VEHICLE FOR HIGH LIFT WORK

Technical Field

[0001] The present invention relates to a vehicle for high lift work which is used for high lift work such as loading of cargos to an airplane, ship, and the like, maintenance, check, and cleaning.

Background

[0002] There is available a vehicle for high lift work having a container installed elevatably with respect to a platform truck, a platform connected to the container so as to be movable in the width direction of container, and a canopy connected to the container to cover the platform, the platform and the canopy being extendable toward an airframe, for example, to load in-flight meal, equipment, baggage, etc. into an airplane (for example, refer to Patent Document 1).

[Patent Document 1] Japanese Patent No. 3550020

[0003] On the other hand, an opening/closing door installed to the airframe, which usually opens toward the outside from the airframe, sometimes becomes a hindrance to the canopy pulled out from the container toward a loading port. Therefore, the above-described Document has disclosed a vehicle for high lift work configured so that the distal end of the canopy rises when the canopy is pulled out from the container. As a means for elevating the canopy, mainly, an actuator that is controlled electrically or hydraulically.

[0004] However, if elevating means that does not use electricity, oil pressure, etc. is proposed in place of the actuator, the fuel economy can be improved.

[0005] Also, in the conventional canopy, although measures are taken in the case where the canopy interferes with an obstacle in the vertical direction of the container, no measures are taken in the case where the canopy interferes with an obstacle in the width direction of the container. Therefore, in the case where the canopy pulled out from the container interferes with an obstacle in the width direction of the container, the

work for positioning the vehicle for high lift work with respect to the airframe is troublesome, and in the worst case, the canopy cannot be used.

[0006] On the other hand, some platform can be moved along the width direction of container to prevent the interference with the opening/closing door (for example, refer to Patent Document 2).

[Patent Document 2] Unexamined Japanese Patent Publication No. 2000-272403

[0007] However, in this case as well, for the conventional canopy, a region that cannot be covered by the canopy is produced near the loading port when the platform is moved. Therefore, in the work in hard rain, the workers and cargos may get drenched, or the rain may intrude into the airframe through the loading port, so that the workers have troublesomeness of having to take measures as necessary.

Disclosure of the Invention

[0008] The present invention has been made in view of the above-described fact, and a problem to be solved by the present invention is to propose a vehicle for high lift work which can be used without interference of a canopy with an obstacle.

[0009] The invention described in claim 1, which is the present invention, provides a vehicle for high lift work having a container installed elevatably to a truck; a platform connecting with the container; and a canopy which connects with the container and covers the platform, characterized in that there is provided a turning element pivotally supporting the canopy so that the canopy is turnable with respect to the container.

[0010] The invention described in claim 2 is characterized in that in claim 1, the turning element has a movable body held so as to be movable along a container axis, and connects the movable body to the canopy.

[0011] The invention described in claim 3 is characterized in that in claim 1, the turning element has a canopy supporting body for movably holding the canopy, and connects the canopy supporting body to a roof portion of the container.

[0012] The invention described in claim 4 is characterized in that in claim 3, there are provided a guide member which extends around the turning element and is held to the container and a seating member for holding the canopy supporting body so that the canopy supporting body is movable along the guide member.

[0013] The invention described in claim 5 is characterized in that in any one of claims 1 to 3, there are provided a guide member which extends around the turning element and is held to the container and a seating member for holding the canopy so that the canopy is movable along the guide member.

[0014] The invention described in claim 6 is characterized in that in any one of claims 1 to 5, there is provided an actuator for turning the canopy with respect to the container.

[0015] The invention described in claim 7 is characterized in that in any one of claims 1 to 6, there is provided canopy elevating means for elevating the canopy with respect to the container.

[0016] The invention described in claim 8 is characterized in that in claim 3 or 4, there is provided an actuator for turning the canopy supporting body with respect to the container.

[0017] The invention described in claim 9 is characterized in that in any one of claims 2 to 5, the platform is movable in the width direction of the container, and there is provided an interlock mechanism for interlocking the platform with the canopy or the canopy supporting body.

[0018] The invention described in claim 10 is characterized in that in claim 3, 4, 8 or 9, there is provided an actuator for elevating the canopy supporting body with respect to the container.

[0019] The invention described in claim 11 is characterized in that in any one of claims 1 to 10, there is provided an auxiliary canopy turnably held at the distal end of the canopy.

[0020] The invention described in claim 12 is characterized in that in claim 11, a link mechanism which consists of a wire or a bar and corrects an opening produced between the auxiliary canopy and a target position having a loading port etc. when the canopy is turned is

provided between the canopy and the auxiliary canopy.

[0021] The invention described in claim 13 provides a vehicle for high lift work having a container installed elevatably to a truck; a platform connecting with the container; and a canopy which connects with the container and covers the platform, characterized in that there is provided a canopy supporting body for holding the canopy so that the canopy is movable along a container axis, and a cam mechanism for elevating the canopy with respect to the canopy supporting body according to the movement of the canopy is provided between the canopy supporting body and the canopy.

[0022] The invention described in claim 14 is characterized in that in any one of claims 1 to 11, the truck is provided with a driving source for an engine etc. and a driver's cabin.

