

{Fig. 54}

Fig. 54 shows the screen of the unloading operation state.

{Fig. 55}

Fig. 55 shows a screen for instructing to unload.

{Fig. 56}

Fig. 56 shows a screen for instructing to close a door.

{Description of Embodiments}

{0040}

Now, with reference to the drawings, embodiments of the present invention will be described.

{0041}

{First embodiment}

Fig. 1 is a vertical sectional view of an elevator type mechanical parking facility showing a first embodiment of the present invention. An operation panel according to the present invention can be widely applied to mechanical parking facilities for loading/unloading vehicles into and from a plurality of parking spaces using a conveyor, and is not limited to an elevator type multilevel parking facility described below.

{0042}

A mechanical parking facility 1 is an elevator type tower multilevel parking facility that can house a plurality of vehicles 2, and includes a parking tower 4 having, on a ground level, a loading/unloading door 3 through which the vehicle 2 is loaded/unloaded. The ground level of the parking tower 4 is an entry level 6, and a turn table 7 for changing a direction of the vehicle 2 is provided on a floor surface of the entry level 6. The turn table 7 includes a turning plate 9 and a turning drive unit 10 in a recessed pit 8 formed in the floor surface of the entry level 6.

{0043}

A vertical raising and lowering path 11 is formed at a center of the parking tower 4, and a lift 12 (elevator-like conveyor) is provided in the raising and lowering path 11 so as to be vertically raised and lowered. The lift 12 is hung at four corners by a plurality of wire ropes 13 extending downward from, for example, an unshown winch provided in an upper portion of the parking tower 4, and can be vertically raised and lowered in the raising and lowering path 11 by activation of a winch.

{0044}

Meanwhile, vehicle housing shelves 14 (parking spaces) are provided on opposite sides of the raising and lowering path 11. The multiple stories vehicle housing shelves 14 are

vertically provided with the raising and lowering path 11 therebetween, and each vehicle housing shelf 14 houses one pallet 15 on which a vehicle is placed. A pole or the like of the vehicle housing shelf 14 is not shown.

{0045}

On floor surfaces of the lift 12 and the vehicle housing shelf 14, an unshown delivery mechanism is provided so that the delivery mechanism can smoothly deliver an empty pallet 15 or a pallet 15 on which the vehicle 2 is placed from the lift 12 to the vehicle housing shelf 14 or from the vehicle housing shelf 14 to the lift 12 when heights of the floor surfaces of the lift 12 and the vehicle housing shelf 14 become the same level.

{0046}

In Fig. 1, for example, a vehicle housing shelf 14 immediately above the entry level 6, that is, a vehicle housing shelf 14 on a lowest level, and a vehicle housing shelf 14 on a second lowest level have a large ceiling height (space from a vehicle housing shelf 14 located just above the housing shelf) so that a high roof vehicle can be loaded. Further, such vehicle housing shelves 14 for high roof vehicles are provided upstairs. This can reduce a total height of the parking tower 4, and increase the spaces for vehicles.

{0047}

Also, a charging device 18 for charging an on-vehicle battery in an electric vehicle (EV) such as a hybrid vehicle is provided on a specified number of vehicle housing shelves 14 and pallets 15. The charging device 18 includes a receiving device 19 provided on the pallet 15, and a transmission device 20 that is provided on the vehicle housing shelf 14 and comes into contact with the receiving device 19 to supply electric power from an external power supply (commercial power supply) to the receiving device 19. The receiving device 19 includes an unshown socket, and is connected to a vehicle 2 to be charged by a charging cable, and the vehicle 2 is charged during parking. A vehicle housing shelf on which the transmission device 20 is placed is denoted by a reference numeral 14E and distinguished from other vehicle housing shelves 14, and a pallet on which the receiving device 19 is provided is denoted by a reference numeral 15E and distinguished from other pallets 15.

{0048}

Fig. 2 is a perspective view showing the entry level 6. When viewed from outside, an emergency doorway 23 is provided on a left side of the loading/unloading door 3, and a loading control light 24 having blue and red lamps is provided above the loading/unloading door 3. Also, an operation panel 25 is provided, for example, on a right side of the loading/unloading door 3. The operation panel 25 is operated

by a manager of the mechanical parking facility 1, and includes a touch panel type operation display 26 as shown in Fig. 3. The operation panel 25 includes a key cylinder 27 for activation, an emergency stop button 28, and operation switches such as activation buttons 29, 30 of the turn table 7. The operation panel 25 may be provided near the loading/unloading door 3 as described above, but may be provided in an unshown manager room provided near the loading/unloading door 3.

{0049}

In the entry level 6, there is a space in which the pallet 15 is placed at the center, and on a wall on the opposite side of the loading/unloading door 3, a mirror 32 for a driver to confirm a position of the vehicle, and a lighting type stop position instruction light 33 to instruct to "drive forward", "stop", and "drive rearward" are provided. On opposite side walls of the entry level 6, human detection/vehicle sensors 35, 36 for detecting a size and a front-rear position of the vehicle, an emergency stop button 37, or the like are provided. The stop position instruction light 33 gives an instruction on a vehicle position to a driver of the vehicle based on data of the vehicle position detected by the vehicle sensors 35, 36.

{0050}

Further, a control device 40 that controls the entire

mechanical parking facility 1 is provided in the entry level 6. The control device 40 performs a series of loading/unloading operations by the lift 12, and performs the loading/unloading operations while transmitting and receiving information to and from the operation panel 25 as described later.

{0051}

Fig. 4 is a block diagram showing a schematic configuration of a control system of the mechanical parking facility 1.

The operation panel 25 is connected to the control device 40. The touch panel type operation display 26 of the operation panel 25 serves as both an input unit and a display unit. Various types of information input by the manager on the operation display 26 is transmitted to the control device 40, and various types of information transmitted from the control device 40 is displayed on the operation display 26.

{0052}

The control device 40 includes a screen depiction/scrolling/input information processing unit 40a, and a database 40b is connected to the control device 40. In the database 40b, data such as an occupied state, a shape and a type of a pallet, a shape and a type of a vehicle housing shelf, presence or absence of a chargeable vehicle, a charging state, EV charging data for each pallet are accumulated.

{0053}

Also, to the control device 40, control units such as an EV charging control unit 41, a loading/unloading door control unit 42, a conveyor control unit 43, a loading/unloading monitoring control unit 44, a vehicle weight measurement/control unit 45, and a turning drive unit control unit 46 are connected.

