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PLATFORM OF VEHICLE FOR HIGH LIFT WORK

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a platform of a vehicle for high lift work used for work at a high place, such as loading of cargo into an airplane or a ship, maintenance, checking, and cleaning.

2. Description of Related Art

[0002] For such a vehicle for high lift work, for example, when in-flight meal, furnishings, baggage, etc. are loaded into an airplane, after a truck body is brought close to an airframe, a work bed is brought close to a loading port in the airframe at a high place by using a link mechanism provided on the truck body to load the in-flight meal etc. via a platform extending from the work bed.

[0003] However, in the case of a large airplane, the weight of loaded fuel only reaches two hundred and several tens tons, so that the airframe lowers. In particular, when cargoes are loaded, or passengers are allowed to get on, the amount of lowering sometimes reaches several hundred millimeters. In this case, due to the lowering of airframe, an airframe door that is open outward from the loading port interferes with the distal end of platform, which may present a problem that the airframe door is damaged. Therefore, the worker must always pay attention to a difference in height between the airframe door and the platform.

[0004] To solve this problem, conventionally, a main platform is fixed to the work bed, and the main platform is provided with a sub-platform which has a width narrower than that of the main platform and slides along the width direction. By sliding the sub-platform to a position at which the distal end thereof does not overlap with the airframe door, the interference between the airframe door and the sub-platform has been precluded (for example, refer to Patent Document 1).

[0005]

[Patent Document 1] Unexamined Japanese Patent Publication No. 2000-272403

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SUMMARY OF THE INVENTION

[0006] In the above-described prior art, there is room for improvement in terms of work space because the width of the sub-platform is narrower than that of the main platform.

[0007] The present invention has been made in view of the above situation, and accordingly an object thereof is to provide a platform of a vehicle for high lift work, which is capable of securing a wide work space while a function of sliding a sub-platform with respect to a main platform is maintained.

[0008] The invention described in claim 1 provides a platform of a vehicle for high lift work including a self-propelled truck body having a cabin at the front, a work bed provided so as to be elevated with respect to the truck body, a main platform fixedly held on the work bed at a position at which a floor surface thereof coincides with the floor surface of the work bed, and a sub-platform extending from a front face of the main platform, characterized in that the main platform is formed by a rectangular flat plate, and on a front face thereof, an extension portion for supporting the sub-platform slidably along the width extending to both sides of the main platform, and the sub-platform is provided with a floor surface coinciding with the floor surface of the main platform.

[0009] The invention described in claim 2 provides the platform of a vehicle for high lift work according to claim 1, characterized in that the main platform is provided with a wide slit, which is open toward both sides, on the front face thereof, and the sub-platform is provided with a projecting portion, which has a width narrower than that of the slit and is inserted in the slit to slide the sub-platform along the slit.

[0010] The invention described in claim 3 provides the platform of a vehicle for high lift work according to claim 1 or 2, characterized in that the sub-platform is provided with a first auxiliary platform capable of being pulled out of and stored in a front face of the sub-platform in the longitudinal direction and a second auxiliary platform capable of being pulled out of and stored in the front face of the sub-platform in

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the longitudinal direction.

[0011] The invention described in claim 4 provides the platform of a vehicle for high lift work according to any one of claims 1 to 3, characterized in that a width of the first auxiliary platform is narrower than a width of the second auxiliary platform.

[0012] The invention described in claim 5 provides the platform of a vehicle for high lift work according to any one of claims 1 to 4, characterized in that a chamfer portion is provided at at least one of a distal end corner of the sub-platform and the first auxiliary platform and a distal end corner of the sub-platform and the second auxiliary platform.

[0013] The invention described in claim 6 provides the platform of a vehicle for high lift work according to claim 5, characterized in that at least one of the first auxiliary platform and the second auxiliary platform is provided with an auxiliary platform which can swing or slide the auxiliary platform and can be pulled out of and stored in a front face of the chamfer portion.

[0014] The invention described in claim 7 provides the platform of a vehicle for high lift work according to claim 1 or 2, characterized in that the sub-platform is provided with one auxiliary platform capable of being pulled out of and stored in the front face of the sub-platform in the longitudinal direction.

[0015] The invention described in claim 8 provides the platform of a vehicle for high lift work according to claim 7, characterized in that a chamfer portion is provided at at least one of distal end corners of the sub-platform and the one auxiliary platform.

[0016] The invention described in claim 9 provides the platform of a vehicle for high lift work according to claim 8, characterized in that the one auxiliary platform is provided with an auxiliary platform which can swing or slide the auxiliary platform and can be pulled out of and stored in a front face of the chamfer portion.

[0017] According to the present invention, since the main platform is provided with the extension portion on the front face thereof, and

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the sub-platform having a floor surface coinciding with the floor surface of the main platform is supported by the extension portion, even if the floor surface of the sub-platform is secured so as to be equal to or greater than the width of the main platform, the sub-platform can be slid with respect to the main platform. Therefore, according to the present invention, a wide work space can be secured while a function of sliding the sub-platform with respect to the main platform is maintained.

[0018] Also, the present invention may be configured so that the slit, which is open toward both sides, is provided on the front face of the main platform, the projecting portion of the sub-platform having a width narrower than that of the slit is inserted, and the remaining portion of the sub-platform is supported by the extension portion provided on the front face of the main platform. In this case as well, even if the floor surface of the sub-platform is secured so as to be equal to or greater than the width of the main platform, the sub-platform can be slid with respect to the main platform. As a result, a wide work space can be secured while a function of sliding the sub-platform with respect to the main platform is maintained. In addition, according to such a configuration, since the width of the projecting portion of the sub-platform is narrower than the width of the slit in the main platform, resultantly, the amount of slide of the sub-platform increases, so that even if the floor surface of the sub-platform is secured so as to be equal to or greater than the width of the main platform, a necessary amount of slide of the sub-platform can be secured.

