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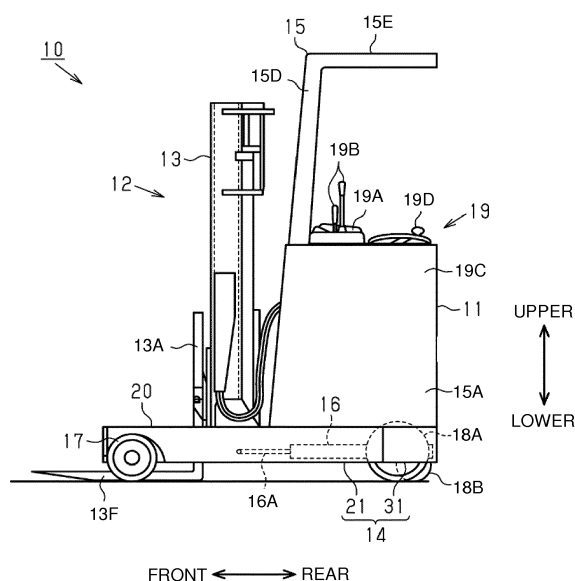
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(54) **REACH TRUCK**

(57) A reach truck includes a vehicle body (11); a mast assembly (13) that is disposed in a front part of the vehicle body (11) and has a loading implement (12); a straddle arm assembly (21) having a pair of right and left straddle arms (20) that guides the mast assembly (13) to move in a longitudinal direction of the straddle arm assembly (21); and a rear frame assembly (31) that is joined to a rear end of the straddle arm assembly (21) and accommodates therein a drive unit (35). The rear frame assembly includes a joint member (31 A, 33A) through which the rear frame assembly (31) and the straddle arm assembly (21) are joined to each other by a fastening member (41, 42, 43, 44).

FIG. 1



Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a reach truck.

[0002] Japanese Patent Application Publication No. 2008-221981 discloses a reach truck that includes a mast assembly having a pair of right and left forks (loading implement) and a straddle arm assembly having a pair of right and left straddle arms that guides the mast assembly to move in the longitudinal direction of the reach truck. A cylinder (a hydraulic cylinder) having an extendable piston rod is provided in the lower portion of the vehicle body for moving the straddle arms forward and rearward or in the longitudinal direction of the reach truck for a distance within a specified stroke length. This type of reach truck further includes a rear frame assembly that is joined to the rear end of the straddle arm assembly and accommodates therein a drive unit. The rear end of the straddle arm assembly and the front end of the rear frame assembly are joined together by welding, thus forming a module component.

[0003] Various designs of a reach truck, such as the length and the shape of, and the spaced distance between the straddle arms, are varied depending on the application of each reach truck. Therefore, there has been a number of reach trucks of different designs for the straddle arms. However, a common drive unit is often used and accommodated in the rear frame assembly of many different models of reach truck. Accordingly, the rear frame assemblies need not necessarily be manufactured for each different model of the reach truck. However, in the case that the straddle arm assembly and the rear frame assembly are provided as individual module components, a modification in the design of the straddle arm assembly may inevitably cause a modification in the design of the rear frame assembly. In such a case, a different rear frame assembly needs to be manufactured for a reach truck having the modified straddle arm assembly, which causes a lot of troubles to the manufacturing of the reach trucks.

[0004] The present invention, which has been made in view of the above problems, is directed to providing a reach truck that is easy to manufacture.

SUMMARY OF THE INVENTION

[0005] In accordance with an aspect of the present invention that solves the above problems, there is provided a reach truck including a vehicle body, a mast assembly that is disposed in a front part of the vehicle body and has a loading implement, a straddle arm assembly having a pair of right and left straddle arms that guides the mast assembly to move in a longitudinal direction of the straddle arm assembly, and a rear frame assembly that is joined to a rear end of the straddle arm assembly and accommodates therein a drive unit. The rear frame assembly includes a joint member through which the rear

frame assembly and the straddle arm assembly are joined to each other by a fastening member.

[0006] Other aspects and advantages of the invention will become apparent from the following description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

FIG. 1 is a side view of a reach truck according to one embodiment of the present invention;

FIG. 2 is an exploded perspective view of a straddle arm assembly, a rear frame assembly, and an upper frame assembly of the reach truck of FIG. 1;

FIG. 3A is a perspective view of a part of the reach truck of FIG. 1 as viewed from an angle;

FIG. 3B is a perspective view of the part of the reach truck of FIG. 1 as viewed from another angle;

FIG. 4 is a schematic side view showing a part of the reach truck; and

FIG. 5 is a perspective view showing a part of a reach truck according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0008] The following will describe an embodiment of a reach truck according to the present invention with reference to FIGS. 1 to 4. In the following description, the terms such as front, rear, right, left, upper, lower and the like are used to refer to the positions or directions as viewed from an operator of the reach truck facing in the forward traveling direction of the reach truck.