{0054}

The EV charging control unit 41 receives a charging command from the control device 40 to activate the charging device 18, and feeds back EV charging state accumulation information prepared based on an amount of charge obtained from a charging voltage indicator 50 to the control device 40.

{0055}

The loading/unloading door control unit 42 receives an operation command from the control device 40 to open/close the loading/unloading door 3, and receives a position signal of the loading/unloading door 3 from a loading/unloading door sensor 51 to feed back the information to the control device 40.

{0056}

The conveyor control unit 43 receives an operation command from the control device 40 to cause raising and lowering of the lift 12 and loading/unloading of the pallet 15, and receives a position signal of the lift 12 from a

conveyor position sensor 52 to feed back the information to the control device 40.

{0057}

The loading/unloading monitoring control unit 44 receives an operation command from the control device 40 to receive information on presence or absence of a vehicle or a person or a position thereof on the entry level 6 from the human detection/vehicle sensors 35, 36, and feeds back the information to the control device 40.

{0058}

The vehicle weight measurement/control unit 45 receives an operation command from the control device 40 to measure a weight of a vehicle placed on the lift 12 using a vehicle weight measuring instrument 54, and feeds back the information via a vehicle weight sensor 55 to the control device 40.

{0059}

The turning drive unit control unit 46 receives an operation command from the control device 40 to operate the turn table 7 (turning drive unit 10), receives a turning position signal of the turn table 7 from a turn table position sensor 56, and feeds back the information to the control device 40.

{0060}

When the vehicle 2 is loaded into the mechanical parking facility 1 configured as described above, an empty pallet 15

(15E) is taken out from a vehicle housing shelf 14 (14E) on which no vehicle 2 is housed and loaded onto the lift 12 and lowered along the raising and lowering path 11, and placed on the turn table 7 (turning plate 9). The vehicle 2 enters the entry level 6 through the loading/unloading door 3 and stops on the pallet 15 placed on the turn table 7, and then the turn table 7 is turned to change a direction of the vehicle 2 to a direction of the vehicle housing shelf 14. The pallet 15 changed in direction is conveyed upward together with the vehicle 2 by the lift 12, stopped at a height of the vehicle housing shelf 14 (14E) on which no vehicle 2 is housed, and slid from a floor surface of the lift 12 to a floor surface of the vehicle housing shelf 14. Thus, the vehicle 2 is housed on the vehicle housing shelf 14 together with the pallet 15.

{0061}

In unloading operation, the lift 12 stops at a height of a vehicle housing shelf 14 on which a vehicle 2 to be unloaded is housed, the vehicle 2 housed on the vehicle housing shelf 14 is moved to the lift 12 together with the pallet 15, the lift 12 is lowered to the turn table 7 to place the pallet 15 and the vehicle 2 on the turn table 7, the vehicle 2 is changed in direction by the turn table 7 to be directed to the loading/unloading door 3, and then unloaded.

{0062}

Next, a procedure for loading/unloading the vehicle 2

using the operation panel 25 will be described.

For loading, an automatic selection loading method in which the manager inputs only a type of a vehicle to be loaded on the operation display 26 of the operation panel 25, and then the control device 40 automatically selects an empty vehicle housing shelf 14, and a manual loading method in which the manager views a loading state in the parking tower 4 displayed on the operation display 26 of the operation panel 25, and directly selects an empty vehicle housing shelf 14 by touching a touch panel can be selected.

{0063}

{Automatic selection loading method}

As shown in Fig. 5, an initial screen of the operation display 26 includes a primary display section A and a secondary display section B (this applies to all the descriptions below). In the primary display section A, two icons of "TYPE OF VEHICLE" and "LOADING STATE", and the number of vehicles that can be parked (for example, 100) are displayed.

When the automatic selection loading method is selected, the "TYPE OF VEHICLE" icon is first touched. Each icon reacts when touched and changes its color, reversing black from white or vice versa, or the like (turned gray in Fig. 5), and simultaneously emits a touch sound.

{0064}

Then, the screen changes to a screen shown in Fig. 6, and icons corresponding to types of vehicles, and the number of vehicles that can be parked are displayed in the primary display section A. For example, when a high roof vehicle is to be loaded, a "HIGH ROOF" icon is touched. "CALLING" indicating that a current operation stage is a calling step is displayed in the secondary display section B.

{0065}

When the number of empty spaces for a vehicle of a particular type is zero, the icon of the vehicle indicates that the number of the vehicles that can be parked is zero, and the icon cannot be selected if touched. For example, like an icon of a high roof chargeable vehicle, the icon is displayed in a pale color but does not react if touched.

{0066}

If the "HIGH ROOF" icon is touched in a pallet selection screen in Fig. 6, the screen changes to a screen shown in Fig. 7 to confirm "IS HIGH ROOF TO BE LOADED?". This screen includes "YES" and "NO" icons, and if the high roof vehicle is to be loaded, the "YES" icon is touched. Thus, the screen changes to a screen shown in Fig. 8, and an operation of the lift 12 is started to convey a pallet 15 on an empty vehicle housing shelf 14 automatically selected by the control device 40 to the entry level 6. In the screen in Fig. 8, a number of the pallet that is being called (for example, No. 4) and a

time for the pallet to arrive at the entry level 6 (for example, 1 minute and 10 seconds) are displayed in an upper part of the secondary display section B.

{0067}

In the screen in Fig. 8, a "RETURN" icon is displayed in an upper left part of the primary display section A, and if this icon is touched, calling of the pallet 15 is discontinued and the screen returns to the initial screen. Also, a "RESERVE" icon is displayed in a lower right part of the primary display section A, and next loading/unloading can be reserved during calling of the pallet 15. If the "RESERVE" icon is touched during calling of the pallet 15, the screen changes to a reservation input screen shown in Fig. 9. This screen includes a "TYPE OF VEHICLE" icon and a "LOADING STATE" icon like the initial screen. If the icons are operated as described above to reserve next loading/unloading, the screen changes to a reservation display screen shown in Fig. 10, and a plurality of reservation contents are displayed in a bottom section. The reservation contents each include a "CANCEL RESERVATION" icon, and the icon can be touched to cancel the reservation. During these operations, an arrival time of the pallet 15 displayed in the upper part of the secondary display section B is being count down.

