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(54) FORKLIFT HEAD-GUARD STRUCTURE

FRONTSCHUTZSTRUKTUR FÜR GABELSTAPLER

STRUCTURE DE PROTECTION DE TYPE BAVETTE POUR CHARIOT ÉLEVATEUR À FOURCHE

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• **HAYAKAWA, Tomoyuki**
Tokyo 108-8215 (JP)

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(74) Representative: **Ter Meer Steinmeister & Partner**

Patentanwälte mbB

Nymphenburger Straße 4

80335 München (DE)

(73) Proprietor: **Mitsubishi Logisnext Co., Ltd.**

Nagaokakyo-shi

Kyoto 617-8585 (JP)

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(72) Inventors:

• **ISHIGAMI, Akihiro**

Tokyo 108-8215 (JP)

EP 2 915 771 B1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a head guard structure for a forklift.

BACKGROUND

[0002] A head guard is mounted to a forklift used to carry, load and unload various loads. A head guard is a guard unit for protecting a driver from a fallen load when a load falls due to collapse of loads upon loading or unloading loads at a height.

[0003] The head guard includes a pair of right and left front pillars disposed at the front of a vehicle of a forklift at intervals in the vehicle width direction, a right and left rear pillars disposed at the rear of the vehicle at intervals in the vehicle width direction, and a ceiling disposed over the front pillars and the rear pillars. The head guard has high rigidity to protect the driver from fallen loads.

[0004] Patent Document 1 discloses a head guard structure.

[0005] According to Patent Document 1, a front cover is fixed by bolts to right and left pillars at the front of a head guard provided for a vehicle body.

[0006] This front cover is formed from transparent resin having strength and durability, such as polycarbonate.

[0007] In this way, a driver is prevented from getting wet when it rains.

[0008] Furthermore, a ceiling cover having the same configuration is provided to prevent a driver from getting wet when it rains.

[0009] Further, Patent Document 2 discloses a cutout disposed on a roof cover of a head guard to load and unload a battery of a forklift. The cutout has a U shape including an opening at a side of a center portion in the vehicle front-rear direction. There is also provided a lid for closing the cutout when the battery is not being loaded or unloaded.

[0010] A roof board of the roof cover is formed from a metal plate such as an iron plate, a rigid resin plate including FRP, or the like.

Citation List

Patent Literature

[0011]

Patent Document 1: Japanese Unexamined Patent Application Pub. No. 2003-104695

Patent Document 2: Japanese Unexamined Patent Application Pub. No. 2005-82356

[0012] Document JP S58 221775 describes a overhead guard for a forklift, wherein the front half overhead section is made of crosspieces. Consequently when lift-

ing a mast to perform loading work at high position, the leading edge of fork and load can be confirmed through the gap between the crosspieces to cause no trouble for the work, while the falling material is blocked by a cover plate to protect the driver.

[0013] Document JP S58 221776 describes a head guard structure for a forklift for protecting a driver's head from hurting without sacrifice of the overhead view, by making round the lower end of a strength member of an overhead guard roof. A plurality of rectangular rods are extending in the front and back directions of car and arranged with proper interval in the lateral direction between a front member and V-shaped member.

SUMMARY

Technical Problem

[0014] However, according to Patent Document 1, the front and the ceiling are covered by polycarbonate or the like. Polycarbonate produces slight scars on its surface due to aging, which reflect light diffusely and considerably detract the visibility.

[0015] Further, if a load falls from above, the polycarbonate would possibly become damaged and scatter broken substances over a driver.

[0016] Still further, Patent Document 2 discloses a cutout for loading and unloading batteries of the vehicle disposed on a roof cover of a head guard. The cutout is closed by a lid.

[0017] However, since the cutout is formed thereon, the rigidity required for a head guard cannot be secured unless a number of reinforcement members are disposed on the ceiling and the lid.

[0018] As a result, the structure becomes complex, and the cost rises due to the increased cost and production workload for the reinforcement members. Further, since the roof board of the roof cover is formed from a metal plate such as an iron plate and FRP, the roof board is opaque, and the upward view may not be ensured.

[0019] The present invention was made in view of the above issues. An object is to provide a head guard structure for a forklift that prevents a driver from getting wet directly from rain, whereby it is possible to directly check tips of forks when the forks carrying a load reach the top position.

Solution to Problem

[0020] In order to achieve the above object, the present invention according to the independent claim 1 is provided. Thus, the strength and rigidity of the ceiling is high, and it is possible to protect the driver from rainwater when it rains. Also, it is possible to maintain the front upward view during operation of the forklift.

[0021] Thus, it is possible to improve workability and safety of the forklift in rain.

[0022] Further, preferably in the present invention, a

position of the front flange surface in the vehicle front-rear direction is disposed at least behind a line connecting tips of forks for placing loads and an eye point of a driver through the intervals between the bar members when the tips of the forks reach a top position and the driver is seated at a rightly seated position.

[0023] Accordingly, when the forks are lifted to the top position, it is possible for the driver to check the tip of the forks from the rightly seated position, i.e., in an attitude that enables smooth driving operation of the forklift. Thus, the loading work using the forklift is facilitated, and the safety is improved.

[0024] Further, preferably in the present invention, a rear edge of the top board may include a rear flange surface bended downward, the rear flange surface including opposite ends in the vehicle width direction respectively fixed to the pair of right and left rear pillars.

[0025] Accordingly, it is possible to improve the rigidity in the vehicle width direction of the rear pillars with the rear flange surface.

[0026] Further, since the rear flange surface has a similar effect (an effect to improve rigidity in the vehicle width direction) to that of the front lateral frame, it is possible to reduce the cost.

[0027] Further, preferably in the present invention, the top board may include a plurality of elongated grooves formed to have heights varied in a vertical direction over an entire region of the top board in the vehicle width direction.

[0028] Accordingly, with the plurality of elongated grooves formed over the entire region of the top board in the vehicle width direction, it is possible to improve rigidity against fallen objects from above the top board, and to improve rigidity of the front pillars and the rear pillars in the vehicle width direction.

[0029] Further, preferably in the present invention, the top board includes a reinforcement member extending in the vehicle width direction, disposed on a side of the top board which is adjacent to a driver's seat and at a position facing the driver's seat.

[0030] Accordingly, the reinforcement member is just disposed on the side of the top board adjacent to the driver's seat, which makes it possible to easily improve the rigidity against fallen objects from above the top board.

[0031] Further, preferably in the present invention, the bar members may each have a rectangular cross section in an orthogonal direction to an axis of each bar member, each bar member being disposed so that long sides of the cross section extend in the vertical direction.

[0032] Accordingly, with the long sides of the rectangular cross sections extending in the vertical direction, the intervals between the bar members are large as compared to a case in which the long sides of the rectangular cross sections are disposed in the horizontal direction. Thus, the upward view is enlarged.

[0033] Further, with the long sides arranged in the vertical direction, the rigidity in the vertical direction improves

and thus the safety improves.

[0034] Further, if the same rigidity is to be maintained, it is possible to reduce the weight of the material and to reduce the material cost in accordance with the reduced weight.

Advantageous Effects

[0035] With the above configuration, provided is a head guard structure whereby it is possible to directly check the tips of the forks on which a load is placed, and to prevent the driver from directly rained on when it rains.

BRIEF DESCRIPTION OF DRAWINGS

[0036]

FIG. 1 is a schematic side view of a forklift according to one embodiment of the present invention.