[0019] Also, in the present invention, it is preferable that the sub-platform be provided with the flat plate shaped first auxiliary platform capable of being pulled out of and stored in the front face of the sub-platform in the longitudinal direction and the flat plate shaped second auxiliary platform capable of being pulled out of and stored in the front face of the sub-platform in the longitudinal direction. In this case, even if the target position such as the loading port above the main wing of airplane is located at a far place, the platform can be set

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at the target position, and a wider work space can be secured.

In addition, according to such a configuration, the sliding operation of the sub-platform for preventing interference of the distal end of the platform with the door, which opens outward from the loading port, can be kept at a minimum. Therefore, the work time for loading of cargoes etc. and maintenance at a high place is shortened, which results in improved work efficiency.

[0020] Further, in the present invention, the width of the first auxiliary platform may be narrower than the width of the second auxiliary platform. In this case, if the first auxiliary platform is arranged on the side such that the sub-platform is difficult to slide, the center axis of the first auxiliary platform lies at a position shortest from the center axis of the loading port. Therefore, even in the state in which the sub-platform is difficult to slide, the center axis of the first auxiliary platform has only to be slid in the direction of the center axis of the loading port. As a result, the amount of slide of the sub-platform is kept at a minimum, so that the work time for loading of cargoes etc. and maintenance at a high place is shortened, which results in improved work efficiency. Also, when a vehicle for high lift work is used to perform work, usually, if the vehicle is caused to approach the airframe in a state in which the vehicle axis coincides with the center axis of the target position, the platform is easily set at the target position. However, if the width of the second auxiliary platform is greater than that of the first auxiliary platforms, when the vehicle is caused to approach the airframe in a state in which the vehicle axis coincides with the center axis of the loading port, the center axis of the second auxiliary platform lies at a position shortest from the center axis of the loading port. Therefore, even in the state in which the sub-platform can be slid freely, the center axis of the second auxiliary platform has only to be slid in the direction of the center axis of the target position. As a result, the amount of slide of the sub-platform is kept small, so that the work time for loading of cargoes etc. and maintenance at a high place is shortened, which

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results in improved work efficiency.

[0021] Further, in the present invention, it is preferable that a chamfer portion be provided at at least one of a distal end corner of the sub-platform and the first auxiliary platform and a distal end corner of the sub-platform and the second auxiliary platform. In this case, even if the work bed is raised or lowered, the distal end corner of the platform does not become a hindrance, and therefore the vehicle for high lift work can be moved to a position close to the target position. As a result, the amount of extension of the auxiliary platform can be kept at a minimum.

[0022] In addition, in the present invention, it is preferable that at least one of the first auxiliary platform and the second auxiliary platform be provided with an auxiliary platform which can swing or slide the auxiliary platform and can be pulled out of and stored in a front face of the chamfer portion. In this case, even if the work bed is raised or lowered, the distal end corner of the auxiliary platform does not become a hindrance, and therefore a wide work space can be secured even at the time of actual work.

[0023] Also, in the present invention, the sub-platform can be provided with one auxiliary platform capable of being pulled out of and stored in the front face of the sub-platform in the longitudinal direction. In this case, even if the target position such as the loading port above the main wing of airplane is located at a far place, the platform can be set at the target position by a simple construction, so that a wider work space can be secured.

[0024] Further, even in the case where one auxiliary platform is provided, it is preferable that a chamfer portion be provided at at least one of distal end corners of the sub-platform and the one auxiliary platform. In this case as well, even if the work bed is raised or lowered, the distal end corner of the platform does not become a hindrance, so that the vehicle for high lift work can be moved to a position near the target position. As a result, the amount of extension of the auxiliary platform can be kept at a minimum.

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[0025] In addition, even in the case where one auxiliary platform is provided, it is preferable that the one auxiliary platform be provided with an auxiliary platform which can swing or slide the auxiliary platform and can be pulled out of and stored in the front face of the chamfer portion. In this case as well, even if the work bed is raised or lowered, the distal end corner of the auxiliary platform does not become a hindrance, and therefore a wide work space can be secured even at the time of actual work.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

[Figure 1] A side view of a lift truck, being one embodiment of the present invention, which is used at an airport and has a box-type cargo bed for loading in-flight meal etc. into an airplane.

[Figure 2] Figures 2(a) and 2(b) are a top view and a side view, respectively, showing a case where a platform is at a neutral position, in the embodiment shown in Figure 1.

[Figures 3] A top view of a main platform in the embodiment shown in Figure 1.

[Figure 4] A front view of a main platform and a top view of a sub-platform in the embodiment shown in Figure 1.

[Figure 5] A front view of a sub-platform and a top view of auxiliary platforms in the embodiment shown in Figure 1.

[Figure 6] A top view of a principal portion showing a state in which a lift truck is stopped near an airframe in the embodiment shown in Figure 1.

[Figure 7] A top view of a principal portion showing a work state in which a platform is extended from a lift truck to load cargoes in the embodiment shown in Figure 1.

[Figure 8] A side view showing a lift truck together with a part of an airframe in the embodiment shown in Figure 1.

[Figure 9] A top view of a principal portion showing a state in which a sub-platform is slid to the left with respect to a main platform in the embodiment shown in Figure 1.