{0068}

When the pallet 15 arrives at the entry level 6, the

screen changes to a screen shown in Fig. 11, a guide "LOAD" is displayed, and the loading/unloading door 3 is opened. Thus, the vehicle 2 can be driven into the entry level 6. At this time, a display of "LOADING" indicating a loading step is added to the secondary display section B.

{0069}

When the vehicle 2 stops in a fixed position on the entry level 6, the operation display 26 changes to a screen shown in Fig. 12, and "CONFIRM SAFETY IN PARKING FACILITY AND PUSH CONFIRMATION BUTTON" is displayed. Also, a display of "CONFIRMATION" indicating a confirmation step is added to the secondary display section B. The manager confirms that a driver of the vehicle 2 leaves the entry level 6, and also checks a state of the vehicle. For example, the manager confirms that an antenna is housed, a door mirror is folded, a door is not opened, an engine stops, a vehicle body does not protrude from the pallet, or the like, and touches a "CONFIRM" icon if there is no abnormality.

{0070}

Then, the screen changes to a screen shown in Fig. 13, and a "CLOSE DOOR" icon is displayed together with a guide "CONFIRM THAT THERE IS NO PERSON IN PARKING FACILITY, AND CLOSE DOOR". The manager again confirms that there is no person in the parking facility, and then touches the "CLOSE DOOR" icon to close the loading/unloading door 3. A display

of "DOOR CLOSING" indicating a door closing step is added to the secondary display section B.

{0071}

When the loading/unloading door 3 is completely closed, the operation display 26 changes to a screen shown in Fig. 14, and the displayed number of vehicles that can be parked is reduced by one from the number originally displayed (for example, 99). Thus, loading by the automatic selection loading method is completed.

{0072}

{Manual loading method}

When the manual loading method is selected, as shown in Fig. 15, a "LOADING STATE" icon is first touched among two icons of "TYPE OF VEHICLE" and "LOADING STATE" displayed in the primary display section A on the initial screen. Thus, the screen changes to a screen shown in Fig. 16. On this screen, an internal structure of the parking tower 4 is displayed in a simplified manner, and icons 14i of the vehicle housing shelves 14 are displayed in real time together with numbers and empty/occupied states thereof. Only a pallet is displayed on an icon 14i indicating empty, and a pallet and a picture of a vehicle placed on the pallet are displayed on an icon 14i indicating occupied. Then, as described later, the icon 14i indicating empty can be touched to cause the control device 40 to perform a loading operation.

{0073}

Each icon 14i displays a type of a vehicle that can be parked on the vehicle housing shelf, and for an area having the charging device 18 (Nos. 1 to 4 vehicle housing shelves in Fig. 16), for example, a charge state mark of a plug cord is displayed to be recognizable. For example, "HIGH" is displayed for an area that can house high roof vehicles, and "MID" is displayed for an area that can house only mid-roof vehicles or smaller vehicles. Other conceivable types of vehicles include ordinary vehicles, low-floor vehicles, oversized vehicles, light automobiles, or the like. Mid-roof vehicles or light automobiles can be housed on the vehicle housing shelf for high roof vehicles.

{0074}

The operation display 26 can display only a part of all levels in the parking tower 4, for example, five levels. To view a level that is not displayed, scroll icons C, D, E, F on a right side of the screen are touched to scroll the screen. If the scroll icons D, E are touched, the screen is scrolled upward and downward by one screen (for five levels), and if the scroll icons C, F are touched, the screen is skipped to a top level and a bottom level.

{0075}

In a lower part of the secondary display section B, a vehicle weight indicator G that indicates a vehicle weight,

and a speed indicator H that indicates a raising and lowering speed of the lift 12 are displayed. In a lower part of the primary display section A, a current level indicating icon J that indicates, using a number, a level at which the lift 12 is currently located, and icons K, L indicating "FRONT SIDE" and "BACK SIDE" are provided. For example, the mechanical parking facility 1 includes a parking tower on a front side and a parking tower on a back side arranged in parallel inside one loading/unloading door 3. When the icon K indicating "FRONT SIDE" is touched, a parking state in the parking tower on the front side is displayed on the operation display 26, and when the icon L indicating "BACK SIDE" is touched, a parking state in the parking tower on the back side is displayed on the operation display 26. For the icons K, L, a selected one is displayed in a deep color and a non-selected one is displayed in a pale color.

{0076}

An icon 12i indicating a position and a movement of the lift 12 is displayed in real time on the operation display 26 together with the icon 14i of each vehicle housing shelf 14, and the screen is automatically scrolled upward and downward with the movement of the icon 12i of the lift 12.

Specifically, when the icon 12i moves up, the screen is sequentially scrolled to upper levels, and when the icon 12i moves down, the screen is sequentially scrolled to lower

levels. If the scroll icons C, D, E, F are touched during the automatic scrolling, manual scrolling using the scroll icons is prioritized. In the screen in Fig. 16, the icon 12i of the lift 12 is being at a height of, for example, Nos. 7 and 8 vehicle housing shelves.

{0077}

When a vehicle to be loaded is, for example, a high roof vehicle, and a hybrid vehicle that requires charging of a battery, the operation display 26 is viewed to look for an icon 14i indicating empty, corresponding to high roof, and having a charge state mark. In the screen in Fig. 16, the icons 14i of Nos. 1 to 4 vehicle housing shelves all indicate occupied, and thus the scroll icon D is touched to scroll the screen to upper levels.

{0078}

Thus, the screen moves to a screen shown in Fig. 17. On this screen, icons 14i of Nos. 11 to 20 vehicle housing shelves are displayed. In a state in Fig. 17, for example, Nos. 16, 19, and 20 icons 14i indicate high roof, chargeable, and empty. Thus, the vehicle may be parked in any of the three areas. As described above, the lift 12 stops at the height of the Nos. 7 and 8 vehicle housing shelves, selecting the No. 16 icon 14i closest to the lift 12 minimizes an amount of movement of the lift 12 to minimize a time for loading. Thus, the No. 16 icon 14i is touched. The touched icon 14i is

highlighted as compared to other icons by reversing color or flashing, and the highlighted display is continued until the loading/unloading operation is completed.