[0023] According to the present invention, since there is provided the turning element pivotally supporting the canopy so that the canopy is turnable with respect to the container, the canopy can be used without interference with an obstacle in the width direction of the container by a simple construction. Also, in the present invention, even in the case where the platform is moved in the width direction of the container, the canopy can be turned in accordance with this movement. Therefore, the platform can be covered even near a loading/unloading port such as an airframe's loading port.

[0024] In particular, in the present invention, it is preferable that there be provided the guide member which extends around the turning element and is held to the container and the seating member for holding the canopy so that the canopy is movable along the guide member. In this case, since the canopy is held separately at a position different from the turning member, a stable turning operation can be secured. In addition, since a load applied to the turning element is reduced, the durability can be improved without reinforcing the turning element itself.

[0025] Also, in the present invention, the canopy can be turned with respect to the container by manual operation. However, if an actuator

for turning the canopy with respect to the container is provided, fine adjustment at the time when the canopy is turned is made easily, so that the workability is also improved.

[0026] Also, in the present invention, if the canopy elevating means for elevating the canopy with respect to the container is provided, the canopy can be used without interference with an obstacle in the height direction of the container.

[0027] On the other hand, in the present invention, if the turning element has the movable body held so as to be movable along the container axis, and connects the movable body to the canopy, the canopy is turned with respect to the container, and, at the same time can be put in and taken out along the container axis. Therefore, even if the cover region is decreased by the turning of the canopy, it is compensated by pulling out the canopy from the container, so as to eliminate uncovered region up to the distal end of the platform.

[0028] Similarly, in the present invention, even if the turning element has the canopy supporting body for movably holding the canopy, and connects the canopy supporting body to the roof portion of the container, the canopy is turned with respect to the container, and at the same time can be put in and taken out along the container axis. In this case, the canopy may be held by the seating member moving along the guide member held to the container. However, even if the canopy supporting body is held by the seating member, the same effect as that in the case where the canopy is held by the seating member can be achieved. Also, in this case as well, the canopy supporting body can be turned by manual operation. However, if the actuator for turning the canopy supporting body with respect to the container is provided, the same effect as that in the case where the canopy is turned by the actuator can be achieved.

[0029] When the platform is also movable in the width direction of the container, if the interlock mechanism for interlocking the platform with the canopy or the canopy supporting body is provided, the canopy or the canopy supporting body can automatically be allowed to follow

the platform even if the platform is moved in the width direction of the container. Therefore, the workability can be improved by a simple construction.

[0030] Further, in the case where the canopy is movably held by the canopy supporting body as well, if the actuator for elevating the canopy supporting body with respect to the container is provided, the canopy can be used without interference with an obstacle in the height direction of the container. In addition, fine adjustment at the time when the canopy is elevated is made easily, so that the workability is also improved.

[0031] Also, in the present invention, it is preferable that the auxiliary canopy held turnably at the distal end of the canopy be provided. According to this configuration, even if an opening is produced between the auxiliary canopy and a target object having the loading port etc. when the canopy is turned, the opening is closed by further turning the auxiliary canopy with respect to the canopy, so that the platform can be covered surely. Especially in this case, if the link mechanism for correcting the opening produced between the auxiliary canopy and the target object having the loading port etc. when the canopy is turned is provided between the canopy and the auxiliary canopy, the opening between the auxiliary canopy and the target object can be closed automatically without the manual operation of the auxiliary canopy or the use of the actuator etc., so that the workability is improved.

[0032] Also, in the present invention, a canopy carrying surface for holding the canopy so that the canopy is movable along the container axis is provided, and the cam mechanism for elevating the canopy with respect to the canopy carrying surface according to the movement of the canopy is provided between the canopy carrying surface and the canopy. According to this configuration, electricity, oil pressure, etc. required to drive the actuator etc. when the canopy is elevated with respect to the container is not needed, so that the electric power consumption efficiency, fuel economy, and the like can be improved. In addition, since the actuator etc. are not needed, the weight can be reduced.

[0033] Further, in the present invention, if the power source for the engine etc. and the driver's cab are provided integrally or separately with respect to the truck to which the container is installed, the mobility as the vehicle for high lift work is improved, so that the workability can be improved.

[0034] A vehicle for high lift work in accordance with the present invention will now be described with reference to the accompanying drawings.

Brief Description of the Drawings

[0035]

[Figure 1] A side view of a lift truck used to load cargos, in-flight meals, etc. into an airplane, showing one embodiment of the present invention.

[Figure 2] A plan view of Figure 1.

[Figure 3] A plan view illustrating the operation of a canopy arranged in the roof portion of a container in the embodiment shown in Figure 1.

[Figure 4] Another plan view illustrating the operation of a canopy arranged in the roof portion of a container in the embodiment shown in Figure 1.

[Figure 5] Still another plan view illustrating the operation of a canopy arranged in the roof portion of a container in the embodiment shown in Figure 1.

[Figure 6] A sectional view taken along the line A-A of Figure 3.

[Figure 7] A sectional view taken along the line B-B of Figure 3.

[Figure 8] A geometric diagram illustrating the operation of a link mechanism that connects a canopy and auxiliary canopy to a slider in the embodiment shown in Figure 1.

[Figure 9] Figures 9(a) to 9(c) are front views corresponding to Figures 3 to 5.

[Figure 10] A sectional view taken along the line C-C of Figure 9(a).

[Figure 11] A schematic diagram illustrating the operation of a seating member moving along a guide member in the embodiment shown in Figure 1.