FIG. 2 is a schematic perspective view of a head guard according to one embodiment of the present invention.

FIG. 3 is a schematic perspective view of a ceiling of a head guard of the present invention.

FIG. 4A is a detail view of a joint structure of the ceiling of the head guard according to the present invention, and FIG. 4B is a diagram illustrating a welding range of a gusset.

FIG. 5A is an attachment structure diagram of front pillars to a vehicle body, and FIG. 5B is a cross-sectional view taken along the line A-A from FIG. 5A.

FIG. 6A is an attachment structure diagram of rear pillars to the vehicle body, and FIG. 6B is a disassembly diagram for attaching the rear pillars to the vehicle body.

DETAILED DESCRIPTION

[0037] Embodiments of the present invention will now be described in detail with reference to the accompanying drawings.

[0038] It is intended, however, that unless particularly specified, dimensions, materials, shapes, relative positions and the like of components described in the embodiments shall be interpreted as illustrative only and not limitative of the scope of the present invention.

[0039] FIG. 1 is a schematic side view of a forklift according to one embodiment of the present invention, and the reference sign 1 indicates an overall side view of a forklift.

[0040] A forklift 1 includes a vehicle body 21, a load lifting unit 7 mounted to a front part of the vehicle body 21, a head guard 5, front wheels 8, rear wheels 9 mounted to the rear of the vehicle body 21, a counterweight 3 mounted to the rear of the vehicle body 21, a steering wheel 6 for steering the rear wheels 9, and a seat 10 for seating a driver. The head guard 5 is to prevent a load from falling onto a driver's seat due to collapse of loads

lifted by the load lifting unit 7. The front wheels 8 are driving wheels for moving the forklift 1. The rear wheels 9 are steering wheels of the forklift 1. The counterweight 3 has a weight such that the rear wheels 9 do not become spaced from the road surface due to the weight of loads on the load lifting unit 7, and such that the rear wheels 9 can contact the road surface firmly.

[0041] Since the forklift 1 is steered by the rear wheels 9, the rear wheels 9 are brought into firm contact with the road surface by the counterweight 3.

[0042] The vehicle body 21 includes the vehicle body 21 on which an engine, a device for driving the front wheels, a hydraulic pump such as a hydraulic cylinder, and a device for driving and work such as a steering device for the rear wheels (not illustrated) are mounted, and an engine cover 24 covering the top of these devices for traveling and work.

[0043] The vehicle body 21, to which the head guard 5 is mounted, includes a pair of right and left side frames (not illustrated), and a plurality of cross members (not illustrated). The side frames have a rectangular basic cross section in the vehicle width direction, and extend in the vehicle front-rear direction at an interval in the vehicle width direction. The cross members connect the pair of right and left side frames in the vehicle width direction, and are arranged at an interval in the front-rear direction.

[0044] The devices for traveling and devices for work are accommodated between the pair of right and left side frames.

[0045] The engine cover 24 covers a space between the pair of right and left side frames.

[0046] A seat 10 for seating a driver is disposed on the upper surface of the engine cover 24.

[0047] The vehicle body 21 has high strength and high rigidity because the counterweight 3 or the like are connected to the vehicle body 21 via the cross members.

[0048] The load lifting unit 7 includes forks 72 having an L shape as seen from the side, on which loads are to be placed, a back rest 73 to which the forks 72 are attached, a mast 71 for supporting the back rest 73 slidably in the vertical direction, a lift chain (not illustrated) for sliding the back rest 73 in the vertical direction, an assist mast 75 that is fit slidably in the vertical direction to the mast 71 so as to lift the back rest 73 further above the upper end of the mast 71, and a tilt cylinder (hydraulic pressure) 76 for tilting the mast 71 and the assist mast 75 to adjust tips of the forks 72. The tips of the forks 72 are tilted (adjusted) upward and downward to insert the forks 72 under a load, so that the load is placed on the forks 72.

[0049] The assist mast 75 is slid by a lift cylinder (hydraulic pressure) that is not illustrated, upward and downward with respect to the mast 71.

[0050] FIG. 2 is an exterior perspective view of the head guard 5. The head guard 5 includes a pair of front pillars 51, 51 disposed at the front of the vehicle body 21 so as to be spaced from each other in the vehicle width

direction, a pair of rear pillars 52, 52 disposed at the rear of the vehicle body 21 so as to be spaced from each other in the vehicle width direction, and a rectangular ceiling 53 welded to the upper ends of the four pillars on the four corners.

[0051] While the front and rear pillars are arranged in pairs, the same reference number is used for each pair to simplify the description.

[0052] The front pillars 51 each have a pillar shape with a cross-section in an orthogonal direction to the axis of the pillar forming a hollow closed cross section of a substantially rectangular shape.

[0053] As illustrated in FIG. 1, the lower parts of the front pillars are attached to the front of the vehicle body 21 of the forklift 1 and above the front wheels 8.

[0054] FIG. 5A and 5B illustrate details of the attachment structure of the lower parts of the pillars 51.

[0055] An attachment structure of the pillars 51 adjacent to the vehicle body 21 includes a pair of right and left front-attachment brackets 21b standing on the upper surface of a front fender 21a of the vehicle body 21, a pair of right and left gussets 21c disposed on the inner sides of the front-attachment brackets 21b in the vehicle width direction so as to maintain the rigidity of the front-attachment brackets 21b in the vehicle width direction, and an instrument panel 28 (see FIG. 1) connecting the pair of right and left gussets 21c, for instance. A steering wheel 6, a control lever for driving and lifting loads, driving meter devices and the like are mounted to the instrument panel 28. An instrument reinforcement member for reinforcement is disposed inside the instrument panel 28.

[0056] Further, the right and left front attachment brackets 21b each have a distal end inclined toward the inside of the vehicle body 21, so as to have an inclined surface of a trapezoidal shape as seen in the vehicle front-rear direction. This inclined surface guides insertion from above when mounting the front pillars 51 to the front attachment brackets 21b, and makes it possible to determine the positions of the center lines in the vehicle width direction of the vehicle body 21 and the head guard 5.

[0057] Thus, the lower end and the upper end of the head guard 5 respectively have a dimension WL and a dimension WU in the vehicle width direction, satisfying a relationship of $WL > WU$ so as to conform to the inclined surface.

[0058] The front attachment brackets 21b each include the first attachment holes 21d penetrating through in the vehicle width direction. A nut 22d constitutes a fastening member 22 fixed to a position corresponding to each of the first attachment holes 21d, on a side of the front attachment bracket 21b that is inside the vehicle. The nuts 22d are welded to the front attachment bracket 21b.

[0059] FIG. 5B is a cross-sectional view taken along the line A-A from FIG. 5A. At the lower part of each front pillar 51, two second attachment holes 51a are disposed in the vertical direction on a face facing the first attachment holes 21d.

[0060] The second attachment holes 51a are disposed so as to open on a surface contacting the front attachment bracket 21b of the rectangular cross section.

[0061] Further, work holes 51b are disposed so as to open at the lower part of each front pillar 51, and on a face of the rectangular cross section that is opposite to the face on which the second attachment holes 51a are disposed. The work holes 51b each have a diameter larger than that of the second attachment holes 51a.

[0062] Each work hole 51b has a diameter such that a bolt 22a, a spring washer 22b, and a plain washer 22c, all of which constitute a fastening member 22, can pass through the work hole 51b, and a box wrench (not illustrated) for fastening the bolt 22a can pass through the work hole 51b.