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- [Figure 10] A top view of a principal portion showing a state in which auxiliary platforms are pulled out forward from a sub-platform slid to the left in the embodiment shown in Figure 1.
- [Figure 11] A top view of a principal portion showing a state in which auxiliary platforms are set to a loading port in the embodiment shown in Figure 1.
- [Figure 12] A top view of a principal portion showing a state in which auxiliary platforms are set to a loading port having no obstacle such as a main wing in the embodiment shown in Figure 1.
- [Figure 13] A top view of a principal portion showing a state in which a sub-platform is slid to the left with respect to a main platform and auxiliary platforms are pulled out forward in another embodiment of the present invention.
- [Figure 14] Figures 14(a) and 14(b) are a top view and a side view, respectively, showing a case where a platform is at a neutral position in still another embodiment of the present invention.
- [Figure 15] A front view of a main platform and a top view of a sub-platform in the embodiment shown in Figure 14.
- [Figure 16] A front view of a sub-platform and a top view of auxiliary platforms in the embodiment shown in Figure 14.
- [Figure 17] A top view of a principal portion showing a state in which a sub-platform is slid to the left with respect to a main platform in the embodiment shown in Figure 14.
- [Figure 18] A top view of a principal portion showing a state in which auxiliary platforms are pulled out forward from a sub-platform slid to the left in the embodiment shown in Figure 14.
- [Figure 19] A top view of a principal portion showing a state in which auxiliary platforms are set to a loading port in the embodiment shown in Figure 14.
- [Figure 20] A top view of a principal portion showing a state in which auxiliary platforms are set to a loading port having no obstacle such as a main wing in the embodiment shown in Figure 14.

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[0027] Embodiments of the present invention will now be described with reference to the accompanying drawings. In the following explanation, the direction in which a driver seat is located is taken as the front, and upper, lower, right and left directions are defined by the direction viewed from the driver.

[0028] Figure 1 is a side view of a lift truck 100, being one embodiment of the present invention, which is used at an airport and has a box-type cargo bed for loading in-flight meal etc. into an airplane. Also, Figures 2(a) and 2(b) are a top view and a side view, respectively, showing a case where a platform 200, described later, is at a neutral position. Figures 3 to 5 are exploded views showing parts of the platform 200 shown in Figure 2.

[0029] As shown in Figure 1, the lift truck 100 includes a self-propelled truck body 120 having a cabin 110 at the front, a pantographic link mechanism 130 provided on a truck body frame 121 mounted on the truck body 120, and a box-type cargo bed (work bed) 140 elevating on the truck body 120 by means of the link mechanism 130. At four places at the front, rear, right and left of the truck body frame 121, a stabilizing hydraulic jack 122 is provided to secure stability with respect to wind pressure at the time when the box-type cargo bed 140 is raised.

[0030] The link mechanism 130 is made up of two outside links 131 arranged in parallel with each other transversely and two inside links 132 arranged in parallel with each other transversely, a link shaft 133 for rotatably supporting the side links 131 and 132, and a hydraulic lift cylinder 134 installed between the side links 131 and 132.

[0031] The outside links 131 are configured so that portions near the upper ends thereof are connected integrally by a front shaft 151, and the lower ends thereof are supported so as to be movable along the truck body frame 121. The inside links 132 are also configured so that portions near the upper ends thereof are connected integrally by a rear shaft 152, and the lower ends thereof are fixed to the truck body frame 121 so as to be turnable by a fixing shaft 150. The front shaft

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151 and the rear shaft 152 each extend in a rectangular cargo bed frame 160 for holding the box-type cargo bed 140. Thereby, the link mechanism 130 is raised and lowered by the extension and retraction of the hydraulic lift cylinder 134 while the box-type cargo bed 140 is kept in a state of being parallel with a road surface with respect to the truck body 120. In this embodiment, a linear-motive mechanism consisting of rollers, rails, etc. is provided between the box-type cargo bed 140 and the cargo bed frame 160, so that the cargo bed frame 160 supports the box-type cargo bed 140 so as to be movable along a beam 160a of the cargo bed frame 160.

[0032] In this embodiment, the box-type cargo bed 140 has, as shown in Figure 1, a platform 200 which can be extended and contracted in the front direction of the vehicle to load meal and cargoes into the airplane. In an ordinary state, for example, during the running of vehicle, the platform 200 is supported in a state of being in contact with a frame 123 fixed to the truck body frame 121 as indicated by region A in Figure 1, and is placed at a predetermined upper position of the cabin 110 provided on the truck body 120.

[0033] The platform 200 is one independent unit as shown in Figure 2, and consists of a main platform 210, a sub-platform 220, and three auxiliary platforms 230, 240 and 250 as shown in Figures 3 to 5. These platforms operate independently on the basis of the main platform 210.

[0043] As shown in Figures 3 and 4, the main platform 210 is formed by a rectangular flat plate, and on a front face 210t thereof, a wide slit 211, which is open toward both sides, is provided, and at both sides of the slit 211, a bracket 212 is integrally provided. Also, the bracket 212 is fitted with rollers 213, and the roller 213 is attached to two guide Rails 142 extending upward from the front both sides of the box-type cargo bed 140. Thereby, when the box-type cargo bed 140 begins to rise, the guide rails 142 move relative to the main platform 210. Therefore, although the box-type cargo bed 140 is raised while the platform 200 is kept at a position indicated by region

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A in Figure 1, when the height of floor surface of the box-type cargo bed 140 coincides with the floor surface height of the main platform 210f, the main platform 210 comes into contact with a lower end portion of the guide rail 142 and is fixedly held on the box-type cargo bed 140, so that the platform 200 rises integrally with the box-type cargo bed 140.