[Figure 12] Figures 12(a) and 12(b) are side views corresponding to Figures 3 and 4, and Figure 12(c) is an enlarged view of an essential portion of Figure 12(b).

[Figure 13] A front view of an essential portion, showing a second embodiment of the present invention.

[Figure 14] Figures 14(a) to 14(c) are front views corresponding to Figures 3 to 5, showing a third embodiment of the present invention.

[Figure 15] A plan view illustrating the operation of a canopy, showing a fourth embodiment of the present invention.

[Figure 16] Another plan view illustrating the operation of a canopy in the fourth embodiment.

[Figure 17] Still another plan view illustrating the operation of a canopy in the fourth embodiment.

[Figure 18] A side view corresponding to Figure 15 in the fourth embodiment.

[Figure 19] An enlarged view of an essential portion showing a universal joint in the fourth embodiment.

[Figure 20] Figures 20(a) and 20(b) are side views illustrating the operation of an actuator from the cross section D-D of Figure 15 in the fourth embodiment.

[Figure 21] Figures 21(a) and 21(b) are a front view and a side view, respectively, illustrating the operation of an actuator corresponding to Figure 20(a).

[Figure 22] Figures 22(a) and 22(b) are a front view and a side view, respectively, illustrating the operation of an actuator corresponding to Figure 20(b).

[Figure 23] A plan view illustrating the operation of a canopy, showing a fifth embodiment of the present invention.

[Figure 24] Another plan view illustrating the operation of a canopy in the fifth embodiment.

[Figure 25] Still another plan view illustrating the operation of a canopy in the fifth embodiment.

[Figure 26] A side view corresponding to Figure 23.

[Figure 27] Figures 27(a) and 27(b) are sectional views taken along the line E-E of Figure 23 corresponding to Figures 23 and 26, respectively.

[Figure 28] A perspective schematic view corresponding to Figure 26.

[Figure 29] A plan view showing a sixth embodiment of the present invention.

[Figure 30] A plan view showing a seventh embodiment of the present invention.

[Figure 31] A side view of an essential portion, showing one example of a means for elevating a canopy with respect to a container by a rail from the outside of the container in the first embodiment of the present invention.

[Figure 32] Another side view of an essential portion, showing the first embodiment.

[Figure 33] A plan view showing Figure 31 from the direction D1.

Best Mode for Carrying Out the Invention

[0036] Figure 1 is a side view showing a lift truck 1, which is one mode of the present invention, used to load in-flight meal, cargos, etc. into an airplane 10. This figure shows a work state at the time when cargos etc. are loaded by using this lift truck 1. Also, Figure 2 is a plan view of Figure 1, in which a canopy 7, described later, is omitted.

[0037] In Figures 1 and 2, reference numeral 100 denotes an airframe (target object) of airplane, and a loading port 110 for loading cargos, in-flight meal, etc. is located above a main wing 120. The loading port 110 is fitted with an opening/closing door 130 that is open to the left outward.

[0038] The lift truck 1 is a mobile vehicle for high lift work which is integrally provided with a driver's cab 2a formed on a vehicle body (truck) 2 and a driving source such as an engine, not shown. The lift truck 1 has a cargo bed frame 4 installed to the vehicle body 2 via a crosslink type elevating mechanism 3, a box-shaped container 5 movable along the cargo bed frame 4, a platform 6 connected to the container 5, the canopy 7 connected to a roof portion 5a of the container 5 to cover

the platform 5.

[0039] The platform 6 includes a connection platform 6b connected elevatably via guide rails 5b and brackets 6a provided on both sides of the container 5, a main platform 6c held so as to be movable along the width direction Y of container by the connection platform 6b, and two sub-platforms 6d and 6e held by the main platform 6c so as to be movable along the container axis X. These two sub-platforms 6d and 6e have a width different from each other.

[0040] In this embodiment, an auxiliary plate 8 is set detachably between the main platform 6c and the loading port 110. Also, in this embodiment, right and left opening/closing doors 5c of the container 5 each consist of three doors combined slidably, and form a protective wall by being pulled out toward the loading port 110.

[0041] Figures 3 to 5 are plan views illustrating the operation of the canopy 7 arranged in the roof portion 5a of the container 5. Figure 6 is a sectional view taken along the line A-A of Figure 3, and Figure 7 is a sectional view taken along the line B-B of Figure 3. For convenience, only a frame of the canopy 7 is shown in Figures 3 to 5.

[0042] As shown in Figures 3 to 5, the canopy 7 has a substantially trapezoidal shape formed by cutting corner portions of an end 7e thereof, and the end 7e is connected to a slider (movable body) 11, which is movable along the container axis X, via a universal joint (turning element) 10. This slider 11 moves along the container axis X between two rails 12 provided in the roof portion 5a of the container 5. For example, as shown in Figure 6, the slider 11 is moved along the rails 12 by rollers 11a provided on the slider 11. The slider 11 is fixed to the container 5 via an actuator 13 that is expanded and contracted by electrical control or hydraulic control. However, the slider 11 may be moved by manual operation without the use of the actuator 13. In this case, the slider 11 may be moved slidingly by mutual contacting without the use of the rollers 11a and the rails 12.