[0063] The front pillars 51 are fixed to the front attachment brackets 21b by assembling the spring washer 22b and the plain washer 22c onto the bolt 22a, all of which being a fastening member 22, and screwing the bolt 22a onto the nut 22d through the work hole 51b.

[0064] Each work hole 51b is closed by a resin plug 23 after fastening the first bolt 22a.

[0065] The rear pillars 52 each have a pillar shape with a cross-section in an orthogonal direction to the axis of the pillar forming a hollow closed cross section of a substantially rectangular shape, similarly to the front pillars 51.

[0066] FIGs. 6A and 6B illustrate an attachment structure of the lower parts of the rear pillars 52 to the vehicle body 21.

[0067] An attachment structure of the rear pillars 52 adjacent to a frame (not illustrated in FIGs. 6A and 6B) includes a pair of right and left first support brackets 26 disposed at the rear of the vehicle body 21 and along an outer side in the vehicle width direction of the upper surface of the frame, and a pair of right and left second support brackets 27 extending upward from the frame.

[0068] The first support brackets 26 each have a pillar shape with a substantially rectangular cross section as seen in a planar view.

[0069] The rear pillars 52 of the head guard 5 are attached to rear attachment brackets 25. Each attachment bracket 25 is disposed and fixed over the upper parts of the first support bracket 26 and the second support bracket 27.

[0070] As a result, the attachment part of at the lower part of each rear pillar 52 has high rigidity with respect to the vertical direction, the front-rear direction, and the right-left direction of the vehicle.

[0071] As illustrated in FIGs. 6A and 6B, each rear attachment bracket 25 includes a flat portion 25a disposed over the upper parts of the first support bracket 26 and the second support bracket 27, a vertical wall portion 25c formed continuously from the flat portion 25a and bended downward, and a protrusion 25a to which the rear pillar 52 is attached.

[0072] The protrusion 25a is disposed so as to contact the front face of the rectangular closed cross section of

one of the rear pillars 52.

[0073] The protrusion 25a includes the fourth attachment hole 25d penetrating through in the vehicle front-rear direction disposed at a position corresponding to the third attachment hole 52a of the rear pillar 52.

[0074] A nut 22d constituting a fastening member 22 is disposed in accordance with the axis of the fourth attachment hole 25d at a side opposite to the face contacting the rear pillar 52.

[0075] Further, the protrusion 25a includes a guide portion 25e inclined toward the rear of the vehicle (or curved in an arc shape) at the distal end, so as to facilitate fitting when the rear pillar 52 is fit onto the protrusion 25a.

[0076] With reference to FIGs. 2, 3, and 4, the shape of the ceiling 53 will be described in detail.

[0077] The ceiling 53 includes a pair of right and left vertical frames 55 each coupling the upper ends of one of the front pillars 51 and one of the rear pillars 52, a front lateral frame 54 coupling the pair of right and left front pillars 51, a top board 56a extending to the center part of the vertical frames 55 in the vehicle front-rear direction and including a front flange surface 56b bended downward, and a plurality of bar members 57 disposed in a space between the front flange surface 56b and the front lateral frame 54. Each bar member 57 has the first end fixed to the front lateral frame 54, and the second end fixed to the front flange portion 56d. The bar members 57 are arranged at intervals in the vehicle width direction.

[0078] As illustrated in FIG. 4, the vertical frames 55 and the rear pillars 52 are coupled to be fixed (welded).

[0079] Further, a gusset 58 formed into a substantially L shape of a thick plate is welded to the joint between the vertical frame 55 and each rear pillar 52.

[0080] The first arm 58a of the L shape is along the inner side of the upper end of the rear pillar 52, and the second arm 58b of the L shape is along the inner side of the rear end of the vertical frame 55.

[0081] Further, the ends of the first arm 58a and the second arm 58b of the L shape are each formed into a semi-circle shape.

[0082] As illustrated in FIG. 4B, the gusset 58 formed into a substantially L shape of a thick plate is welded to the vertical frame 55 and to the rear pillar 52 over the entire periphery of the gusset 58 formed into a substantially L shape of a thick plate continuously.

[0083] The ends of the gusset 58 is formed in a semi-circle shape, so as not to have a welding-termination part where welding is terminated at positions (the first arm 58a, and the second arm 58b) to which the highest stress is applied, when bending force is applied between the rear pillar 52 and the vertical frame 55 in the front-rear direction or the vehicle-width direction.

[0084] At a welding-termination part, welding heat is released outward and weld penetration is likely to be insufficient. Also, a welding-termination part is cooled fast and a decrease in the welding speed is likely to be caused.

[0085] Since the gusset 58 does not have corners (a

semi-circle shape), it is possible to prevent uneven distribution of welding strength possibly caused by a partial increase in the welding heat. Further, since the ends of the gusset 58 each have a semi-circle shape, the change in the cross-sectional rigidity is reduced, which makes it possible to prevent stress concentration.

[0086] While the joint structure between the vertical frame 55 and the rear pillars 52 is described above, the vertical frames 55 are joined to the front pillars 51, and the front lateral frame 54 is joined to the front pillars 51, with similar structures, which are thus not described in detail.

[0087] As illustrated in FIGs. 3 and 4, the ceiling 53 includes the top board 56 and the plurality of bar members 57 disposed between the top board 56 and the front lateral frame 54.

[0088] The top board 56 includes a ceiling portion 56a formed in a flat shape that prevents a driver from getting wet from rain, the front flange surface 56b formed continuously from the ceiling portion 56a and bended downward at the front side in the vehicle front-rear direction, a rear flange surface 56c extending continuously from the ceiling portion 56a and bended downward at the rear side in the vehicle front-rear direction, a welding margin portion welded to the upper surfaces of the pair of right and left vertical frames 55, and a reinforcement member 56e disposed on a side of the ceiling portion 56a that is adjacent to the driver. The reinforcement member 56e has a cross section in the front-rear direction that is formed to have a hollow closed cross section with the ceiling portion 56a. Also, the reinforcement member 56e extends across the entire region in the vehicle width direction.

[0089] As illustrated in FIG. 1, the position of the front flange surface 56b in the vehicle front-rear direction is determined so that the driver can directly check the tips 72a of the forks 72 at the top position of the forks 72 of the forklift 1, when the driver is seated rightly on the seat 10.

[0090] Specifically, the position FP of the front flange surface is disposed, in the vehicle front-rear direction, at least behind the position at which the lower edge 56bp of the front flange surface 56b intersects a connection line IL between an eye point IP of the driver and the tips 72a of the forks 72.

[0091] Thus, the position FP of the front flange surface varies depending on the height of the head guard 5.

[0092] Here, "seated rightly" means that a driver of a standard size is seated on the seat 10 so that the forklift 1 can be easily operated.

[0093] The bar members 57 each have a solid closed cross section of a rectangular shape in an orthogonal direction to the axis of the bar member 57.

[0094] The long sides of the rectangular shape of each bar member 57 are disposed in the vertical direction. Each bar member 57 is fixed (by welding) to the front lateral frame 54 at the first end, and to the front flange surface 56b at the second end.

[0095] Thus, the bar members 57 are fixed with the long (high) sides disposed in the vertical direction, which makes it possible to maintain high rigidity against fallen objects from above.

[0096] Further, since the shorter sides of the rectangular shape are in the vehicle width direction, the bar members 57 are arranged at wide intervals, which results in an effect to expand the upward view.