[0035] Also, as shown in Figure 3, the main platform 210 is provided with an extension portion 214 projecting forward in a front lower portion of the slit 211. This extension portion 214 is provided with rollers 215 at the distal end 214t thereof to support a main portion 221 of the sub-platform 220, described later, by means of the rollers 215. The extension portion 214 may be constructed by a frame only for the purpose of lighter weight of the main platform 210. Also, in the slit 211, a guide rail 216 is provided. This guide rail 216 supports rollers 224 provided on a projecting portion 222 of the sub-platform 220, described later. Therefore, the main platform 210 supports the sub-platform 220 so as to be slidable along the slit 211.

[0036] As shown in Figure 4, the sub-platform 220 includes the main portion 221 having a width W_2 greater than a width W_1 of the main platform 210, and the projecting portion 222 which connects with the rear portion of the main portion 221, has a width W_3 narrower than a width W_s of the slit 211 in the main platform 210, and is inserted in the slit 211. Also, between the main portion 221 and the projecting portion 222, a difference in height 223 is formed. By this difference in height 223, as shown in Figure 2(b), a floor surface 221f of the sub-platform 220 (main portion 221) forms a flat floor surface which coincides with a floor surface 210f of the main platform 210.

[0037] Further, between the main platform 210 and the projecting portion 222 of the sub-platform 220, as shown in Figure 2(a), a hydraulic or electrically-controlled actuator 260 is provided. By the extension and retraction of this actuator 260, the sub-platform 220 is slid along the width direction of the main platform 210.

[0038] As shown in Figures 4 and 5, the sub-platform 220 is provided

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with two passages 225 and 226 which are open to a front face 220t thereof and have a different width, and near the distal end thereof, a slope portion 220I having a gentle slope is formed. Therefore, when the first auxiliary platform 230 and the second platform 240 are inserted in the passages 225 and 226, respectively, the floor surface 221f of the sub-platform 220 connects with a floor surface 230f of the auxiliary platform 230 without a difference in height via the slope portion 220I, and also connects with a floor surface 240f of the auxiliary platform 240 without a difference in height via the slope portion 220I.

[0039] As shown in Figure 5, the auxiliary platform 230 is of a substantially rectangular plane shape the rear portion of which projects. The auxiliary platform 230 is provided with a protector rubber 231, which is a tubular buffering member, on the front face thereof, and is provided with a roller 232 at both sides thereof. As shown in Figure 2(a), between the auxiliary platform 230 and the sub-platform 220, a hydraulic or electrically-controlled actuator 270 is provided. Therefore, by the extension and retraction of the actuator 270, the auxiliary platform 230 moves the sub-platform 220 in the longitudinal direction along the passage 225 so as to be pulled out of and stored in the front face 220t thereof. Similarly, as shown in Figure 5, the auxiliary platform 240 is also of a substantially rectangular plane shape the rear portion of which projects. The auxiliary platform 240 is provided with a protector rubber 241, which is a tubular buffering member, on the front face thereof, and is provided with a roller 242 at both sides thereof. As shown in Figure 2(a), between the auxiliary platform 240 and the sub-platform 220, a hydraulic or electrically-controlled actuator 280 is provided. Therefore, by the extension and retraction of the actuator 280, the auxiliary platform 240 also moves the sub-platform 220 in the longitudinal direction along the passage 226 so as to be pulled out of and stored in the front face 220t thereof.

[0040] Although both of the auxiliary platforms 230 and 240 are moved longitudinally by only the rollers 232 and 242 in this

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embodiment, means, for example, such that guide rails for slidably supporting the auxiliary platforms via the rollers 232 and 242 are provided in the passages 225 and 226 may be used. Also, in this embodiment, as shown in Figure 5, a width W4 of the auxiliary platform 230 is narrower than a width W5 of the auxiliary platform 240 ($W5 > W4$), these widths W4 and W5 may be equal to each other.

[0041] Further, in this embodiment, as shown in Figures 4 and 5, at the distal end corners of the sub-platform 220 and the auxiliary platform 230, chamfer portions 220c and 230c are provided, respectively. As shown in Figure 2(a), when the auxiliary platform 230 is stored in the sub-platform 220, the distal ends of the chamfer portions 220c and 230c align on the same plane.

[0042] In addition, the auxiliary platform 230 is provided with the fan-shaped auxiliary platform 250 which can swing or slide the auxiliary platform 230 in the longitudinal direction and can be pulled out of and stored in the front face of the chamfer portion 230c. Specifically, the auxiliary platform 250 is provided with a protector rubber 251, which is a buffering member, on the front face thereof, and, like other platforms, is provided with a roller on both sides. Alternatively, the auxiliary platform 250 is pivotally supported so as to be turnable with respect to the auxiliary platform 230 so as to be pulled out of and stored in the front face of the chamfer portion 230c by the extension and retraction of an actuator disposed between the auxiliary platform 250 and the sub-platform 220.

[0043] In this embodiment, as shown in Figure 1, at the front of the box-type cargo bed 140, transversely opened doors 143 of a hinged double construction having two right and left doors are provided. These doors 143 are attached to the inner wall of the box-type cargo bed 140 via a hinge. The door 143 consists of a plurality of doors 143a, 143b and 143c. When the doors 143 are opened toward the platform 200 after the floor surface height of the box-type cargo bed 140 coincides with the floor surface height of the main platform 210, the doors 143 form platform protective walls by being slid along the

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platform 200, as indicated by region B in Figure 1.