[0043] Also, in the distal end of the canopy 7, an auxiliary canopy 8 is provided which is turnably held by the canopy 7. Specifically, as

shown in Figure 7, the auxiliary canopy 8 is turnably installed to a center frame 7a of the canopy 7 via a pin P, and in the distal end thereof, a cushioning member 8a is provided to lighten the contact with the airframe 100. Further, a link mechanism consisting of a metallic bar 9 is provided between the auxiliary canopy 8 and the slider 11. Specifically, one end 9a of the bar 9 is turnably fixed to the slider 11, and the other end 9b thereof is turnably fixed to the auxiliary canopy 8. According to this link mechanism, even if the canopy 7 is turned from a state shown in Figure 8(a) in which the canopy 7 is not turned around the universal joint 10, the pin P pivotally supporting the auxiliary canopy 8 and the other end 9b of the metallic bar keep a parallel state as shown in Figure 8(b), so that an opening produced between the auxiliary canopy 8 and the airframe 100 having the loading port 110 etc. when the canopy 7 is turned can be corrected automatically.

[0044] Next, Figures 9(a) to 9(c) are front views corresponding to Figures 3 to 5, respectively, and Figure 10 is a sectional view taken along the line C-C of Figure 9(a).

[0045] In Figure 9, reference numeral 14 denotes a rail (guide member) that extends around the universal joint 10 and is held to the container 5. A seating member 15 is movably held along the rail 14. Specifically, as shown in Figure 10, the seating member 15 movably holds the rail 14 by means of a first roller 15a rolling on a support surface 14a of the rail 14 and a second roller 15b rolling on the back surface (back surface in the Figure 9) 14b of the rail 14. Also, the seating member 15 is held to the rail 14 via an actuator 16 that is expanded and contracted by electrical control or hydraulic control. Thereby, the seating member 15 can be moved along the rail 14 by the expansion and contraction of the actuator 16 as shown in Figure 11.

[0046] Also, on both sides in the upper portion of the seating member 15, rollers 17 for holding the canopy 7 is provided. In the case where the contact surface with the canopy 7 is flat, the roller 17 is required to be provided separately with a means for restraining the turning of the canopy 7 with respect to the seating member 15. In this embodiment,

however, the roller 17 integrally has a canopy carrying surface 17a and a turn regulating portion 17b for regulating the turning of the canopy 7. Thereby, the canopy 7 can be moved along the container axis X with respect to the seating member 15 while turning along the rail 14 together with the seating member 15.

[0047] Although the seating member 15 is held to the rail 14 via the actuator 16, it may be moved by manual operation. Also, the movement of the rail 14 and the seating member 15 and the movement of the seating member 15 and the canopy 7 may be performed slidingly by mutual contacting without the use of the roller and rail.

[0048] According to the above-described configuration, the canopy 7 can be pulled out from a state in which the canopy 7 is arranged in the roof portion 5a of the container 5 as shown in Figure 3 toward the airframe 100 as shown in Figure 4 via the slider 11 that is moved along the container axis by the actuator 13. After the canopy 7 has been pulled out, the seating member 15 is moved along the rail 14 by the actuator 16 as shown in Figure 5, by which the canopy 7 is turned around the universal joint 10 with respect to the slider 11. As a result, the canopy 7 can be turned with respect to the container 5.

[0049] In this embodiment, there is provided a means for elevating the canopy 7 with respect to the container 5 to prevent the canopy 7 from interfering with an obstacle in the height direction Z of the container 5.

[0050] Figures 12(a) and 12(b) are side views corresponding to Figures 3 and 4, respectively. Figure 12(c) is an enlarged view of an essential portion of Figure 12(b).

[0051] As shown in Figure 12(c), on the back surface of the canopy 7, which is in contact with the canopy carrying surface 17a, there are formed a contact surface f1 extending from the end 7e side of the canopy 7, a height difference surface f2 connecting to the contact surface f1 and being raised toward the distal end of the canopy 7, and a contact surface f3 locating at a position higher than the contact surface f1, which is connected to the height difference surface f2 and extends

toward the distal end of the canopy 7. Thereby, between the canopy carrying surface 17a and the canopy 7, there is formed a cam mechanism Cm in which the contact surfaces f1, f2 and f3 are cam surfaces, and the carrying surface 17a of the roller 17 is a cam follower. According to such a configuration, as shown in Figures 12(a) and 12(b), the canopy 7 can be elevated with respect to the canopy carrying surface 17a according to the movement of the canopy 7.

[0052] Figure 13 is a front view showing an essential portion in accordance with a second embodiment of the present invention. In this embodiment, the seating member 15 is provided with a cover member 15c that covers the turn regulating portion 17b provided integrally with the roller 17 to prevent the canopy 7 from floating. Other configurations are the same as those of the first embodiment.

[0053] Further, Figure 14 shows a third embodiment of the present invention. Figures 14(a) to 14(c) are front views corresponding to Figures 3 to 5, respectively. In this embodiment, the same reference numerals are applied to elements that are the same as those in the first and second embodiments, and the explanation thereof is omitted.

[0054] This embodiment employs an actuator 18 as a means for elevating the canopy 7 with respect to the container 5, and separately has a second seating member 19 provided with the roller 17 for holding the canopy 7. The second seating member 19 is held and fixed by the seating member 15 via the actuator 18. By this configuration as well, the canopy 7 can be elevated with respect to the container 5.