[0097] In the present embodiment, the bar members 57 each have a rectangular cross-section of a thick plate shape. The same effect can be achieved even if each bar member 57 is a hollow member having a rectangular shape with its long sides arranged in the vertical direction.

[0098] With reference to FIG. 4, the joint structure between the top board 56 and the vertical frame 55 and the rear pillars 52 will be described.

[0099] The top board 56 includes flanges 56d at the ends in the vehicle width direction. Each flange 56d is placed on the upper surface of either one of the pair of right and left vertical frames 55.

[0100] Each flange 56d is fillet welded (W3) over the entire region in the vehicle front-rear direction on the upper surface of the corresponding one of the pair of right and left vertical frames 55.

[0101] Further, an end in the vehicle width direction of the front flange surface 56b is fillet welded (W4) to the inner side of the corresponding vertical frame 55 in the vertical direction.

[0102] Further, an end in the vehicle width direction of the rear flange surface 56c of the top board 56 is fillet welded (W5) to the inner side in the vehicle width direction of the corresponding gusset 58 connecting the vertical frame 55 and the rear pillar 52 in the vertical direction.

[0103] The top board 56 has a box shape that has an opening at the lower side, formed by the ceiling portion 56a, the front flange surface 56b, and the rear flange surface 56c of the top board, and the right and left vertical frames 55, 55.

[0104] Thus, with the top board 56 including the reinforcement members 56e disposed adjacent to the driver's seat on the ceiling portion 56a and having the above box shape, the head guard 5 achieves high rigidity especially in the vertical direction.

[0105] While the ceiling portion 56a has a flat plate shape in the present embodiment, the ceiling portion 56a may have a cross section in the vehicle front-rear direction whose height is varied in the vertical direction so as to have a corrugated shape (arc or triangular), or trapezoidal, so that a plurality of elongated grooves are arranged in the vehicle width direction.

[0106] With the above configuration, the rigidity in the vertical direction of the entire ceiling portion 56a is increased, which makes it no longer necessary to provide the reinforcement members 56e. In this way, it is possible to reduce the material cost and weight.

[0107] As described above, with the top board 56 having a box shape with an opening at the lower side, it is possible to achieve high rigidity for the head guard 5, and

to expand driver head clearance (clearance between the head of the driver and the top board 56) HC, which results in improvement of habitability and therefore enhancement of merchantability.

[0108] Further, the front flange 56b of the top board 56 is disposed, in the vehicle front-rear direction, behind the connection line IL connecting the eye point IP of the driver and the tips 72a of the forks 72 at the top position of the forks 72.

[0109] As a result, with the above head guard structure for a forklift, it is possible to directly check the tips of the forks when the forks carrying loads reach the top position, and to prevent the driver from directly receiving rainwater when it rains.

Industrial Applicability

[0110] The present invention can be provided as an attachment structure for attaching a head guard to a vehicle body of a forklift.

Reference Signs List

[0111]

1	Forklift	25
3	Counterweight	
5	Head guard	
6	Steering wheel	
7	Load lifting unit	30
8	Front wheel (driving wheel)	
9	Rear wheel (steering wheel)	
21	Vehicle	
21b	Front attachment bracket	
21d	First attachment hole	35
22	Fastening member	
25	Rear attachment bracket	
25a	Protrusion	
25d	Fourth attachment hole	
51	Front pillar	40
52	Rear pillar	
54	Front lateral frame	
55	Vertical frame	
56	Top board	
56a	Ceiling portion	45
56b	Front flange surface	
56c	Rear flange surface	
57	Bar member	
58	Gusset	50

Claims

1. A head guard structure for a forklift, comprising:

a pair of right and left front pillars (51, 51) mounted to a front of a vehicle body (21) of a forklift (1) and spaced from each other in a vehicle width

direction;

a pair of right and left rear pillars (52, 52) mounted to a rear of the vehicle body (21) and spaced from each other in the vehicle width direction;

a pair of right and left vertical frames (55, 55) connecting upper ends of the front pillars (51) and upper ends of the rear pillars (52) in a vehicle front-rear direction;

a front lateral frame (54) connecting the upper ends of the pair of right and left front pillars (51, 51) in the vehicle width direction;

a top board (56) disposed over the pair of right and left vertical frames (55, 55) via flanges at opposite ends of the top board (56) in the vehicle width direction disposed on upper surfaces of the vertical frames (55, 55), so as to extend from rear ends of the vertical frames (55) toward front of the vehicle, the top board (56) including a front edge disposed at a center of the vertical frames (55) in a front-rear direction and a front flange surface (56b) formed continuously from the front edge and bended downward; and

a plurality of bar members (57) each including a first end fixed to the front lateral frame and a second end fixed to the front flange surface (56b), the bar members (57) being arranged at intervals in the vehicle width direction,

characterised in that a gusset (58) of a substantially L shape of a thick plate formed by a first arm (58a) disposed along the inner side of the upper end of the rear pillars (52) and a second arm (58b) disposed along the inner side of the rear end of the vertical frames (55) is welded to a joint portion between the vertical frame (55) and the rear pillar (52), such that the gusset (58) is welded to the vertical frame 55) and to the rear pillar (52) over the entire periphery of the gusset (58) continuously, wherein the ends of the first arm (58a) and the second arm (58b) of the L shape are each formed into a semi-circle shape.

2. The head guard structure for a forklift according to claim 1, wherein a position of the front flange surface (56b) in the vehicle front-rear direction is disposed at least behind a line (IL) connecting tips of forks (72) for placing loads and an eye point (IP) of a driver through the intervals between the bar members (57) when the tips of the forks (72) reach a top position and the driver is seated at a rightly seated position.

3. The head guard structure for a forklift according to claim 1 or 2, wherein a rear edge of the top board (56) includes a rear flange surface (56c) bended downward, the rear flange surface (56c) including opposite ends in the vehicle width direction fixed to the pair of right and left rear pillars (52, 52), respectively.

4. The head guard structure for a forklift according to any one of claims 1 to 3, wherein the top board (56) includes a plurality of grooves formed to have heights varied in a vertical direction over an entire region of the top board (56) in the vehicle width direction. 5
5. The head guard structure for a forklift according to any one of claims 1 to 4, wherein the top board (56) includes a reinforcement member (56e) extending in the vehicle width direction, disposed on a side of the top board (56) which is adjacent to a driver's seat and at a position facing the driver's seat. 10
6. The head guard structure for a forklift according to any one of claims 1 to 5, wherein the bar members (57) each have a rectangular cross section in an orthogonal direction to an axis of each bar member (57), each bar member (57) being disposed so that long sides of the cross section extend in the vertical direction. 15 20