[0009] Referring now to FIG. 1, there is shown a reach truck 10 having a vehicle body 11. The reach truck 10 includes a loading equipment 12 located in the front of the vehicle body 11. The loading equipment 12 includes a mast assembly 13 that is disposed vertically in the front part of the vehicle body 11, and a pair of right and left forks 13F mounted to the mast assembly 13 through a lift bracket 13A. The forks 13F correspond to the loading implement of the present invention. The forks 13F are movable in the vertical direction relative to the mast assembly 13 via the lift bracket 13A.

[0010] The vehicle body 11 of the reach truck 10 includes a base frame assembly 14 that forms a base of the vehicle body 11 and an upper frame assembly 15 that is disposed on the base frame assembly 14 and forms a body portion of the vehicle body 11. The base frame assembly 14 includes a straddle arm assembly 21 having a pair of right and left straddle arms 20 that guides

the mast assembly 13 to move forward or rearward or in the longitudinal direction of the straddle arm assembly 21. The base frame assembly 14 further includes a rear frame assembly 31 that is joined to the rear end of the straddle arm assembly 21 on the side opposite to the straddle arms 20. The straddle arms 20 have a square columnar shape extending forward.

[0011] A pair of reach cylinders 16 (hydraulic cylinders) is disposed in the lower part of the vehicle body 11. Each reach cylinder 16 has a piston rod 16A joined to the mast assembly 13. The mast assembly 13 is movable forward and rearward along the straddle arms 20 for a distance within a specified stroke length during the extending and retracting motion of the piston rods 16A of the reach cylinders 16.

[0012] Each straddle arm 20 has in a lower part of the leading end thereof a driven wheel 17. The vehicle body 11 has in the lower rear part thereof a steerable drive wheel 18A and a caster wheel 18B. The steerable drive wheel 18A is disposed at a position offset leftward from the width center of the vehicle body 11 as seen in the forward moving direction of the reach truck 10 and the caster wheel 18B is spaced rightward at a predetermined distance away from the steerable drive wheel 18A in such a manner that the steerable drive wheel 18A and the caster wheel 18B are provided in a pair in the lateral direction of the vehicle body 11.

[0013] An operator's compartment 19 or a cabin of a stand-up type is provided in the right rear part of the vehicle body 11. An instrumental panel 19A is disposed in the front part of the operator's compartment 19 of the vehicle body 11. The instrumental panel 19A has an operation control lever 19B for controlling the load-handling operation and the like. An upright accommodating box 19C is provided on the left side of the operator's compartment 19 and a steering wheel 19D is provided at the top of the accommodating box 19C.

[0014] As shown in FIG. 2, the upper frame assembly 15 includes a pair of right and left side members 15A that forms the right and left side portions of the vehicle body 11 and a laterally-extending vertical connecting member 15B through which the side members 15A are connected to each other. The connecting member 15B is connected to the side members 15A approximately at the respective longitudinal centers thereof. A horizontal partition member 15C is provided on the front side of the connecting member 15B, extending frontward from a position of the connecting member 15B that is above the center of the connecting member 15B as measured in the vertical direction thereof. The partition member 15C is joined at opposite lateral sides thereof to the side members 15A. The upper frame assembly 15 and the partition member 15C cooperate to form a space for accommodating therein a battery (not shown) below the partition member 15C. A pair of L-shaped pillars 15D is provided at the opposite front corners of the partition member 15C, extending upward from the upper surface thereof and an overhead guard 15E is mounted to the top of the pillars 15D.

[0015] A bracket 15F having an L-shaped cross section is fixed to the inner surface of the respective side members 15A at bottom positions thereof that are frontward of the connecting member 15B. Each bracket 15F includes a first bracket portion 151F extending upward along the inner surface of the side members 15A and a second bracket portion 152F extending inward of the side members 15A at a right angle relative to the first bracket portion 151 F. The first and second bracket portions 151 F, 152F are strip-like members extending in the longitudinal direction of the vehicle body 11. Each bracket 15F is fixed at the first bracket portion 151F thereof to the inner surface of its corresponding side member 15A by welding. The second bracket portion 152F of each bracket 15F has therethrough two bolt holes 15H that are spaced at a distance in the longitudinal direction.