[0044] On a front roof of the box-type cargo bed 140, a rain-averting canopy 144, which is stored in the roof at the time of running and is taken out as necessary, is provided. This canopy 144 improves the work environment in bad weather by being raised and extended by a hydraulic cylinder, not shown. Reference numeral 145 denotes a hand rail which is detachably provided on the platform 200 for the safe of workers.

[0045] Next, the specific operation of this embodiment is explained with reference to Figures 6 to 12.

[0046] Figure 6 is a top view of a principal portion showing a state in which the lift truck 100 is stopped near an airframe 10. Figure 7 is a top view of a principal portion showing a work state in which the platform 200 is extended from the lift truck 100 to load cargocs. Figure 8 is a side view showing the lift truck 100 shown in Figure 6 together with a part of the airframe 10.

[0047] In the case where a loading port 12 in the airframe 10 is located at an upper part of a main wing 11, and a door 13 is open outward to the left, as shown in Figure 6, when the lift truck 100 is stopped, it is necessary to set a clearance C1 with respect to an engine 14 at 1.1 meters and to set a horizontal distance C2 between the left distal end corner of the platform 200 and the main wing 11 at 1 meter or larger. In this case, since another vehicle 300 is stopping at the right, as shown in Figure 6, the lift truck 100 must be stopped substantially perpendicularly to the airframe 10.

[0048] Therefore, the lift truck 100 in accordance with the present invention forms a passage for connecting the lift truck 100 substantially perpendicularly to the airframe 11 between the box-type cargo bed 140 and the loading port 12 by the procedure described below.

[0049] Figure 9 is a top view of a principal portion showing a state in which the sub-platform 220 is slid to the left with respect to the main platform 210. Figure 10 is a top view of a principal portion showing a state in which the auxiliary platforms 230 to 250 are pulled

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out forward from the sub-platform 220 slid to the left. Figure 11 is a top view of a principal portion showing a state in which the auxiliary platforms 230 to 250 are set to the loading port 12.

[0050] In this embodiment, first, as shown in Figure 6, after the lift truck 100 is stopped at a position close to the position of the loading port 12 in the airframe 10, the hydraulic jacks 122 are lowered to stabilize the truck 100. Next, as shown in Figure 8, the box-type cargo bed 140 is raised to a height at which the floor surface height thereof coincides with the floor surface height of the loading port 12 by the link mechanism 130, and is slid forward along the cargo bed frame 160.

[0051] Then, as shown in Figure 9, the actuator 260 is extended to slide the sub-platform 220 to the left (upper side on the figure) with respect to the main platform 210. In this case, the slit 211 open toward both sides is provided on the front face 210t of the main platform 210. The projecting portion 222 of the sub-platform 220 having a width narrower than that of the slit 211 is inserted, and the remaining portion (main portion 221) of the sub-platform is supported by the flat plate shaped extension portion 214 provided at a lower part of the front face 210t of the main platform 210. Therefore, even if the width $W2$ of the floor surface 221f of the sub-platform 220 is secured so as to be equal to or greater than the width $W1$ of the main platform 210, the sub-platform 220 can be slid with respect to the main platform 210. Therefore, according to such a configuration, a wide work space can be secured while a function of sliding the sub-platform 220 with respect to the main platform 210 is maintained. In addition, according to such a configuration, the width $W3$ of the projecting portion 222 of the sub-platform 220 is narrower than the width Ws of the slit 221 of the main platform 210. As a result, the amount of slide of the sub-platform 220 increases, so that even if the width $W2$ of the floor surface 221f of the sub-platform 220 is secured so as to be equal to or greater than the width $W1$ of the main platform 210, a necessary amount of slide of the sub-platform 220 can be secured.

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[0052] Subsequently, as shown in Figure 10, the actuators 270 and 280 are extended to pull out the auxiliary platforms 230 and 240 forward (to the right-hand side on the figure) toward the airframe 10 from the sub-platform 220. In this case, as shown in Figure 11, the auxiliary platform 230 is positioned at a position at which the distal end (protector rubber 231) thereof does not come into contact with the airframe 10, and the auxiliary platform 250 is pulled out of the chamfer portion 230c. Since the airframe door 13 of the loading port 12 is opened to the left outward, the auxiliary platform 240 is positioned at a position at which the distal end (protector rubber 241) of the auxiliary platform 240 does not overlap with the airframe door 13.

[0053] Specifically, since the auxiliary platform 230 and the auxiliary platform 240 are provided on the sub-platform 220, even if the target position such as the loading port 12 above the main wing of airplane is located at a far place, the platform 200 can be set at the target position, and a wide work space can be secured. In addition, according to such a configuration, the sliding operation of the sub-platform 220 for preventing interference of the distal end of the auxiliary platform 230 with the airframe door 13 can be kept at a minimum. Therefore, the work time for loading of cargoes etc. and maintenance at a high place is shortened, which results in improved work efficiency.

[0054] In this embodiment, as shown in Figure 7, a detachable auxiliary plate 290 is placed between the auxiliary platform 230 and the loading port 12. However, work may be performed without the use of the auxiliary plate 290.

[0055] In this embodiment, to set the platform 200 to the loading port 12, as shown in Figure 11, the sub-platform 220 is positioned at a position at which the center axis O1 of the auxiliary platform 230 substantially coincides with the center axis O of the loading port 12 by the actuator 260. If the auxiliary platform 230 is arranged on the side such that the sub-platform 220 is difficult to slide, the center axis O1 of the auxiliary platform 230 lies at a position shortest from the center

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axis O of the loading port 12. Therefore, in the case where the width W4 of the auxiliary platform 230 is narrower than the width W5 of the auxiliary platform 240, even in the state in which the sub-platform 220 is difficult to slide, the center axis O1 of the auxiliary platform 230 has only to be slid in the direction of the center axis O of the loading port 12. As a result, the amount of slide of the sub-platform 220 is kept at a minimum, so that the work time for loading of cargoes etc. and maintenance at a high place is shortened, which results in improved work efficiency.