{0079}

Thus, the screen changes to a screen shown in Fig. 18, and "YES" and "NO" icons are displayed together with a guide "IS HIGH ROOF/CHARGING PALLET No. 16 TO BE LOADED?". When the "YES" icon is touched, the screen changes to a screen shown in Fig. 19, and a state where the icon 12i of the lift moves up and arrives at the No. 16 shelf is displayed in real time. At this time, the number of the pallet that is being called (No. 16) and a time for the pallet to arrive at the entry level 6 (for example, 1 minute and 10 seconds) are displayed in the upper part of the secondary display section B. Also, the speed indicator H indicates a raising speed of the lift 12. Further, the current level indication icon J indicates the number of a level through which the lift 12 is passing.

{0080}

When the icon 12i of the lift moves up to a height of the No. 16 shelf, as shown in Fig. 20, a state is displayed where the pallet is delivered from the icon 14i of the No. 16 vehicle housing shelf onto the icon 12i of the lift. When the delivery is completed, as shown in Fig. 21, a state of lowering of the lift 12 is displayed together with a lowering speed. Further, as shown in Fig. 22, a state of the lift 12

arriving at the entry level 6 is displayed. Meanwhile, an arrival time of the pallet 15 displayed in the upper part of the secondary display section B is being count down.

{0081}

When the lift 12 arrives at the entry level 6, the screen changes to a screen shown in Fig. 23, a guide "LOAD" is displayed, and the loading/unloading door 3 is opened. Thus, the driver of the vehicle 2 drives the vehicle 2 into the entry level 6. When the vehicle 2 stops in a fixed position on the entry level 6, the operation display 26 changes to a screen shown in Fig. 24. On this screen, "CONFIRM SAFETY IN PARKING FACILITY AND PUSH CONFIRMATION BUTTON" is displayed. The driver gets out of the vehicle 2 and connects a charging cable to a charging device, and leaves the entry level 6. Then, the manager confirms that the driver of the vehicle 2 is not on the entry level 6, also confirms a state of the vehicle, and touches a "CONFIRM PARKING FACILITY" icon if there is no abnormality.

{0082}

Then, the screen changes to a screen shown in Fig. 25, and a "CLOSE DOOR" icon is displayed together with a guide "CONFIRM THAT THERE IS NO PERSON IN PARKING FACILITY, AND CLOSE DOOR". The manager confirms that there is no person in the parking facility, and then touches the "CLOSE DOOR" icon to close the loading/unloading door 3.

{0083}

When the loading/unloading door 3 is completely closed, the display of the operation display 26 changes to a screen shown in Fig. 26, and the displayed number of vehicles that can be parked is reduced by one from the number originally displayed (for example, 99). Thus, loading is completed.

{0084}

Further, if a "LOADING STATE" icon shown in Fig. 26 is touched during housing of the vehicle 2, as shown in Fig. 27, an operation of the lift 12 (icon 12i) on which the vehicle 2 is placed being raised and housed on the No. 16 vehicle housing shelf is displayed in real time. At this time, the speed indicator H indicates a raising speed of the lift 12, and the vehicle weight indicator G indicates a vehicle weight of the vehicle 2. As such, even during display of the operation of housing, a "RESERVATION" icon in a lower right part of the screen can be touched, and thereby the screen changes to a reservation display screen shown in Figs. 9 and 10 to allow reservation of a next loading/unloading operation.

{0085}

{Unloading method}

Next, a procedure for unloading will be described.

As shown in Fig. 28, for unloading, a "LOADING STATE" icon displayed on the initial screen of the operation display 26 is touched. Thus, the screen changes to a screen shown in

Fig. 29. When a vehicle to be unloaded is housed on, for example, the No. 16 vehicle housing shelf, an icon of the No. 16 vehicle housing shelf is not displayed on the screen shown in Fig. 29, and thus the scroll icon D is touched to scroll the screen to upper levels. Thus, the screen moves to a screen shown in Fig. 30. Then, the icon 14i of the No. 16 vehicle housing shelf is touched. This allows the control device 40 to perform an unloading operation.

{0086}

Specifically, the operation display 26 changes to a screen shown in Fig. 31, and "YES" and "NO" icons are displayed together with a guide "IS No. 16 HIGH ROOF/CHARGING PALLET TO BE UNLOADED?". If the "YES" icon is touched, the screen changes to a screen shown in Fig. 32, and a state where the icon 12i of the lift moves up and arrives at the No. 16 shelf is displayed in real time. At this time, the number of the pallet that is being called (No. 16) and a time for the pallet to arrive at the entry level 6 (for example, 1 minute and 30 seconds) are displayed in the upper part of the secondary display section B. Also, the speed indicator H indicates a raising speed of the lift 12, and the current level indication icon J indicates the number of a level through which the lift 12 is passing.

{0087}

When the lift 12 is raised to a height of the No. 16

shelf, as shown in Fig. 33, a state is displayed where the pallet and the vehicle are delivered from the icon 14i of the No. 16 vehicle housing shelf onto the icon 12i of the lift. When the delivery is completed, as shown in Fig. 34, a state of lowering of the lift 12 is displayed together with a lowering speed and a vehicle weight. Further, as shown in Fig. 35, a state of the lift 12 arriving at the entry level 6 is displayed. Meanwhile, an arrival time of the pallet 15 displayed in the upper part of the secondary display section B is being count down.

{0088}

When the lift 12 arrives at the entry level 6, the screen changes to a screen in Fig. 36, a guide "UNLOAD" is displayed, and the loading/unloading door 3 is opened. Thus, the driver of the vehicle 2 enters the entry level 6, disconnects the charging cable from the charging device, and unloads the vehicle 2 from the entry level 6. When the vehicle 2 is unloaded from the entry level 6, the display on the operation display 26 changes to a screen shown in Fig. 37, and a "CLOSE DOOR" icon is displayed together with a guide "CONFIRM THAT THERE IS NO PERSON IN PARKING FACILITY, AND CLOSE DOOR". The manager confirms that there is no person in the parking facility, and then touches the "CLOSE DOOR" icon to close the loading/unloading door 3.

{0089}

When the loading/unloading door 3 is closed, the display on the operation display 26 returns to the initial screen shown in Fig. 38, the displayed number of vehicles that can be parked is increased by one from the number before unloading (for example, 100), and unloading is completed.