Patentansprüche

1. Kopfschutzstruktur für einen Gabelstapler, die Folgendes umfasst: 25
 - ein Paar rechter und linker vorderer Säulen (51, 51), die an einer Vorderseite eines Fahrzeugkörpers (21) eines Gabelstaplers (1) montiert sind und in einer Fahrzeugbreitenrichtung voneinander beabstandet sind; 30
 - ein Paar rechter und linker hinterer Säulen (52, 52), die an einer Rückseite des Fahrzeugkörpers (21) montiert sind und in der Fahrzeugbreitenrichtung voneinander beabstandet sind; 35
 - ein Paar rechter und linker vertikaler Rahmen (55, 55), die obere Enden der vorderen Säulen (51) und obere Enden der hinteren Säulen (52) in einer Richtung von vorn nach hinten bezüglich des Fahrzeugs verbinden; 40
 - einen vorderen seitlichen Rahmen (54), der die oberen Enden des Paares rechter und linker vorderer Säulen (51, 51) in der Fahrzeugbreitenrichtung verbindet; 45
 - eine obere Platte (56), die über dem Paar rechter und linker vertikaler Rahmen (55, 55) mittels Wangen an entgegengesetzten Enden der oberen Platte (56) in der Fahrzeugbreitenrichtung angeordnet ist, die so auf oberen Oberflächen 50
 - der vertikalen Rahmen (55, 55) angeordnet ist, dass sie sich von hinteren Enden der vertikalen Rahmen (55) zu der Vorderseite des Fahrzeugs erstreckt, wobei die obere Platte (56) eine vordere Kante, die bei der Mitte der vertikalen Rahmen (55) in eine Richtung von vorn nach hinten angeordnet ist, und eine vordere Wangenfläche (56b), die von der vorderen Kante fortlaufend 55

ausgebildet und abwärts gebogen ist, aufweist; und
 mehrere Stangenelemente (57), wovon jedes ein erstes Ende, das an dem vorderen seitlichen Rahmen fixiert ist, und ein zweites Ende, das an der vorderen Wangenfläche (56b) fixiert ist, aufweist, wobei die Stangenelemente (57) in Abständen in der Fahrzeugbreitenrichtung angeordnet sind,
dadurch gekennzeichnet, dass
 ein Winkelstück (58) im Wesentlichen in einer L-Form aus einer dicken Platte, das durch einen ersten Arm (58a), der entlang der Innenseite des oberen Endes der hinteren Säulen (52) angeordnet ist, und einen zweiten Arm (58b), der entlang der Innenseite des hinteren Endes der vertikalen Rahmen (55) angeordnet ist, gebildet ist, an einen Verbindungsabschnitt zwischen dem vertikalen Rahmen (55) und der hinteren Säule (52) so angeschweißt ist, dass das Winkelstück (58) an den vertikalen Rahmen (55) und an die hintere Säule (52) über den gesamten Umfang des Winkelstücks (58) fortlaufend angeschweißt ist, wobei die Enden des ersten Arms (58a) und des zweiten Arms (58b) der L-Form jeweils in einer Halbkreisform ausgebildet sind.

2. Kopfschutzstruktur für einen Gabelstapler nach Anspruch 1, wobei eine Position der vorderen Wangenfläche (56b) in Richtung von vorn nach hinten bezüglich des Fahrzeugs wenigstens hinter einer Linie (IL) angeordnet ist, die die Spitzen der Gabeln (72) zum Anordnen von Lasten und einen Augenpunkt (IP) eines Fahrers durch die Zwischenräume zwischen den Stangenelementen (57) verbindet, wenn die Spitzen der Gabeln (72) eine obere Position erreichen und der Fahrer in einer korrekten Sitzposition sitzt.
3. Kopfschutzstruktur für einen Gabelstapler nach Anspruch 1 oder 2, wobei eine hintere Kante der oberen Platte (56) eine hintere Wangenfläche (56c), die abwärts gebogen ist, aufweist, wobei die hintere Wangenfläche (56c) entgegengesetzte Enden in der Fahrzeugbreitenrichtung aufweist, die jeweils an dem Paar rechter und linker hinterer Säulen (52, 52) fixiert sind.
4. Kopfschutzstruktur für einen Gabelstapler nach einem der Ansprüche 1 bis 3, wobei die obere Platte (56) mehrere Rillen aufweist, die so ausgebildet sind, dass sie Höhen aufweisen, die sich in einer vertikalen Richtung über einen gesamten Bereich der oberen Platte (56) in der Fahrzeugbreitenrichtung ändern.
5. Kopfschutzstruktur für einen Gabelstapler nach einem der Ansprüche 1 bis 4, wobei die obere Platte

(56) ein Verstärkungselement (56e) aufweist, das sich in der Fahrzeugbreitenrichtung erstreckt, das auf einer Seite der oberen Platte (56) angeordnet ist, die an den Fahrersitz und an eine Position, die dem Fahrersitz gegenüberliegt, angrenzt.

6. Kopfschutzstruktur für einen Gabelstapler nach einem der Ansprüche 1 bis 5, wobei die Stangenelemente (57) jeweils einen rechteckigen Querschnitt in einer senkrechten Richtung zu einer Achse des jeweiligen Stangenelements (57) aufweisen, wobei jedes Stangenelement (57) so angeordnet ist, dass sich lange Seiten des Querschnitts in der vertikalen Richtung erstrecken.

Revendications

1. Structure de dispositif de protection de tête pour un chariot élévateur à fourche, comportant :

une paire de montants avant droit et gauche (51, 51) montés sur un avant d'une carrosserie de véhicule (21) d'un chariot élévateur à fourche (1) et espacés l'un de l'autre dans une direction de largeur de véhicule ;

une paire de montants arrière droit et gauche (52, 52) montés sur un arrière de la carrosserie de véhicule (21) et espacés l'un de l'autre dans la direction de largeur de véhicule ;

une paire de châssis verticaux droit et gauche (55, 55) reliant des extrémités supérieures des montants avant (51) et des extrémités supérieures des montants arrière (52) dans une direction avant-arrière de véhicule ;

un châssis latéral avant (54) reliant les extrémités supérieures de la paire de montants avant droit et gauche (51, 51) dans la direction de largeur de véhicule ;

un panneau supérieur (56) disposé au-dessus de la paire de châssis verticaux droit et gauche (55, 55) via des rebords à des extrémités opposées du panneau supérieur (56) dans la direction de largeur de véhicule disposés sur des surfaces supérieures des châssis verticaux (55, 55), de manière à s'étendre à partir d'extrémités arrière des châssis verticaux (55) vers l'avant du véhicule, le panneau supérieur (56) incluant un bord avant disposé au niveau d'un centre des châssis verticaux (55) dans une direction avant-arrière et une surface de rebord avant (56b) formée en continu à partir du bord avant et pliée vers le bas ; et

une pluralité d'éléments de barre (57) incluant chacun une première extrémité fixée au châssis latéral avant et une seconde extrémité fixée à la surface de rebord avant (56b), les éléments de barre (57) étant agencés à des intervalles

dans la direction de largeur de véhicule,

caractérisée en ce que

un gousset (58) pratiquement en forme de L d'une plaque épaisse formée par un premier bras (58a) disposé le long du côté intérieur de l'extrémité supérieure des montants arrière (52) et un second bras (58b) disposé le long du côté intérieur de l'extrémité arrière des châssis verticaux (55) est soudé à une partie d'assemblage entre le châssis vertical (55) et le montant arrière (52), de telle sorte que le gousset (58) est soudé au châssis vertical (55) et au montant arrière (52) sur toute la périphérie du gousset (58) de manière continue, dans laquelle les extrémités du premier bras (58a) et du second bras (58b) en forme de L ont chacune une forme de demi-cercle.

2. Structure de dispositif de protection de tête pour un chariot élévateur à fourche selon la revendication 1, dans laquelle une position de la surface de rebord avant (56b) dans la direction avant-arrière de véhicule est disposée au moins derrière une ligne (IL) reliant des pointes de fourches (72) pour placer des charges et un point oculaire (IP) d'un conducteur à travers les intervalles entre les éléments de barre (57) lorsque les pointes des fourches (72) atteignent une position supérieure et que le conducteur est assis dans une position correctement assise.