[0056] Figure 12 is a top view of a principal portion showing a state in which the auxiliary platforms 230 to 250 are set to a loading port 15 having no obstacle such as the main wing 11. In this case, since a door 16 for the loading port 15 opens to the right outward, the auxiliary platform 230 may be aligned with the loading port 15 by sliding the sub-platform 220 to the left. However, according to the platform 200 of this embodiment, the following operation is performed so that the work space is as even as possible.

[0057] First, when a lift truck is used to perform work, usually, if the truck is caused to approach the airframe in a state in which the vehicle axis Ov coincides with the center axis O of the loading port 15, the platform 200 is easily set to the loading port 15. However, if the width of the auxiliary platform 240 is greater than that of the auxiliary platforms 230, when the truck is caused to approach the airframe in a state in which the vehicle axis Ov coincides with the center axis O of the loading port 15, the center axis O2 of the auxiliary platform 240 lies at a position shortest from the center axis O of the loading port 15. Therefore, in the case where the width W4 of the auxiliary platform 230 is narrower than the width W5 of the auxiliary platform 240, even in the state in which the sub-platform 220 can be slid freely, the center axis O2 of the auxiliary platform 240 has only to be slid in the direction of the center axis O of the loading port 15. As a result, the amount of slide of the sub-platform 220 is kept at a minimum, so that the work time for loading of cargoes etc. and maintenance at a high

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place is shortened, which results in improved work efficiency.

[0058] Further, in this embodiment, since the chamfer portions 220c and 230c are provided at the distal end corners of the sub-platform 220 and the auxiliary platform 230, respectively, the clearance C2 is secured between the distal end corner of the platform 200 and the main wing 11, so that even if the box-type cargo bed 140 is raised or lowered, the distal end corner of the platform 200 does not become a hindrance, and therefore the lift truck 100 can be moved to a position close to the loading port 12. As a result, the amount of extension of the auxiliary platform 230 can be kept at a minimum. Although the chamfer portions 220c and 230c are provided at the distal end corners of the sub-platform 220 and the auxiliary platform 230, respectively, in this embodiment, the chamfer portion may be provided only the distal end corner of the sub-platform 220 and the auxiliary platform 240, or may be provided both of the distal end corners of the sub-platform 220 and the auxiliary platform 240.

[0059] In addition, in this embodiment, since the auxiliary platform 230 is provided with the auxiliary platform 250 which can swing or slide the auxiliary platform 230 and can be pulled out of and stored in the front face of the chamfer portion 230c, even if the box-type cargo bed 140 is raised or lowered, the distal end corner of the auxiliary platform 230 does not become a hindrance, and therefore a wide work space can be secured even at the time of actual work. In this embodiment, the auxiliary platform 250 is provided on the auxiliary platform 230. However, in the case where the chamfer portion is provided only at the distal end corner of the auxiliary platform 240 or on both of the auxiliary platform 240 and the platform 230, the auxiliary platform 240 may be provided with an auxiliary platform which can swing or slide the auxiliary platform 240 and can be pulled out of and stored in the front face of the chamfer portion thereof.

[0060] Also, in the present invention, the main platform 210 may be supported slidably along the width by only the extension portion 214 without providing the slit 211 in the main platform 210.

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[0061] Figure 13 is a top view of a principal portion showing a state in which the sub-platform 220 is slid to the left with respect to the main platform 210 and the auxiliary platforms 230 to 250 are pulled out forward in another embodiment of the present invention in which the above-described concept is embodied. In this embodiment, the same reference numerals are applied to elements that are the same as those in Figures 1 to 12, and the explanation thereof is omitted.

[0062] In this embodiment, on the front face 210t of the main platform 210, the guide rail 216 is provided in place of the slit 211, and on the other hand, on the rear face of the sub-platform 220, the plurality of rollers 224 are directly provided on the rear face of the main portion 221 without providing the projecting portion 222. Specifically, in this embodiment, the main platform 210 supports the main portion 221 of the sub-platform 220 by means of the roller 215 provided at the distal end 214t of the extension portion 214, and also supports the rollers 224 provided in the main portion 221 of the sub-platform 220 by means of the guide rail 216. Therefore, the main platform 210 supports the sub-platform 220 so as to be slidable along the width thereof.

[0063] In this case as well, the platforms 210 and 220 are connected by the actuator 260 arranged on the extension portion 214, the extension portion 214 is provided at a lower part of the front face 210t of the main platform 210, and the sub-platform 220 provided with a floor surface 221f coinciding with the floor surface 210f of the main platform 210 is supported by the extension portion 214. Therefore, even if the floor surface 221f of the sub-platform 220 is secured so as to be equal to or greater than the width of the main platform 210, the sub-platform 220 can be slid with respect to the main platform 210. Therefore, according to this configuration as well, a wide work space can be secured while a function of sliding the sub-platform 220 with respect to the main platform 210 is maintained. The guide rail 216 and the rollers 224 may be configured so that the rollers are provided on the front face 210t of the main platform and the guide rail for

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supporting the rollers is provided on the rear face of main portion of the sub-platform 220.