{0090}

As shown in Fig. 16, the charge state mark of, for example, a picture of a plug cord is displayed on the icon 14i of the vehicle housing shelf having the charging device so that it is identifiable. As shown in Figs. 39(a) to 39(f), such a charge state mark may be changed according to a charging state or a type of electric power used for charging.

{0091}

For example, (a) shows a mark indicating that the vehicle can be charged, (b) shows a mark indicating that the vehicle cannot be charged, (c) shows a mark indicating that the vehicle is being charged, (d) shows a mark indicating that charging has completed, (e) shows a mark indicating that charging has failed, and (f) shows a mark indicating that a nighttime power supply is being used. When the vehicle cannot be charged as in (b), the charge state mark may be undisplayed.

{0092}

As described above, the operation panel 25 includes the touch panel type operation display 26. On the operation

display 26, the icon 14i of each vehicle housing shelf 14 (or 14E) is displayed in real time together with an empty/occupied state thereof. When the icon 14i indicating empty is touched for loading, the control device 40 performs the loading operation, and when the icon 14i of the vehicle housing shelf on which the vehicle to be unloaded is parked is touched for unloading, the control device 40 performs the unloading operation.

{0093}

As such, the loading/unloading state in the parking facility is clearly displayed on the touch panel type operation display 26, and thus the manager can view the operation display 26 and reliably grasp the loading/unloading state in the parking facility. The icon 14i indicating empty is touched for loading, and the icon 14i of the vehicle housing shelf 14 on which the vehicle to be unloaded is parked is touched for unloading, thereby allowing the control device 40 to perform the loading operation or the unloading operation.

{0094}

Thus, there is no need to input the number of a vehicle housing shelf or a pallet for loading/unloading using a numerical keypad as is conventional, but the icon 14i can be directly touched to cause the control device 40 to start the loading/unloading operation. This provides good operability,

and reduces possibility of an input error.

{0095}

Also, the position and the movement of the lift 12 are displayed in real time on the operation display 26 using the icon 12i together with the icon 14i of each vehicle housing shelf. This allows the loading/unloading state in the parking facility to be more clearly grasped, and allows a quick loading/unloading operation. For example, for loading by the manual loading method, the icon 14i indicating empty closest to the icon 12i indicating the position of the lift 12 is touched, thereby reducing a time for the lift 12 to take an empty pallet in the parking space, and allowing the empty pallet to be conveyed to the entry level 6 in a short time. This can minimize a waiting time of a user and allow efficient operation.

{0096}

Also, on the operation display 26, the vehicle housing shelves 14 of all the levels in the parking tower 4 are not displayed, but partial, for example, five levels are displayed at each time. The display is automatically scrolled with raising and lowering of the icon 12i of the lift, and also can be manually scrolled by touching the scroll icons C, D, E, F provided on the screen.

{0097}

Thus, even in the tower mechanical parking facility

including multiple levels, loading/unloading states of all the levels are not listed, but loading/unloading states in several levels can be displayed at each time. Thus, even with a restriction in screen size of the operation display 26, the display of each level can be enlarged to improve visibility and touch-operability. Also, manual scrolling may be allowed to further increase convenience.

{0098}

Further, the icon 14i of each vehicle housing shelf 14 indicates empty/occupied, and also a type of a vehicle that can be parked on the vehicle housing shelf 14, the number of vehicles that can be parked, and presence or absence of the charging device. Thus, not only an ordinary vehicle, but also vehicles requiring special housing structures such as a high roof vehicle, a heavy vehicle, a low-floor vehicle, or a chargeable vehicle can be loaded into the vehicle housing shelf 14 with an optimum structure at a time, and the empty state in the parking facility can be clearly grasped, thereby contributing to an efficient operation of the mechanical parking facility 1.

{0099}

For loading, when the icon 14i indicating empty is touched, as shown in Figs. 7 and 18, a next screen displays a screen for confirming whether the vehicle is to be loaded. For unloading, when the icon 14i of the vehicle housing shelf

14 on which the vehicle to be unloaded is housed is touched, as shown in Fig. 31, a next screen displays a screen for confirming whether the vehicle is to be unloaded. Thus, even if the icon 14i is touched wrong, the operation can be corrected, thereby preventing the control device 40 from being activated by a wrong instruction. This can provide good operability and prevent an input error.

{0100}

Further, even during a loading/unloading operation, the screen can be changed to the reservation operation screen to reserve next loading/unloading as shown in Figs. 8 to 10. Thus, the next loading/unloading operation can be reserved without waiting for completion of the current loading/unloading operation, thereby providing an efficient operation.

{0101}

As shown in Figs. 40 to 42, an immediate loading button M may be displayed on the operation display 26.

The immediate loading button M is displayed so as to be touch-operable only when the loading/unloading operation is not performed, there is one or more empty vehicle housing shelf 14, and the lift 12 in an empty state is being at the entry level 6. At this time, the immediate loading button M may be highlighted by flashing or the like. Also, the number of a vehicle housing shelf to which a pallet placed on the

lift 12 belongs is also displayed together with the icon 12i of the lift 12 (in this example, No.20 is displayed).

{0102}

When the lift 12 is not located at the entry level 6, as shown in Fig. 41, for example, the immediate loading button M is displayed in pale color and does not react if touched.

Alternatively, the immediate loading button M is not displayed. Also in this case, the current level indication icon J indicating a level at which the lift 12 is located is displayed.

{0103}

If the immediate loading button M is touched when displayed to be touch-operable, the loading/unloading door 3 is opened to allow the vehicle to drive into the entry level 6. Thus, the manager can touch the immediate loading button M to allow the vehicle 2 to immediately drive into the entry level 6 without looking for an empty space by viewing or scrolling the operation display 26. This increases operability, and minimizes a waiting time of a user to provide an efficient operation.

{0104}

As shown in Fig. 42, a type of a vehicle that can be loaded such as "HIGH ROOF" can be displayed on the immediate loading button M to further increase convenience.

{0105}

As shown in Fig. 43, an immediate unloading button N may be displayed on the operation display 26.

The immediate unloading button N is displayed to be touch-operable when the loading/unloading operation is not performed and only when the lift 12 in an occupied state is being at the entry level 6. At this time, as shown in Fig. 43, the immediate unloading button N may be highlighted by reversing color or flashing. The operation display 26 displays that the icon 12i of the lift 12 in the occupied state is located at the entry level 6. Also, the number of a vehicle housing shelf to which a pallet placed on the lift 12 belongs is also displayed (in this example, No. 20 is displayed).