[0055] Figures 15 to 17 are plan views showing a fourth embodiment of the present invention, which illustrate the canopy operation. Figure 18 is a side view corresponding to Figure 15, and Figure 19 is an enlarged view showing an essential portion of a universal joint 20. Also, Figures 20(a) and 20(b) are side views illustrating the operation of an actuator 28, described later, from the cross section D-D of Figure 15. Figures 21 and 22 each are front view and side view corresponding to Figures 20(a) and 20(b), illustrating the operation of an actuator 26, described later. In this embodiment as well, the same reference

numerals are applied to elements that are the same as those in other embodiments, and the explanation thereof is omitted.

[0056] In this embodiment, the canopy 7 is movably held to a guide frame (canopy supporting body) 21. This guide frame 21 includes two guide portions 21a arranged in parallel along the container axis and an end portion 21e connecting so as to cross these elements. The end 21e is connected to the end 7e of canopy via an actuator 23. Thereby, the canopy 7 can be moved along the guide portion 21a of the guide frame 21. Although the canopy 7 is fixed to the guide frame 21 via the actuator 23 that is expanded and contracted by electrical control or hydraulic control, the canopy 7 may be moved by manual operation without the use of the actuator 23. Also, the movement of the guide frame 21 may be performed slidingly by mutual contacting without the use of the roller and rail.

[0057] Also, the end 21e of the guide frame 21 is turnably connected to the roof portion 5a of the container 5 via the universal joint 20. As shown in Figure 19, the universal joint 20 has a first joint element 20a attached to the end 20e of the guide frame 21 so as to be turnable around the axis of the actuator 23 and a second joint element 20b attached to the roof portion 5a of the container 5 so as to be turnable around the axis of the actuator 23. These two joint portions 20a and 20b are installed turnably by a pin member 20c.

[0058] In Figures 15 to 17, reference numeral 24 denotes a first slide rail (guide member) extending around the universal joint 20. As shown in Figure 20, the first slide rail 24 is fixed via the actuator 28 erected from the roof portion 5a of the container 5 and a joint member 29. Also, to a guide beam 21c set between the guide portions 21a of the guide frame 21, a second slide rail (seating member) 25, which is held to the slide rail 24 so as to be movable along the slide rail 24, is fixed. Further, as shown in Figures 21 and 22, a connecting portion 21d depends integrally from the guide beam 21c. To an elongated hole n1 provided in the connecting portion 21d, an end protrusion 26a of the actuator 26 fixed to the container 5 is fitted slidably. Thereby, as

shown in Figure 17, the guide frame 21 can be moved along the slide rails 24 and 25 by the expansion and contraction of the actuator 26. Also, as shown in Figures 21 and 22, the guide frame 21 can be elevated with respect to the container 5 by the expansion and contraction of the actuator 28.

[0059] According to the above-described configuration, the canopy 7 can be pulled out by the actuator 23 from a state in which the canopy 7 is stored in the guide frame 21 as shown in Figure 15 toward the airframe 100 as shown in Figure 16. After the canopy 7 has been pulled out, as shown in Figure 17, the guide frame 21 is moved along the slide rails 24 and 25 by the actuator 26, by which the guide frame 21 is turned around the universal joint 20. As a result, the canopy 7 can be turned with respect to the container 5. Also, according to the above-described configuration, when the actuator 28 is expanded from the position shown in Figure 20(a) to the position shown in Figure 20(b), the guide frame 21 located at the position shown in Figure 21 can be moved freely along the elongated hole n1. Therefore, the guide frame 21 can be raised to the position shown in Figure 22 without interference with the actuator 26.

[0060] Figures 23 to 25 are plan views showing a fifth embodiment of the present invention, which illustrate the canopy operation. Figure 26 is side view corresponding to Figure 23. In this embodiment as well, the same reference numerals are applied to elements that are the same as those in other embodiments, and the explanation thereof is omitted.

[0061] In this embodiment, the platform 6 is moved in the width direction of the container 5 together with a slide frame 30 provided on the front surface (loading port 110 side) of the container 5. Specifically, as shown in Figure 26, the slide frame 30 has rollers 30a and 30b that roll on rails 5d and 5e provided on the front surface of the container 5, respectively, and the bracket 6a of the platform 6 is elevatably installed to a guide rail 30c of the slide frame 30. Also, the platform 6 is formed by cutting a corner portion of the sub-platform 6e and by providing an auxiliary platform 6f in the cut portion so that the

auxiliary platform 6f can be put in and taken out of the cut portion by its turning.

[0062] In this embodiment, an interlock mechanism IL for interlocking the platform 6 with the guide frame 21 is provided to turn the canopy 7. This interlock mechanism IL is formed by connecting the guide frame 21 and the slide frame 30 mechanically to each other by loosely fitting a pin member (protrusion) 31 provided on the slide frame 30 into an elongated hole n2 provided in the guide frame 21.

[0063] Figures 27(a) and 27(b) are sectional views taken along the line E-E of Figure 23, corresponding to Figures 23 and 26, respectively. Also, Figure 28 is a perspective schematic view corresponding to Figure 26.