[0064] Further, in the present invention, the auxiliary platforms 230 and 240 may be formed by one piece. Figures 14(a) and 14(b) are a top view and a side view, respectively, showing a case where a platform 400 that embodies the above-described concept is at a neutral position. Figures 15 and 16 are exploded views showing parts of the platform 400 shown in Figure 14. In this embodiment, as the main platform, the main platform 210 shown in Figure 3 is used, and the same reference numerals are applied to elements that are the same as those in Figures 1 to 13, and the explanation thereof is omitted.

[0065] The platform 400 is also one independent unit as shown in Figure 14, and consists of the main platform 210, a sub-platform 420, and auxiliary platforms 430 and 450 as shown in Figure 2 and Figures 15 and 16. These platforms operate independently on the basis of the main platform 210.

[0066] In this embodiment, as shown in Figure 14, the sub-platform 420 also includes a main portion 421 having a width W_2 greater than the width W_1 of the main platform 210, and a projecting portion 422 which connects with the rear portion of the main portion 421, has a width W_3 narrower than the width W_s of the slit 211 in the main platform 210, and is inserted in the slit 211. Rollers 424 provided in the projecting portion 422 are slidably supported by the guide rail 216 provided in the slit 211 in the main platform 210. Also, between the main portion 421 and the projecting portion 422, as shown in Figures 14 and 15, a difference in height 423 is formed. By this difference in height 423, as shown in Figure 14, a floor surface 421f of the sub-platform 420 (main portion 421) forms a flat floor surface which coincides with the floor surface 210f of the main platform 210.

[0067] The main portion 421 of the sub-platform 420 is also held slidably via the rollers 215 by the extension portion 214 projecting from a front lower part of the slit 211 in the main platform 210. Also, between the main platform 210 and the projecting portion 422 of the

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sub-platform 420, as shown in Figure 14(a), the hydraulic or electrically-controlled actuator 260 is provided. By the extension and retraction of this actuator 260, the sub-platform 420 is slid along the width direction of the main platform 210.

[0068] Also, as shown in Figures 15 and 16, the sub-platform 420 is provided with a passage 425 which is open to a front face 420t, and near the distal end thereof, a slope portion 420l having a gentle slope is formed. Therefore, when the first auxiliary platform 430 is inserted in the passage 425, the floor surface 421f of the sub-platform 420 connects with a floor surface 430f of the auxiliary platform 430 without a difference in height via the slope portion 420l.

[0069] As shown in Figure 16, the auxiliary platform 430 is of a substantially rectangular plane shape the rear portion of which projects. The auxiliary platform 430 is provided with a protector rubber 431, which is a tubular buffering member, on the front face thereof, and is provided with a roller 432 at both sides thereof. As shown in Figure 14(a), between the auxiliary platform 430 and the sub-platform 420, the hydraulic or electrically-controlled actuator 270 is provided. Therefore, by the extension and retraction of the actuator 270, the auxiliary platform 430 moves the sub-platform 420 in the longitudinal direction along the passage 425 so as to be pulled out of and stored in the front face 420t.

[0070] Although the auxiliary platform 430 is moved longitudinally by only the rollers 432 in this embodiment, means, for example, such that guide rails for slidably supporting the auxiliary platform via the rollers 432 are provided in the passage 425 may be used.

[0071] Further, in this embodiment, as shown in Figures 15 and 16, at the distal end corners of the sub-platform 420 and the auxiliary platform 430, chamfer portions 420c and 430c are provided, respectively. As shown in Figure 14(a), when the auxiliary platform 430 is stored in the sub-platform 420, the distal ends of the chamfer portions 420c and 430c align on the same plane.

[0072] In addition, the auxiliary platform 430 is provided with the

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fan-shaped auxiliary platform 450 which can swing or slide the auxiliary platform 430 in the longitudinal direction and can be pulled out of and stored in the front face of the chamfer portion 430c.

Specifically, the auxiliary platform 450 is provided with a protector rubber 451, which is a buffering member, on the front face, and, like other platforms, is provided with a roller on both sides. Alternatively, the auxiliary platform 450 is pivotally supported so as to be turnable with respect to the auxiliary platform 430 so as to be pulled out of and stored in the front face of the chamfer portion 430c by the extension and retraction of the actuator disposed between the auxiliary platform 450 and the sub-platform 420.

[0073] Figure 17 is a top view of a principal portion showing a state in which the sub-platform 420 is slid to the left with respect to the main platform 210. Figure 18 is a top view of a principal portion showing a state in which the auxiliary platforms 430 and 450 are pulled out forward from the sub-platform 420 slid to the left. Figure 19 is a top view of a principal portion showing a state in which the auxiliary platforms 430 and 450 are set to the loading port 12. In this embodiment, the airframe door 13 opens to the left outward from loading port 12.

[0074] In this embodiment as well, as shown in Figure 17, the actuator 260 is extended to slide the sub-platform 420 to the left (upper side on the figure) with respect to the main platform 210. In this case, the slit 211 open toward both sides is provided on the front face 210t of the main platform 210. The projecting portion 422 of the sub-platform 420 having a width narrower than that of the slit 211 is inserted, and the remaining portion (main portion 421) of the sub-platform is supported by the flat plate shaped extension portion 214 provided at a lower part of the front face 210t of the main platform 210. Therefore, even if the width W2 of the floor surface 421f of the sub-platform 420 is secured so as to be equal to or greater than the width W1 of the main platform 210, the sub-platform 420 can be slid with respect to the main platform 210.

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[0075] Subsequently, as shown in Figure 18, the actuator 270 is extended to pull out the auxiliary platforms 430 forward (to the right-hand side on the figure) toward the airframe 10 from the sub-platform 420. In this case, as shown in Figure 19, the auxiliary platform 430 is positioned at a position at which the distal end (protector rubber 431) thereof does not come into contact with the airframe 10, and the auxiliary platform 450 is pulled out of the chamfer portion 430c. Thereby, the auxiliary platform 450 is positioned at the load port 12 together with the auxiliary platform 230.