{0106}

When the immediate unloading button N is touched when displayed to be touch-operable, the loading/unloading door 3 is opened to allow the vehicle to be unloaded from the entry level 6. Thus, the manager can touch the immediate unloading button N to allow the vehicle 2 to be immediately unloaded from the entry level 6 without viewing or scrolling the operation display 26.

This operation is effective when the lift 12 in the occupied state is being at the entry level 6 immediately after loading, or when there is no user after calling of unloading, and the lift 12 in the occupied state is being at the entry

level 6 with the loading/unloading door 3 being temporarily closed.

This can increase operability, and minimize a waiting time of a user to provide an efficient operation.

{0107}

{Second embodiment}

Fig. 44 is a vertical sectional view of a vertical circulation type mechanical parking facility showing a second embodiment of the present invention, and Fig. 45 is a vertical sectional view taken along the line XLV-XLV in Fig. 44.

A mechanical parking facility 61 includes a parking tower 64 having, on a ground level, a loading/unloading door 63 for a vehicle 2 opening, and an inside of the loading/unloading door 63 is an entry level 65 into which the vehicle 2 drives.

{0108}

The mechanical parking facility 1 includes a widely well-known chain circulation type conveyor 66 (conveyor). The circulation type conveyor 66 includes a drive sprocket 67 journaled in an upper part in the parking tower 64, a driven sprocket 68 axially supported at a lower part of the parking tower 64, an endless conveying chain 69 wound around the sprockets, and a plurality of vehicle conveying cages 71 (parking spaces) are hung at regular intervals from the conveying chain 69 via attachments 70. For example, a total of 26 vehicle conveying cages 71 are provided. Each vehicle

conveying cage 71 detachably includes a pallet 72 on which the vehicle 2 is placed. The pallet 72 is conveyed while being supported from below by the vehicle conveying cage 71.

{0109}

As shown in Fig. 45, two conveying chains 69 are provided on front and rear of the vehicle conveying cage 71. The drive sprocket 67 is rotationally driven by a driving motor 74, a drive shaft 75, and a speed reduction device 76, and a brake device 77 is provided on the drive shaft 75 coaxially with the driving motor 74. The drive sprocket 67 is driven to circulate the vehicle conveying cages 71 in the parking tower 4, and the vehicle 2 is placed (loaded) on a pallet 72 of a vehicle conveying cage 71 that has stopped at the entry level 65 in the bottom part of the parking tower 4, or the vehicle 2 on the pallet 72 is discharged (unloaded).

{0110}

A turn table 80 is provided at the entry level 65. The turn table 80 is placed in a pit 81 provided in a floor of the entry level 65, lifts, from below, the pallet 72 placed on the vehicle conveying cage 71 that has stopped at the entry level 65 and raise the pallet 72 from the vehicle conveying cage 71 to reverse a front-rear direction thereof, and then again lowers and places the pallet 72 on the vehicle conveying cage 71. Thus, the vehicle 2 having loaded forward into the entry level 65 can be easily unloaded forward also in unloading.

{0111}

In the mechanical parking facility 61, among the 26 vehicle loading cages 71, for example, four vehicle loading cages 71 are chargeable vehicle loading cages 71E for charging electric vehicles such as hybrid vehicles or electric vehicles, and include a charging device 84 that supplies electric power to the chargeable vehicle loading cages 71E.

{0112}

The charging device 84 includes a feed relay unit 85 provided in each chargeable vehicle including cage 71E, a cabinet panel 87 that supplies electric power from an external power supply 86 such as a commercial power supply to the feed relay unit 85, and a charging operation panel 88 included in a control device 90 described later. As shown in Fig. 44, the cabinet panel 87 is provided, for example, at a height above the driven sprocket 68. The electric power from the external power supply 86 is distributed via the charging operation panel 88 and the cabinet panel 87 to the feed relay units 85, and used for charging the electric vehicle.

{0113}

The control device 90 that controls the entire mechanical parking facility 61 is provided, for example, in the entry level 65. The control device 90 performs a series of loading/unloading operations by the circulation type conveyor 66, the loading/unloading door 63, and the turn table 80, and

has a schematic configuration substantially the same as in the first embodiment shown in Fig. 4.

{0114}

Specifically, the control device 90 includes a screen depiction/scrolling/input information processing unit 90a, a database 90b is connected to the control device 90, and various devices as in the control device 40 in the first embodiment are provided. The lift 12 is connected as a conveyor to the conveyor control unit 43 in the first embodiment, while the circulation type conveyor 66 is connected to the conveyor control unit 43 in the second embodiment.

{0115}

The layout of the entry level 65 is substantially the same as in the first embodiment shown in Fig. 2, and an operation panel 25 is provided, for example, on the right side of the loading/unloading door 63. The operation panel 25 includes the same touch panel type operation display 26 as in the first embodiment in Fig. 3, and has substantially the same configuration as in the first embodiment other than contents of display on the operation display 26.

{0116}

As shown in Figs. 46 to 48, the operation display 26 displays an internal structure of the parking tower 64 in a simplified manner. Fig. 46 shows a range of several levels in

a lower part including the entry level 65 in the parking tower 64, Fig. 47 shows a range of several levels in a middle part, and Fig. 48 shows a range of several levels in an upper part.

{0117}

On the operation display 26, icons 71i of the vehicle conveying cage 71 and the chargeable vehicle including cage 71E are displayed in real time together with numbers and empty/occupied states thereof, and types of vehicles that can be parked (high roof vehicle, ordinary vehicle, or the like). For example, "HIGH" is displayed for an area that can house high roof vehicles, and "ORDINARY" is displayed for an area that can house only mid-roof vehicles or smaller vehicles.

{0118}

These icons 71i move in real time with actual movement of the vehicle conveying cage 71 and the chargeable vehicle including cage 71E in the parking tower 64, and a manager of the mechanical parking facility 61 can view the icons to grasp the parking state.

{0119}

A picture of a placed vehicle is displayed on an icon 71i indicating occupied so that a direction of the vehicle in a front-rear direction can be determined. The direction is determined and stored by a sensor or a manual input when loading. For example, a high roof vehicle is housed rearward in a No. 2 cage in Fig. 46, and ordinary vehicles are housed

forward in Nos. 5 and 25 cages.