[0016] Each straddle arm 20 includes a guide rail 20A having a C-shaped cross section and extending on the inner side of the straddle arm 20 in the longitudinal direction of the vehicle body 11 so that the mast assembly 13 is guided to move forward and rearward. Each straddle arm 20 has in the upper member thereof two internally-threaded holes 20H spaced in the longitudinal direction at the same distance between two bolt holes 15H in the second bracket portion 152F of the bracket 15F.

[0017] The straddle arm assembly 21 includes a laterally-extending first connecting member 21A through which the straddle arms 20 are connected to each other. The first connecting member 21A is connected at the opposite lateral sides thereof to the bottom surfaces of the straddle arms 20 at portions thereof adjacent to the rear ends of the straddle arms 20 to thereby connect the straddle arms 20 to each other.

[0018] Two internally-threaded holes 21 H are formed through the first connecting member 21A at positions adjacent to the lateral side edges thereof and inward of the straddle arms 20.

[0019] As shown in FIGS. 3A and 3B, the straddle arm assembly 21 further includes a vertical member 22 that continues from the rear end of the first connecting member 21A and extends upward. The vertical member 22 extends laterally between the straddle arms 20.

[0020] The straddle arm assembly 21 further includes a second connecting member 21 B that is disposed so as to face the first connecting member 21A from above and through which the pair of straddle arms 20 are connected to each other. The first connecting member 21A and the second connecting member 21 B correspond to the connecting member of the present invention. The second connecting member 21 B is connected at the opposite lateral sides thereof to the upper parts of the straddle arms 20 to thereby connect the pair of straddle arms 20 to each other.

[0021] As shown in FIG. 2, the rear frame assembly 31 has a rough rectangular shape in a plan view. The rear frame assembly 31 includes a wide frame member 32 forming a rear part of the rear frame assembly 31 and having a width corresponding to the distance between

the outer surfaces of the pair of straddle arms 20, and a narrow frame member 33 continuing from the wide frame member 32 and having a width that is smaller than the width of the wide frame member 32. As shown in FIG. 2, the wide frame member 32 has at the rear thereof curved corners. The narrow frame member 33 that forms a front part of the rear frame assembly 31 is located adjacent to the straddle arm assembly 21. The narrow frame member 33 includes a vertical member 33A that extends vertically and laterally and disposed so as to face the vertical member 22 of the straddle arm assembly 21.

[0022] The vertical member 33A of the narrow frame member 33 has on the front surface 33B thereof facing the straddle arm assembly 21 a pair of first joint members 31A extending toward the straddle arm assembly 21. Each first joint member 31A includes a horizontal arm member 311A that extends perpendicularly from the front surface 33B of the vertical member 33A. Each horizontal arm member 311A is connected to the front surface 33B of the vertical member 33A in such a manner that the plane thereof extends in the lateral direction of the vehicle body 11. Furthermore, each first joint member 31A includes a rib 312A that is connected to the front surface 33B of the vertical member 33A and an upper surface of the horizontal arm member 311A. The first joint members 31A or the horizontal arm members 311A are reinforced by providing the ribs 312A. Each horizontal arm member 311A has a bolt hole 31 H at a position adjacent to the tip end thereof.

[0023] Two bolt holes 33H are formed through the vertical member 33A at positions inward of each first joint member 31A. The two holes 33H are spaced at a specified distance in the direction intersecting the lateral direction of the vehicle body 11.

[0024] The wide frame member 32 of the rear frame assembly 31 has an extended upstanding member 32A that is formed along one of the rear curved corners and extending upward beyond the upper edge of the wide frame member 32. The extended upstanding member 32A has a thickness that is smaller than the thickness of the side and rear walls of the rear frame assembly 31. The extended upstanding member 32A is formed such that the outer surface thereof is located inward of the outer surface of the wide frame member 32 and that the inner surface of the extended upstanding member 32A is in flush with the inner surface of the wide frame member 32.

[0025] The rear frame assembly 31 has therein the aforementioned steerable drive wheel 18A, the caster wheel 18B, and a drive unit 35 (schematically illustrated by a two-dot chain line in FIG. 2) including an electric motor and a brake device that drives and brakes the steerable drive wheel 18A.