[0076] According to this embodiment, since the sub-platform 420 is provided with one auxiliary platform which can move the sub-platform 420 in the longitudinal direction and can be pulled out of and stored in the front face thereof, even if the target position such as the loading port 12 above the main wing 11 of airplane is located at a far place, the platform 400 can be set at the target position by a simple construction in which the number of auxiliary platforms is decreased and an actuator for operating the auxiliary platform is omitted, so that a wider work space can be secured.

[0077] Further, in this embodiment as well, since the chamfer portions 420c and 430c are provided at the distal end corners of the sub-platform 420 and the auxiliary platform 430, respectively, even if the box-type cargo bed 140 is raised or lowered, the distal end corner of the platform 400 does not become a hindrance, and therefore the lift truck 100 can be moved to a position close to the loading port 12. As a result, the amount of extension of the auxiliary platform 430 is kept at a minimum.

[0078] In addition, in this embodiment as well, since the auxiliary platform 430 is provided with the auxiliary platform 450 which can swing or slide the auxiliary platform 430 and can be pulled out of and stored in the front face of the chamfer portion 430c, even if the box-type cargo bed 140 is raised or lowered, the distal end corner of the auxiliary platform 430 does not become a hindrance, and therefore a wide work space can be secured even at the time of actual work.

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[0079] Figure 20 is a top view of a principal portion showing a state in which the auxiliary platforms 430 and 450 are set to the loading port 15 having no obstacle such as the main wing 11. In this case, since the door 16 for the loading port 15 opens to the right outward, the auxiliary platforms 430 and 450 are aligned with the loading port 15 by sliding the sub-platform 420 to the left.

[0080] In the embodiments shown in Figures 19 and 20 as well, as shown in Figure 7, the detachable auxiliary plate 290 is placed between the auxiliary platforms 430 and 450 and the loading port 12. However, according to the above-described configuration, work may be performed without the use of the auxiliary plate 290.

[0081] Also, although the chamfer portion 420c, 430c is provided at the distal end corner of one of the sub-platform 420 and the auxiliary platform 430 in this embodiment, the chamfer portions may be provided at the distal end corners of both of the sub-platform 420 and the auxiliary platform 430. In addition, in the case where the chamfer portions are provided at the distal end corners of both of the sub-platform 420 and the auxiliary platform 430, the auxiliary platform 450 can be provided in both chamfer portions of the auxiliary platform 430.

[0082] Also, in Figures 19 and 20 as well, as explained with reference to Figure 13, the main platform 210 may be supported slidably along the width by only the extension portion 214 without providing the slit 211 in the main platform 210.

[0083] The above-described embodiments merely show some typical examples of the present invention, and various changes and modifications can be made. For example, in the above-described embodiments, the work bed is a box-type cargo bed for loading in-flight meal. However, the work bed may be a flat plate shaped work bed used for maintenance etc. Also, various parts constituting the above-described embodiments can be combined appropriately according to the application.

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Claims

1. A platform of a vehicle for high lift work comprising a self-propelled truck body having a cabin at the front, a work bed provided so as to be elevated with respect to said truck body, a main platform fixedly held on said work bed at a position at which a floor surface thereof coincides with the floor surface of said work bed, and a sub-platform extending from a front face of said main platform, characterized in that

said main platform is formed by a rectangular flat plate, and on a front face thereof, an extension portion for supporting said sub-platform slidably along the width extending to both sides of said main platform, and

said sub-platform is provided with a floor surface coinciding with the floor surface of said main platform.

2. The platform of a vehicle for high lift work according to claim 1, characterized in that

said main platform is provided with a wide slit, which is open toward both sides, on the front face thereof, and

said sub-platform is provided with a projecting portion, which has a width narrower than that of said slit and is inserted in said slit to slide said sub-platform along said slit.

3. The platform of a vehicle for high lift work according to claim 1 or 2, characterized in that said sub-platform is provided with a first auxiliary platform capable of being pulled out of and stored in a front face of said sub-platform in the longitudinal direction and a second auxiliary platform capable of being pulled out of and stored in the front face of said sub-platform in the longitudinal direction.

4. The platform of a vehicle for high lift work according to any one of claims 1 to 3, characterized in that a width of said first auxiliary platform is narrower than that of said second auxiliary platform.

5. The platform of a vehicle for high lift work according to any one of claims 1 to 4, characterized in that a chamfer portion is

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provided at at least one of a distal end corner of said sub-platform and said first auxiliary platform and a distal end corner of said sub-platform and said second auxiliary platform.

6. The platform of a vehicle for high lift work according to claim 5, characterized in that at least one of said first auxiliary platform and said second auxiliary platform is provided with an auxiliary platform which can swing or slide said auxiliary platform and can be pulled out of and stored in a front face of said chamfer portion.

7. The platform of a vehicle for high lift work according to claim 1 or 2, characterized in that said sub-platform is provided with one auxiliary platform capable of being pulled out of and stored in the front face of said sub-platform in the longitudinal direction.

8. The platform of a vehicle for high lift work according to claim 7, characterized in that a chamfer portion is provided at at least one of distal end corners of said sub-platform and said one auxiliary platform.

9. The platform of a vehicle for high lift work according to claim 8, characterized in that said one auxiliary platform is provided with an auxiliary platform which can swing or slide said auxiliary platform and can be pulled out of and stored in a front face of said chamfer portion.

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