{0120}

Further, a charge state mark of, for example, a plug cord is displayed on the icon 71i of the chargeable vehicle including cage 71E so as to be identifiable.

As in the first embodiment, on the operation display 26, indications of steps such as "CALLING", "LOADING/UNLOADING", "CONFIRMATION", and "DOOR CLOSING", a "RETURN" button, scroll icons C, D, E, F, a current level indication icon J, icons K, L for distinguishing a parking tower on a front side from a parking tower on a back side, an immediate loading button M, a reservation icon P, or the like are displayed.

{0121}

The icons described above except the immediate loading button M have the same functions as in the first embodiment, and descriptions thereof will be omitted.

The immediate loading button M is displayed to be touch-operable when an empty vehicle conveying cage 71 or chargeable vehicle including cage 71E is being at the entry level 65, and cannot be touched when an occupied cage is being at the entry level 65.

{0122}

The parking tower 64 includes the parking tower on the front side and the parking tower on the back side, and when a vehicle is loaded into a vehicle conveying cage 71 in the

parking tower on the back side, the vehicle entering through the loading/unloading door 63 needs to pass through the circulation type conveyor 66 in the parking tower on the front side. In this case, the vehicle passes through an unshown path cage for passage provided on the conveying chain 69 together with the vehicle conveying cage 71 and drives into the vehicle conveying cage on the parking tower on the back side.

{0123}

During operation of the circulation type conveyor 66, a stop button 93 is displayed in the operation display 26 (see Figs. 51 and 53). The stop button 93 is not used for an emergency stop of the circulation type conveyor 66 for safety like the emergency stop button 28 (see Fig. 3) provided on the operation panel 25, but used for stopping, at the entry level 65, a closest vehicle conveying cage 71 approaching the entry level 65 during operation of the circulation type conveyor 66.

{0124}

Also in the mechanical parking facility 61, for loading, an automatic selection loading method in which the manager inputs only a type of a vehicle to be loaded on the operation display 26 of the operation panel 25, and then causes the control device 90 to automatically select and call an empty vehicle conveying cage 71, and a manual loading method in which the manager views a loading state in the parking tower

64 displayed on the operation display 26 of the operation panel 25, and directly selects an empty vehicle conveying cage 71 by touching an icon thereof can be selected as in the first embodiment.

{0125}

For unloading, when the manager touches an icon 71i of a vehicle conveying cage 71 in which a vehicle to be unloaded is placed, the vehicle conveying cage 71 is conveyed to the entry level 65, and the loading/unloading door 63 is opened to allow unloading.

{0126}

Further, a turning operation can be performed of turning rearward the vehicle having driven forward into the vehicle conveying cage 71 to facilitate an operation for unloading (turning mode). Only the turning operation and the unloading operation will be described below.

{0127}

For example, as shown in Fig. 49, when the manager touches an icon 71i of a No. 9 vehicle conveying cage displayed in the operation display 26, the selected icon 71i is highlighted as compared to other icons 71i that are not selected, by reversing black from white or vice versa, flashing, or repeating reversing. The vehicle housed in the No. 9 vehicle conveying cage is loaded rearward, and a picture of an ordinary vehicle seen from rear is displayed on the No.

9 icon 71i.

{0128}

Then, the screen changes to a screen shown in Fig. 50, and letters "IS PALLET No. 09, TYPE OF VEHICLE: ORDINARY, TO BE CALLED?", and three icons 94, 95, 96 indicating "UNLOAD (CALL)", "TURN (CHANGE DIRECTION)", and "NO (STOP CALLING)" are displayed. If the icon 96 indicating "NO (STOP CALLING)" is touched, the screen returns to an initial screen, and the operations of the loading/unloading door 63 and the circulation type conveyor 66 are not performed.

{0129}

If the icon 95 indicating "TURN (CHANGE DIRECTION)" is touched on the screen in Fig. 50, the turning mode is entered of reversing the front-rear direction of a parked vehicle without unloading the vehicle. Then, as shown in Fig. 51, a right icon column including the icon 71i of the No. 9 vehicle conveying cage 71 flows downward, and a left icon column flows upward. The movement of the icon columns indicate movement of the vehicle conveying cages 71 (71E) on the circulation type conveyor 66 in real time, and at this time, an arrow operation direction mark 97 is displayed indicating a direction of movement of the vehicle conveying cages 71.

{0130}

Simultaneously, the number of the pallet that is being called (No. 09) and a time for the pallet to arrive at the

entry level 65 (for example, 0 minutes and 20 seconds) are displayed in an upper left part of the operation display 26. Also, as described above, the stop button 93 is displayed in the operation display 26.

{0131}

When the No. 9 vehicle conveying cage 71 arrives at the entry level 65, as shown in Fig. 52, the No. 9 icon 71i is reversed, and front and rear of the picture of the vehicle are changed. At this time, the front-rear direction of the vehicle housed in the No. 9 vehicle conveying cage 71 is actually reversed by the turn table 80.

{0132}

When the No. 9 icon 71i is reversed in the operation display 26, an arrow turning mark 98 indicating a turning operation is displayed next to the icon 71i. On the reversed No. 9 icon 71i, a picture of an ordinary vehicle seen from front is displayed. The turning mode can be used to sequentially turn the vehicles loaded rearward to facilitate unloading.

{0133}

Meanwhile, if the icon 94 indicating "UNLOAD (CALL)" is touched on the screen shown in Fig. 50, an unloading mode for unloading the parked vehicle is entered. In this case, as shown in Fig. 53, the No. 9 icon 71i moves downward with actual movement of the vehicle conveying cage 71. At this

time, the stop button 93 and the operation direction mark 97 are displayed.

{0134}

Then, when the No. 9 vehicle conveying cage 71 arrives at the entry level 65, the screen changes to an operation screen shown in Fig. 54, and a picture showing the No. 9 icon 71i arriving at the entry level 65 is displayed. Then, as shown in Fig. 55, "UNLOAD" is displayed on the operation display 26. When the user unloads the vehicle from the entry level 65, as shown in Fig. 56, a "CLOSE DOOR" icon is displayed together with a guide "CONFIRM THAT THERE IS NO PERSON IN PARKING FACILITY, AND CLOSE DOOR". If this icon is touched, the loading/unloading door 63 is closed and unloading is completed.