3. Structure de dispositif de protection de tête pour un chariot élévateur à fourche selon la revendication 1 ou 2, dans laquelle un bord arrière du panneau supérieur (56) inclut une surface de rebord arrière (56c) pliée vers le bas, la surface de rebord arrière (56c) incluant des extrémités opposées dans la direction de largeur de véhicule fixées à la paire de montants arrière droit et gauche (52, 52), respectivement.

4. Structure de dispositif de protection de tête pour un chariot élévateur à fourche selon l'une quelconque des revendications 1 à 3, dans laquelle le panneau supérieur (56) inclut une pluralité de rainures formées pour avoir des hauteurs variant dans une direction verticale sur une zone complète du panneau supérieur (56) dans la direction de largeur de véhicule.

5. Structure de dispositif de protection de tête pour un chariot élévateur à fourche selon l'une quelconque des revendications 1 à 4, dans laquelle le panneau supérieur (56) inclut un élément de renfort (56e) s'étendant dans la direction de largeur de véhicule, disposé sur un côté du panneau supérieur (56) qui est adjacent à un siège du conducteur et dans une position dirigée vers le siège du conducteur.

6. Structure de dispositif de protection de tête pour un

chariot élévateur à fourche selon l'une quelconque des revendications 1 à 5, dans laquelle les éléments de barre (57) ont chacun une section transversale rectangulaire dans une direction orthogonale à un axe de chaque élément de barre (57), chaque élément de barre (57) étant disposé de sorte que des côtés longs de la section transversale s'étendent dans la direction verticale.