[0026] As shown in FIGS. 3A and 3B, the vertical member 22 of the straddle arm assembly 21 are cut out to form insertion holes 21 D through which the first joint members 31A may be inserted. Each first joint member 31A is passed through its corresponding insertion hole

21 D and placed on the upper surface of the first connecting member 21A. In the state in which the first joint members 31A passed through the insertion holes 21 D and the front surface 33B of the vertical member 33A of the rear frame assembly 31 abuts the vertical member 22 of the straddle arm assembly 21, the bolt holes 31 H of the horizontal arm members 311A and the internally-threaded holes 21 H of the first connecting member 21A are aligned with each other. Then, the first joint members 31A and the first connecting member 21A are set in contact with and joined to each other by bolts 41 inserted and tightened in the bolt holes 31 H and the internally-threaded holes 21 H. The bolts 41 correspond to the fastening member of the present invention. The first joint members 31A that are joined to the straddle arm assembly 21 by the bolts 41 correspond to the joint member of the present invention.

[0027] The vertical member 33A of the rear frame assembly 31 and the vertical member 22 of the straddle arm assembly 21 are set in contact with and joined to each other at the holes 33H by the bolts 42. The bolts 42 correspond to the fastening member of the present invention. The vertical member 33A that is set in contact with and joined to the vertical member 22 by the bolts 42 in the longitudinal direction serves as the second joint member of the present invention that is connected to the straddle arm assembly 21.

[0028] The pair of side members 15A of the upper frame assembly 15 is placed on the upper surfaces of the respective straddle arms 20 and also on the upper edge of the wide frame member 32 of the rear frame assembly 31. Thus the upper frame assembly 15 is placed on the base frame assembly 14. In this state, the bolt holes 15H of each bracket 15F are aligned with the holes 20H of the corresponding straddle arm 20. The upper frame assembly 15 is joined by the bolts 43 to the straddle arm assembly 21 at the bolt holes 15H and the holes 20H that are aligned with each other. The upper frame assembly 15 and the straddle arm assembly 21 are joined together in the vertical direction by the bolts 43.

[0029] As illustrated in FIG. 4, with the side members 15A mounted in place on the upper surfaces of the straddle arms 20 and the upper edge of the wide frame member 32 of the rear frame assembly 31, the extended upstanding member 32A is located inward of the side members 15A. Two threaded holes 15J are formed through each of the side members 15A of the upper frame assembly 15 which overlaps with the extended upstanding member 32A. The upper frame assembly 15 is joined to the rear frame assembly 31 by two bolts 44 screwed in the holes 15J. The bolts 44 correspond to the fastening member of the present invention. The upper frame assembly 15 is joined to the rear frame assembly 31 by the bolts 44 on the lateral sides thereof.

[0030] The following will describe the function of the present embodiment.

[0031] In a reach truck such as 10 of the present embodiment of the present invention, various designs, such

as the distance between the straddle arms 20, the length of the straddle arms 20, and the shape of the straddle arms 20, are modified appropriately depending on the application of the reach truck. As a result, there has been a number of reach trucks of different specifications for straddle arm assemblies. However, the drive unit such as 35 accommodated in the rear frame assembly 31 is often common for various reach trucks. Therefore, the design of the rear frame assembly for accommodating therein the drive unit need not be modified for each different reach truck.

[0032] According to the present embodiment, the rear frame assembly 31 has the first joint members 31A and the vertical member 33A that serve as the joint member and are joined to the straddle arm assembly 21 by the bolts 41 and 42. With this configuration, the straddle arm assembly 21 having different dimensional specifications may be compatibly joined to the rear frame assembly 31 by joining the first joint members 31A of the rear frame assembly 31 and the vertical member 33A to the straddle arm assembly 21 by the bolts 41 and 42.

[0033] By fastening the first joint members 31A of the rear frame assembly 31 and the first connecting member 21A of the straddle arm assembly 21 by means of the bolts 41, the straddle arm assembly 21 and the rear frame assembly 31 are positioned properly relative to each other in the vertical direction. Therefore, for example, relative displacement in the vertical direction between the straddle arm assembly 21 and the rear frame assembly 31 which may occur while the reach truck 10 is traveling may be prevented. Furthermore, in the reach truck 10 in which the first joint members 31A and the first connecting member 21A are set in contact with and joined to each other by the bolts 41 in the vertical direction, the force acting in the vertical direction due to the vertical vibration of the reach truck 10 is received by the contact portions between the first joint members 31 A and the first connecting member 21 A.

[0034] The straddle arm assembly 21 and the rear frame assembly 31 are positioned relative to each other in the longitudinal direction of the vehicle body 11 with the vertical member 33A and the vertical member 22 set in contact with and joined to each other by the bolts 42 in the longitudinal direction. Therefore, for example, relative displacement in the longitudinal direction between the straddle arm assembly 21 and the rear frame assembly 31 which may occur while the reach truck 10 is traveling may be prevented. Furthermore, the vertical member 33A of the rear frame assembly 31 and the vertical member 22 of the straddle arm assembly 21 are set in contact with and joined to each other by the bolts 42 in the longitudinal direction. Therefore, the force acting in the longitudinal direction due to the longitudinal vibration of the reach truck 10 is received by the contact portion between the vertical member 33A and the vertical member 22.