{0135}

In the operation panel 25 of the mechanical parking facility 61 configured as described above, the front-rear direction of the parked vehicle housed in the vehicle conveying cages 71, 71E is displayed on the operation display 26, and thus the manager can grasp the front-rear direction of the parked vehicle.

{0136}

Then, in the operation display 26, the unloading mode in which the parked vehicle housed in the vehicle conveying cage 71, 71E is unloaded, and the turning mode in which the front-

rear direction of the parked vehicle is reversed without being unloaded can be selected. Thus, the icon 71i of the vehicle loaded rearward is selected, and the turning mode is selected, thereby allowing the direction of the vehicle to be reversed and directed forward. Thus, the vehicle can be unloaded forward when unloading, thereby facilitating unloading and allowing efficient operation of the parking facility 61.

{0137}

The operation of reversing the direction of the parked vehicle using the turning mode can be performed between loading/unloading operations, and does not prevent loading/unloading of a different vehicles. Also, when a different vehicle needs to be loaded/unloaded during use of the turning mode, the stop button 93 displayed on the operation display 26 can be conveniently pushed to stop the turning mode and change to a normal loading/unloading operation.

{0138}

Further, if the icon 71i of the vehicle conveying cages 71, 71E displayed on the operation display 26 is touched and selected, the icon is highlighted as compared to other icons that are not selected. Thus, a position or movement of a vehicle to be loaded/unloaded or reversed is clarified, thereby allowing the manager to more easily perform the loading/unloading operation and the reversing operation.

{0139}

The operation panel 25 can be not only used in a new mechanical parking facility, and but also used for improving an operation panel of an existing mechanical parking facility to increase operability.

{0140}

Also, the operation panel and the mechanical parking facility including the operation panel according to the present invention are not limited to the configurations in the above described embodiments, but changes or improvements may be made without departing from the gist of the present invention. The scope of the present invention covers embodiments including such changes or improvements.

{0141}

For example, in the above described embodiments, the example has been described where the operation panel 25 according to the present invention is applied to the elevator type mechanical parking facility 1 including the tower type parking tower 4, and the vertical circulation type mechanical parking facility 61. However, the operation panel according to the present invention may be applied to not only the tower type, elevator type, and vertical circulation type mechanical parking facilities, but also a wide variety of mechanical parking facilities in which vehicles are conveyed by a conveyor such as plane circulation type, multilayer

circulation type, or conveyor conveying type mechanical parking facilities.

{0142}

In the above described embodiment, as shown in Figs. 2 and 4, the case with only one operation panel 25 according to the present invention has been described. However, when a plurality of entry levels are provided such as of a passage type with entry levels arranged on front and rear, or a multi type with entry levels laterally arranged, a plurality of operation panels 25 may be provided according to the number of loading/unloading doors, and the number of the operation panels 25 is not limited to one.

{Reference Signs List}

{Reference Signs List}

{0143}

1, 61 mechanical parking facility

2 vehicle

3, 63 loading/unloading door

4, 64 parking tower

6, 65 entry level

11 raising and lowering path

12 lift (conveyor)

12i icon of lift

14 vehicle housing shelf (parking space)

14i icon of vehicle housing shelf

15, 72 pallet
18, 84 charging device
25 operation panel
26 operation display
40, 90 control device
66 circulation type conveyor (conveyor)
71 vehicle conveying cage (parking space)
71i icon of vehicle conveying cage
93 stop button
M immediate loading button
N immediate unloading button

CLAIMS:

1. An operation panel provided in a mechanical parking facility, for making a control device to perform a series of loading/unloading operations in the mechanical parking facility having a plurality of parking spaces, a conveyer for loading/unloading a vehicle into and from the parking space, and the control device that performs the loading/unloading operations using the conveyer, the operation panel comprising a touch panel type operation display, wherein

the operation display is configured to display an icon of each parking space in real time together with an empty/occupied state of each parking space,

the operation panel is configured to make the control device perform the loading operation when the icon indicating empty is touched for loading, and

the operation panel is configured to make the control device perform the unloading operation when the icon of a

parking space in which a vehicle to be unloaded is parked is touched for unloading,

wherein the operation display is configured to display a part of the plurality of parking spaces, and to automatically scroll its screen in accordance with a movement of the conveyor.

2. The operation panel according to claim 1, wherein a position and a movement of the conveyor are displayed in real time on the operation display using an icon together with the icon of the parking space.

3. The operation panel according to any one of claims 1 to 2, wherein the icon of the parking space indicates a type of a vehicle that can be parked in the parking space.

4. The operation panel according to any one of claims 1 to wherein the operation display is configured to display the number of vehicles that can be parked in the mechanical parking facility.

5. The operation panel according to any one of claims 1 to wherein the operation display is configured to highlight an icon of the parking space as compared to other icons when the icon of the parking space is touched.

6. The operation panel according to any one of claims 1 to wherein the operation display is configured to display a next screen which displays a screen for confirming whether the vehicle is to be loaded when the icon indicating loadable is touched for loading, and to display a next screen which displays a screen for confirming whether the vehicle is to be unloaded when the icon of the parking space in which a vehicle to be unloaded is placed is touched for unloading.

7. The operation panel according to any one of claims

1 to wherein even during the loading/unloading operation, the screen can be changed to a reservation operation screen for a next loading/unloading reservation.

8. The operation panel according to any one of claims 1 to wherein the operation display is configured to display an immediate loading button in case the loading/unloading operation is not performed, the parking space includes one or more empty spaces, and the conveyor in an empty state is being at an entry level into which a vehicle to be parked drives, and the immediate loading button is touched to allow driving into the entry level.

9. The operation panel according to any one of claims 1 to wherein the operation display is configured to display an immediate unloading button in case the loading/unloading operation is not performed, and the conveyor in an occupied state is being at the entry level into which a vehicle to be parked drives, and the immediate unloading button is touched to allow the vehicle to be unloaded from the entry

level.

10. The operation panel according to any one of claims 1 to wherein a direction of vehicle in a front-rear direction of the parked vehicle housed in the parking space is displayed.

11. The operation panel according to any one of claims 1 to wherein the operation panel is configured such that an unloading mode for unloading the parked vehicle housed in the parking space, and a turning mode for turning the parked vehicle to change its direction in a front-rear direction of the parked vehicle without unloading the parked vehicle are selectable.

12. A mechanical parking facility comprising an operation panel according to any one of claims 1 to 11.