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FIG.1

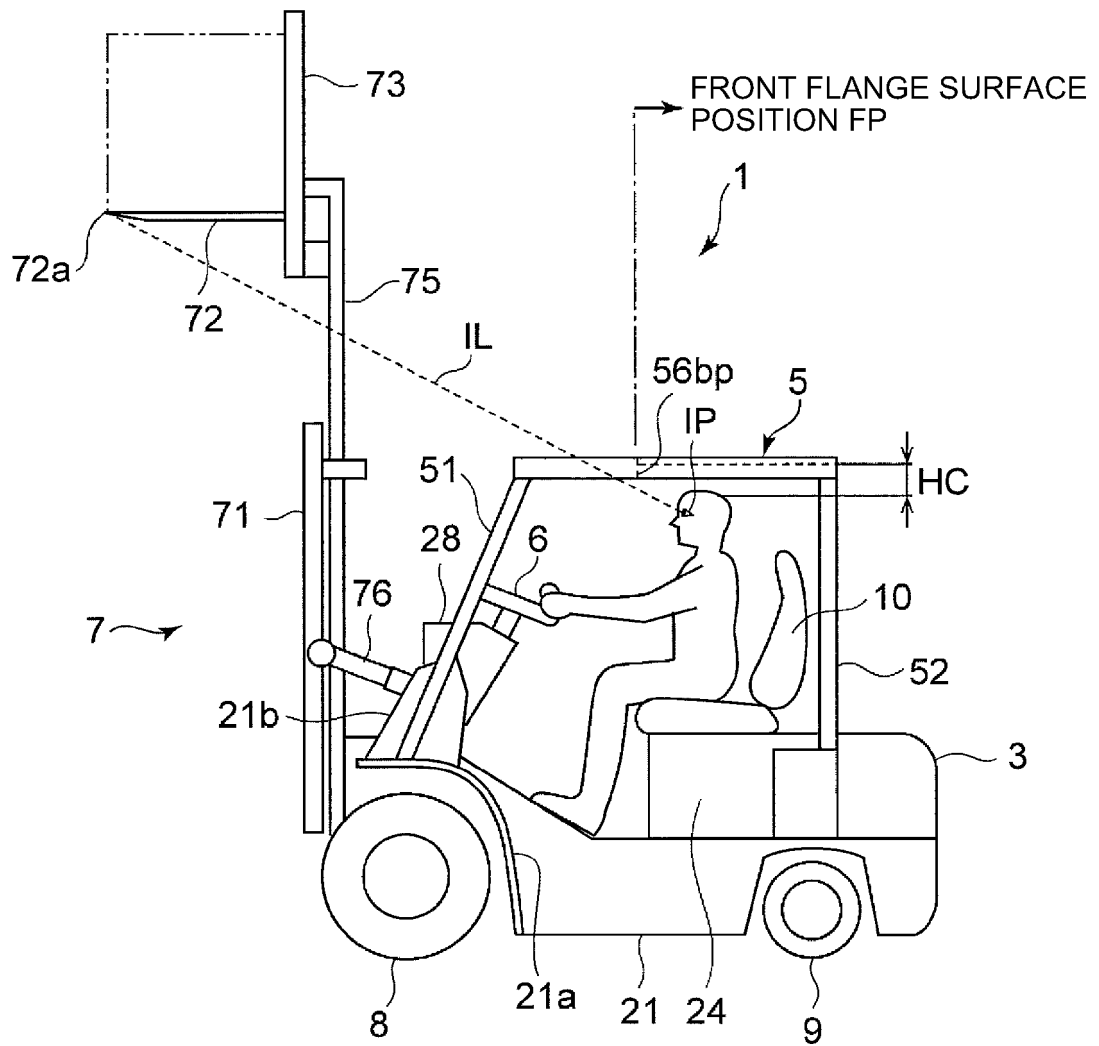


FIG.2

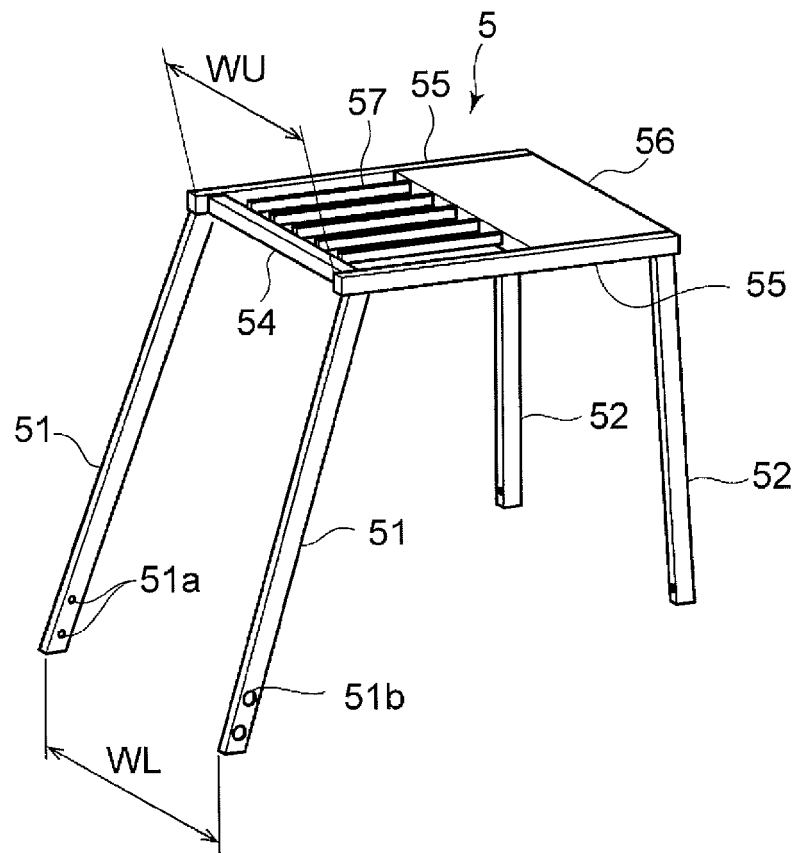


FIG.3

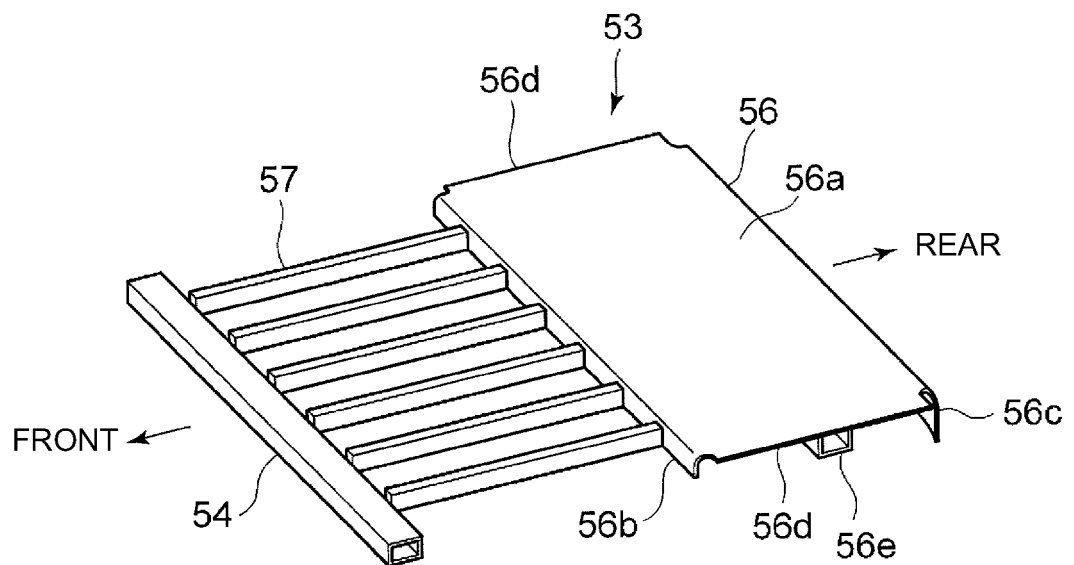


FIG.4A

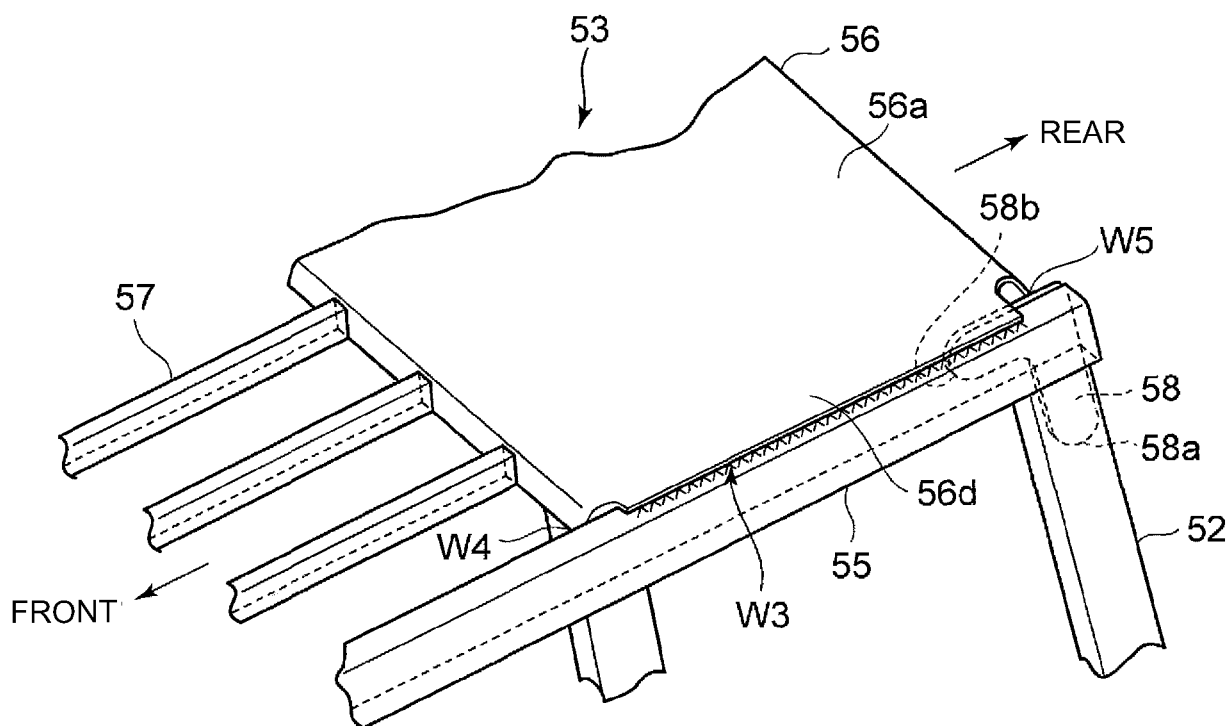


FIG.4B

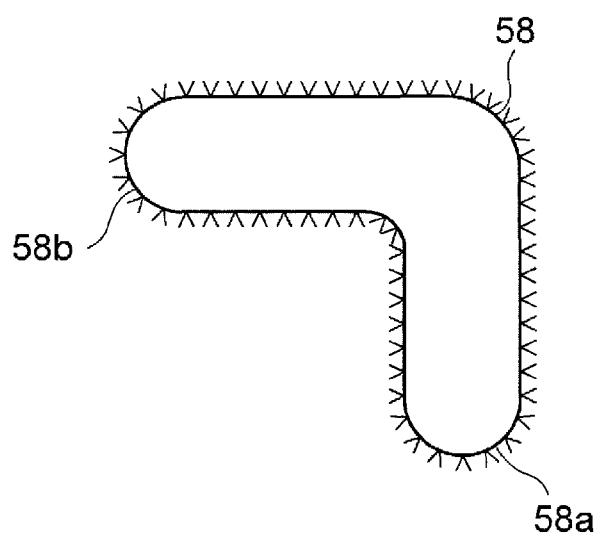