[0064] In the interlock mechanism IL in the fifth embodiment, the elongated hole n2 is formed in the lower surface of a case body 21f forming a space below a guide beam 21e which is set between guide portions 21a of the guide frame 21 separately from the guide beam 21c. The pin member 31 is fitted by loose fitting so that the pin member 31 can be moved with respect to the elongated hole n2 with a predetermined degree of freedom, and a coming-off preventive portion 32 is provided at an upper part of the pin member 31. Also, the pin member 31 is installed so as to be slidable along a pin holding hole n3 in a sleeve body 34 provided on the slide frame 30 through a through hole formed in the slide frame 30, and a coming-off preventive portion 33 is provided at a lower part of the pin member 31.

[0065] Thereby, even if the slide frame 30 is moved along the width direction of the container 5 by an actuator 36 installed to the container 5, the pin member 31 held to the slide frame 30 can run off from the position shown in Figure 26(a) to the position shown in Figure 26(b) in the elongated hole n2 provided in the turning guide frame 21, so that the guide frame 21 turns following the slide frame 30 without distortion of run-off distance. As a result, even if the platform 6a moves in the width direction of the container 5, the canopy 7 automatically follows the platform 6. Also, as shown in Figure 26, as in the case of the third

embodiment, even if the guide frame 21 is raised by the actuator 28, the pin member 31 can be pulled out from the position shown in Figure 26(a) to the position shown in Figure 26(b). Therefore, the guide frame 21 is raised with respect to the container 5 without distortion of pull-out distance. As a result, the canopy 7 is also raised with respect to the container 5.

[0066] According to the above-described configuration, the canopy 7 can be pulled out from a state in which the guide frame 21 is stored as shown in Figure 23 toward the airframe 100 as shown in Figure 24. After the canopy 7 has been pulled out, as shown in Figure 25, the slide frame 30 is moved by the actuator 36, by which the guide frame 21 is turned around the universal joint 20. As a result, the canopy 7 can be turned with respect to the container 5. Also, according to the above-described configuration, when the actuator 28 is expanded, the guide frame 21 can be raised to the position shown in Figure 22 without interference with the slide frame 30 to the position shown in Figure 27(b) at which the movement of the pin member 31 located at the position shown in Figure 27(a) is regulated by the coming-off preventive portions 32 and 33.

[0067] The pin member 31 may be erected directly from the platform 6 without the provision of the slide frame 30. This case can also be applied to the platform 6 in accordance with the first to fourth embodiments which has no slide frame 30. Also, the interlock mechanism IL for turning the canopy 7 may be an interlock mechanism which interlocks the canopy 7 or the guide frame 21 with the slide frame 30, for example, by a rotating body such as a roller provided on the slide frame 30 although the interlock mechanism IL of the above-described embodiment consists of the elongated hole n1 and the protrusion 32 loosely fitted in the elongated hole n1.

[0068] Figure 29 is a plan view showing a sixth embodiment in which another interlock mechanism IL is employed in the first embodiment. In this embodiment, the same reference numerals are applied to elements that are the same as those in the above-described embodiments, and the

explanation thereof is omitted.

[0069] In this embodiment, a roller attached rotatably to the slide frame 30 is used as the interlock mechanism IL. Specifically, as shown in Figure 29, two arms 35 extending toward the loading port 110 are provided on the slide frame 30, and the seating member 15 (refer to Figure 9) provided with the rollers 17 is directly set between the arms 35 without the use of the guide member 14 (refer to Figure 9) and is fixed.

[0070] According to the above-described configuration, the canopy 7 connected to the slider 11 via the universal joint 10 is carried by the slide frame 30 via the canopy carrying surface 17a so as to be put in and taken out of the container 5, and the elevation of the canopy 7 can be achieved by the cam mechanism Cm. In addition, if a play (clearance) enough to turn the canopy 7 in a predetermined amount is set in an interval W between the two turn regulating portions 17b, the canopy 7 is moved within the range of the play in the width direction of the container 5 in association with the slide frame 30. As a result, the canopy 7 can be turned around the universal joint 10 with respect to the container 5. In the sixth embodiment, as its modification, the seating member 15 provided with the rollers 17 disclosed as the second embodiment in Figure 13 can be used in place of the seating member 15 disclosed as the first embodiment in Figure 9. Further, the seating members 15 and 19 in which the actuator 18 disclosed as the third embodiment in Figure 14 interposes can also be used.

[0071] Further, Figure 30 is a plan view showing a seventh embodiment. In this embodiment, the same reference numerals are applied to elements that are the same as those in the above-described embodiments, and the explanation thereof is omitted.

[0072] In this embodiment, which is a modification of the first embodiment, as shown in Figure 30, the canopy 7 and the slide 11 are integrally connected to each other, and a predetermined play (clearance) is formed between the slide 11 and the rail 12, by which a unit of the canopy 7 and the slide 11 is connected to the actuator 13 via the

universal joint 10. In this case as well, the movement of the slider 11 may be performed slidingly by mutual contacting without the use of the roller 11a and the rail 12.

[0073] Also, in the first embodiment, when the canopy 7 is elevated with respect to the container 5, the canopy 7 can be elevated together with the rail 14.

[0074] Figures 31 and 32 are side views of an essential portion, showing one example of a means for elevating the canopy 7 with respect to the container 5 by the rail 14 from the outside of the container 5. Figure 33 is a plan view showing Figure 31 from the direction D1. In the description below, explanation is given assuming that such a means is employed in the first embodiment, and the same reference numerals are applied to elements that are the same as those in the first embodiment, and the explanation thereof is omitted.