FIG.5A

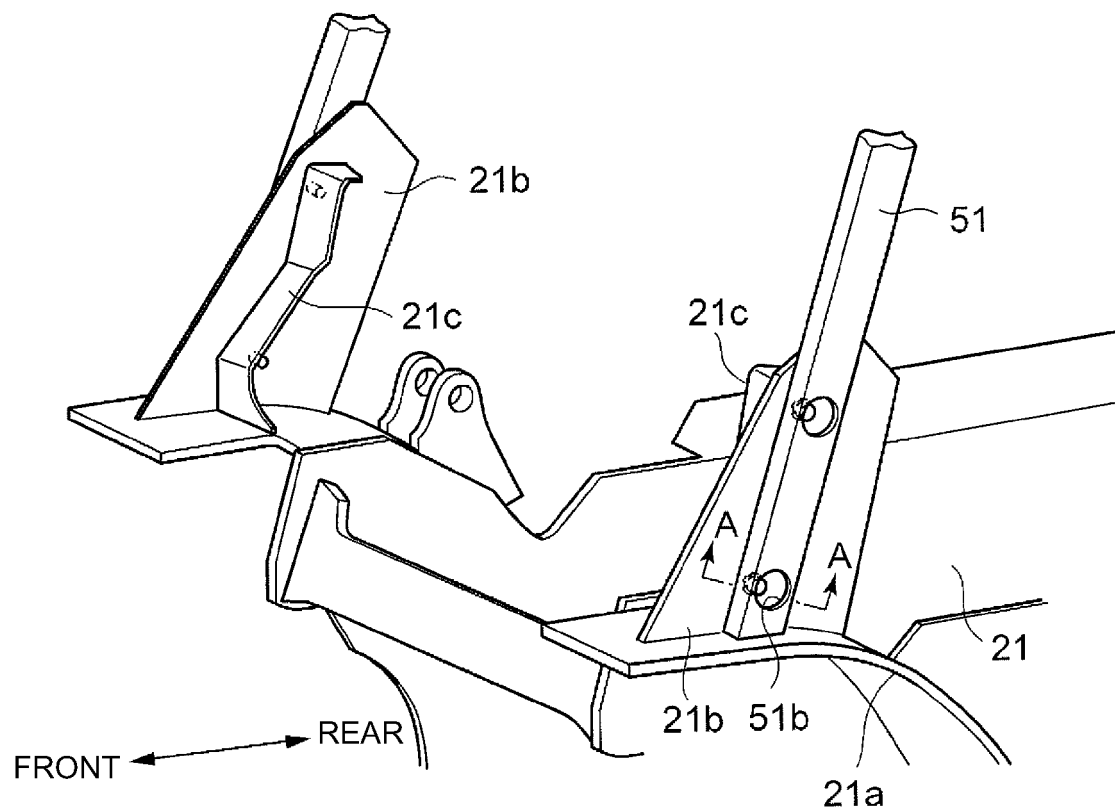


FIG.5B

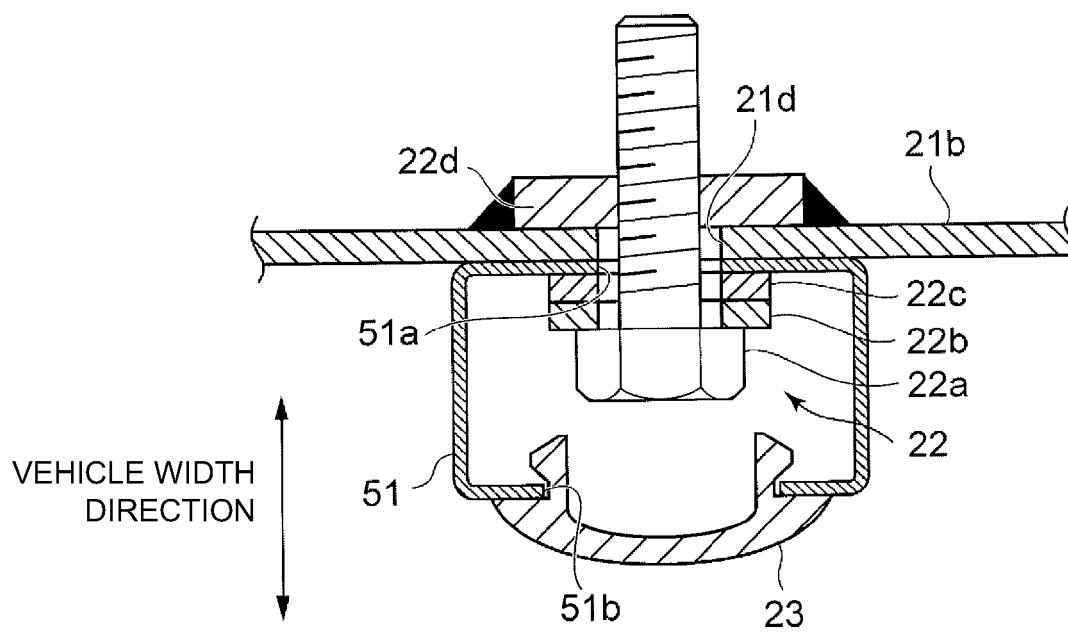


FIG.6A

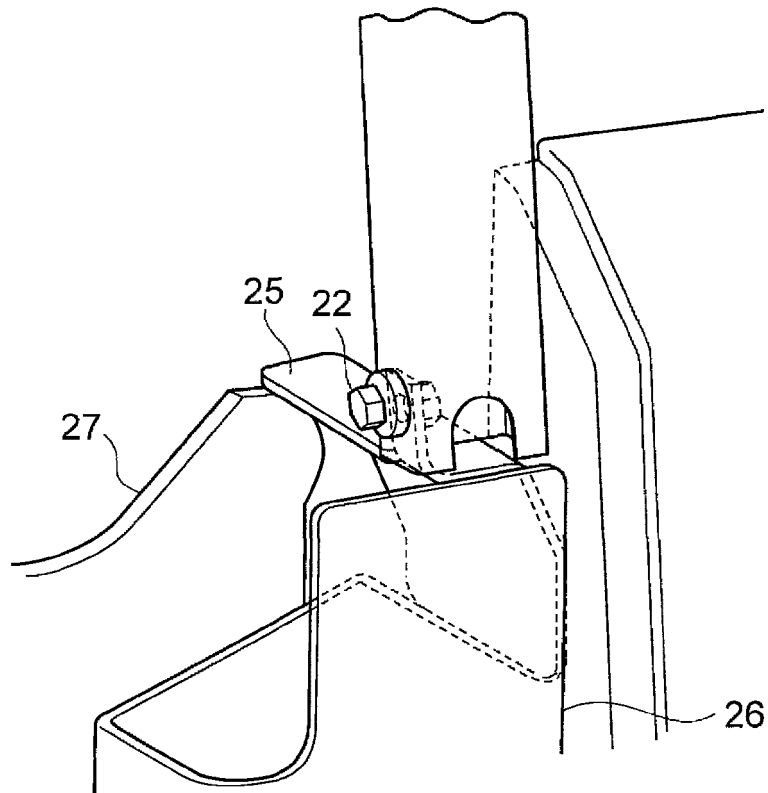
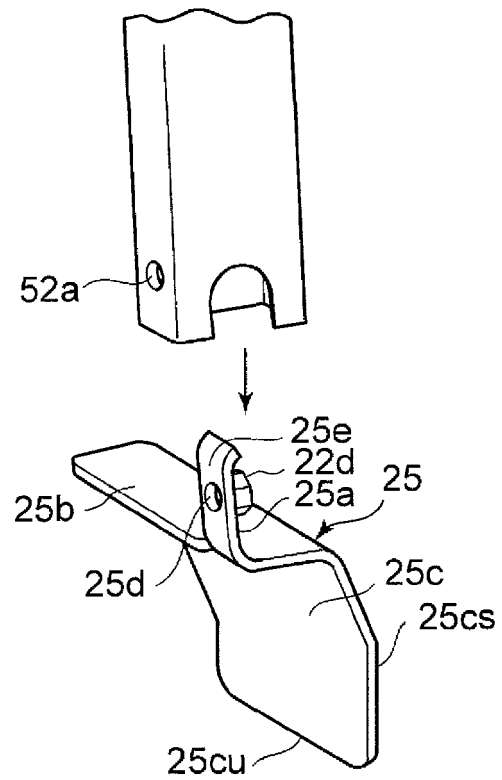


FIG.6B



REFERENCES CITED IN THE DESCRIPTION

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