[0075] In Figures 31 and 32, reference numeral 40 denotes an oscillation frame fixed to each end portion of the rail 14 held oscillatably to the guide rail 5b of the container 5. This oscillation frame 40 is a rectangular triangle shaped frame consisting of a horizontal portion 41 for fixing the rail 14, an oscillation base portion 42 provided at one end of the horizontal portion 41, a vertical portion 43 depending from the oscillation base portion 42, and an inclined portion 44 connecting the ends of the vertical portion 43 and the horizontal portion 41 slantwise to each other. For the oscillation frame 40, the oscillation base portion 42 is disposed between an extension portion 5b1 extending from the guide rail 5b and a bracket 5f welded to the guide rail 5b, and is connected integrally by a pin member P1.

[0076] Also, the oscillation frame 40 has an actuator 45 attached oscillatably to the inclined portion 44 and the guide rail 5b via pin members P2 and P3. Therefore, the oscillation frame 40 is oscillated upward around the pin member P1 with respect to the guide rail 5b by the expansion of the actuator 45, and is oscillated downward around the pin member P1 with respect to the guide rail 5b by the contraction of the actuator 45. In this embodiment, the contact portion between the

vertical portion 43 and a guide rail front surface 5bf is provided with a cushioning member B formed by a stainless steel made plate or the like.

[0077] According to the above-described configuration, in a state in which the actuator 45 is not expanded, as shown in Figure 31, the vertical portion 43 of the oscillation frame 40 is in contact with the front surface 5bf of the guide rail 5b, so that the canopy 7 is held in a horizontal state with respect to the container 5. When the actuator 45 is expanded, as shown in Figure 32, the oscillation frame 40 is oscillated upward, so that the canopy 7 can be raised with respect to the container 5. When the canopy 7 is lowered, the oscillation frame 40 can be returned to the position shown in Figure 31 by the contraction of the actuator 45.

[0078] In the above-described embodiment in which the oscillation frame 40 is used in the first embodiment, in the case where the canopy 7 is not required to elevate greatly, the cam mechanism Cm may be omitted. Also, in the case where the oscillation frame 40 is used in the third embodiment as well, if the canopy 7 is not required to elevate greatly, the actuator 18 may be omitted. Further, the configuration may be such that the frame 40 is not oscillated with respect to the container 5 but is slid along the guide rail 5b.

[0079] As described above, according to the present invention, since the universal joint 10, 20 for pivotally supporting the canopy 7 with respect to the container 5 is provided, the canopy 7 can be used by a simple construction without interference with an obstacle such as the airframe door 130 in the width direction of the container 5. Also, in the present invention, in the case where the platform 6 is moved in the width direction of the container 5 as well, the canopy 7 can be turned according to the movement of the platform 6. Therefore, even near the loading port 110 of airframe, the platform 6 can be covered.

[0080] In particular, in the present invention, if there are provided the guide member 14 which extends around the universal joint 10 (20) and is held to the container 5 and the seating member 15, 19 for holding the canopy 7 so as to be movable along the guide member 14, the

canopy 7 is held separately at a position different from the universal joint 10 (20). Therefore, a stable turning operation can be secured. In addition, a load applied to the universal joint 10 (20) is reduced, so that the durability can be improved without reinforcing the universal joint 10 (20) itself.

[0081] Also, in the present invention, the canopy 7 can be turned by manual operation with respect to the container 5. Since the actuator 13, 23 for turning the canopy 7 with respect to the container 5 is provided, fine adjustment at the time when the canopy 7 is turned is made easily, so that the workability is also improved.

[0082] Also, in the present invention, if the canopy elevating means Cm, 18, 28 for elevating the canopy 7 with respect to the container 5 is provided, the canopy 7 can be used without interference with an obstacle such as the airframe door 130 in the height direction of the container 5.

[0083] On the other hand, in the present invention, if the universal joint 10 has the slider 11 held so as to be movable along the container axis, and connects the slider 11 to the canopy 7, the canopy 7 is turned with respect to the container 5, and, at the same time can be put in and taken out along the container axis. Therefore, even if the cover region is decreased by the turning of a canopy 7, it is compensated by pulling out a canopy 7 from a container 5, so as to eliminate uncovered region up to the distal end of the platform 6.

[0084] Similarly, in the present invention, even if the universal joint 20 has the guide frame 21 for movably holding the canopy 7, and connects the guide frame 21 to the roof portion 5a of the container 5, the canopy 7 is turned with respect to the container 5, and at the same time can be put in and taken out along the container axis. In this case, the canopy may be held by the seating member 15, 19 moving along the guide member 14 held to the container 5. However, even if the guide frame 21 is held by the seating member 25 moving along the guide member 24, the same effect as that in the case where the canopy 7 is held by the seating member 15, 19 can be achieved. Also, in this case

as well, the canopy supporting body 21 can be turned by manual operation. However, if the actuator 26 for turning the guide frame 21 with respect to the container 5 is provided, the same effect as that in the case where the canopy 7 is turned by the actuator 16 can be achieved.

[0085] Also, in the case where the canopy 7 is movably held by the guide frame 21, when the platform 6 is also movable in the width direction of the container 5, the platform 6 and the guide frame 21 are provided with the protrusion 31 or the elongated hole n2 in which the protrusion 31 is fitted loosely, by which the platform 6 and the guide frame 21 are connected mechanically to each other. Thereby, even if the platform 6 is moved in the width direction of the container 5, the canopy 7 can be allowed to follow the platform 6, so that the workability can be improved by a simple construction.

[0086] Further, in the case where the canopy 7 is movably held by the guide frame 21 as well, if the actuator 28 for elevating the guide frame 21 with respect to the container 5 is provided, the canopy 7 can be used without interference with an obstacle such as the airframe door 130 in the height direction of the container 5. In addition, fine adjustment at the time when the canopy 7 is elevated is made easily, so that the workability is also improved.

[0087] Also, in the present invention, in the case where the auxiliary canopy 8 held turnably at the distal end of the canopy 7 is provided, even if an opening is produced between the auxiliary canopy 8 and the airframe 100 having the loading port 110 when the canopy 7 is turned, the opening is closed by further turning the auxiliary canopy 8 with respect to the canopy 7, so that the platform 6 can be covered surely. Especially in this case, if the link mechanism which consists of a wire or the bar 9 and corrects the opening produced between the auxiliary canopy 8 and the airframe 100 when the canopy 7 is turned is provided between the canopy 7 and the auxiliary canopy 8, the opening between the auxiliary canopy 8 and the airframe 100 can be closed automatically without the manual operation of the auxiliary canopy 8 or the use of the actuator etc., so that the workability is improved.

[0088] Also, in the present invention, if the canopy carrying surface 17a for holding the canopy 7 so that the canopy 7 is movable along the container axis is provided, and the cam mechanism Cm for elevating the canopy 7 with respect to the canopy carrying surface 17a according to the movement of the canopy 7 is provided between the canopy carrying surface 17a and the canopy 7, electricity, oil pressure, etc. required to drive the actuator etc. when the canopy 7 is elevated with respect to the container 5 is not needed, so that the electric power consumption efficiency, fuel economy, and the like can be improved. In addition, since the actuator etc. are not needed, the weight can be reduced.

[0089] Further, in the present invention, if the power source for the engine etc. and the driver's cab 2a are provided integrally or separately with respect to the truck 2 to which the container 5 is installed, the mobility as the vehicle for high lift work is improved, so that the workability can be improved.

[0090] The above description exemplifies only one mode of the present invention, and various changes and modifications can be made. For example, the platform 6 and the canopy 7 may be not expanded and contracted with respect to the container 5. Also, the platform 6 may be expanded and contracted only toward the loading port 130 and may be not moved along the width direction of the container 5. Further, the container elevating mechanism is not limited to the crossslink type, and various types can be adopted. In addition, the elements, members, mechanisms, or the like employed in the embodiments can be replaced or combined in various ways between the embodiments according to the application.

Claims

1. A vehicle for high lift work having a container installed elevatably to a truck; a platform connecting with the container; and a canopy which connects with the container and covers the platform, characterized in that

there is provided a turning element pivotally supporting the canopy so that the canopy is turnable with respect to the container.

2. The vehicle for high lift work according to claim 1, characterized in that the turning element has a movable body held so as to be movable along a container axis, and connects the movable body to the canopy.

3. The vehicle for high lift work according to claim 1, characterized in that the turning element has a canopy supporting body for movably holding the canopy, and connects the canopy supporting body to a roof portion of the container.

4. The vehicle for high lift work according to claim 3, characterized in that there are provided a guide member which extends around the turning element and is held to the container and a seating member for holding the canopy supporting body so that the canopy supporting body is movable along the guide member.

5. The vehicle for high lift work according to any one of claims 1 to 3, characterized in that there are provided a guide member which extends around the turning element and is held to the container and a seating member for holding the canopy so that the canopy is movable along the guide member.

6. The vehicle for high lift work according to any one of claims 1 to 5, characterized in that there is provided an actuator for turning the canopy with respect to the container.

7. The vehicle for high lift work according to any one of claims 1 to 6, characterized in that there is provided canopy elevating means for elevating the canopy with respect to the container.

8. The vehicle for high lift work according to claim 3 or 4, characterized in that there is provided an actuator for turning the

canopy supporting body with respect to the container.

9. The vehicle for high lift work according to any one of claims 2 to 5, characterized in that the platform is movable in the width direction of the container, and there is provided an interlock mechanism for interlocking the platform with the canopy or the canopy supporting body.

10. The vehicle for high lift work according to any one of claims 3, 4, 8 and 9, characterized in that there is provided an actuator for elevating the canopy supporting body with respect to the container.

11. The vehicle for high lift work according to any one of claims 1 to 10, characterized in that there is provided an auxiliary canopy turnably held at the distal end of the canopy.

12. The vehicle for high lift work according to claim 11, characterized in that a link mechanism which consists of a wire or a bar and corrects an opening produced between the auxiliary canopy and a target position having a loading port etc. when the canopy is turned is provided between the canopy and the auxiliary canopy.

13. A vehicle for high lift work having a container installed elevatably to a truck; a platform connecting with the container; and a canopy which connects with the container and covers the platform, characterized in that

there is provided a canopy supporting body for holding the canopy so that the canopy is movable along a container axis, and a cam mechanism for elevating the canopy with respect to the canopy supporting body according to the movement of the canopy is provided between the canopy supporting body and the canopy.

14. The vehicle for high lift work according to any one of claims 1 to 13, characterized in that the truck is provided with a driving source for an engine etc. and a driver’s cabin.