[0035] Since the straddle arms 20 are connected to each other through the first and second connecting mem-

bers 21A and 21 B, displacement or detachment of the pair of straddle arms 20 in the direction separating from each other is prevented.

[0036] According to the above embodiment, the following effects are obtained.

(1) In the reach truck 10 of the present embodiment in which the rear frame assembly 31 has the first joint members 31A and the vertical member 33A that are joined to the straddle arm assembly 21 by the bolts 41 and 42, respectively, the rear frame assembly 31 may be joined to the straddle arm assembly 21 of various sizes and types merely by joining the first joint members 31A of the rear frame assembly 31 and the vertical member 33A to the straddle arm assembly 21 by the bolts 41 and 42. Therefore, there is no need of manufacturing a rear frame assembly for each of different models of the reach trucks, and a rear frame assembly may be used commonly among different models, with the result that manufacturing of the reach truck may be facilitated.

(2) In the reach truck 10 of the present embodiment in which the first joint members 31A of the rear frame assembly 31 is set in contact with and joined to the first connecting member 21A by the bolts 41 in the vertical direction, the straddle arm assembly 21 and the rear frame assembly 31 are positioned correctly relative to each other in the vertical direction. Therefore, for example, relative displacement in the vertical direction between the straddle arm assembly 21 and the rear frame assembly 31 which may occur while the reach truck 10 is traveling may be prevented. Furthermore, in the reach truck 10 in which the first joint members 31A and the first connecting member 21A are set in contact with and joined to each other by the bolts 41 in the vertical direction, the force acting in the vertical direction due to vertical vibration of the reach truck 10 is received by the contact portions between the first joint members 31 A and the first connecting member 21 A.

(3) The rear frame assembly 31 in which the vertical member 33A of the rear frame assembly 31 is set in contact with and joined to the vertical member 22 by the bolts 42 in the longitudinal direction, the straddle arm assembly 21 and the rear frame assembly 31 are positioned correctly relative to each other in the longitudinal direction by the vertical member 33A and the vertical member 22 that are joined together by the bolts 42 in the longitudinal direction. Therefore, for example, relative displacement in the longitudinal direction between the straddle arm assembly 21 and the rear frame assembly 31 which may occur while the reach truck 10 is traveling may be prevented. Furthermore, the vertical member 33A of the rear frame assembly 31 and the vertical member 22 of the straddle arm assembly 21 are set in contact with

and joined to each other in the longitudinal direction by the fastening members. Therefore, the force acting in the longitudinal direction due to the longitudinal vibration of the reach truck 10 is received by the contact portion between the vertical member 33A and the vertical member 22.

(4) The upper frame assembly 15 is joined to the straddle arm assembly 21 and the rear frame assembly 31 by the bolts 43 and 44. A structure is considered in which the upper frame assembly 15 is joined by welding to at least one of the straddle arm assembly 21 and the rear frame assembly 31 so as to form a module component for a reach truck. In such a case, if a change is made to the design of the straddle arm assembly 21 or the rear frame assembly 31 for adaptation to a different model, the change may inevitably require a change in the design of the upper frame assembly 15. The configuration of the present embodiment in which the upper frame assembly 15 is joined to the straddle arm assembly 21 and the rear frame assembly 31 by the bolts 43 and 44 eliminates the need for manufacturing an upper frame assembly 15 for each different model of the reach truck 10, and the upper frame assembly 15 can be used commonly among different models, which helps to facilitate the manufacturing of the reach truck 10.

(5) In the present embodiment in which the first connecting member 21A and the second connecting member 21 B of the straddle arm assembly 21 connect the pair of straddle arms 20 to each other, the first and second connecting members 21A and 21 B provide reinforcement and prevent the pair of straddle arms 20 from being displaced or detached away from each other. Therefore, it is easy to maintain the distance between the straddle arms 20.

(6) In the case that the straddle arm assembly 21 and the rear frame assembly 31 are joined to each other, for example, by welding, the drive unit 35 needs to be mounted in the rear frame assembly 31 only after the welding is completed, which restricts the assembling procedure of the reach truck 10. However, the present embodiment in which the rear frame assembly 31 accommodating therein the drive unit 35 is joined to the straddle arm assembly 21 does not suffer from such restriction.

(7) In the case that the straddle arm assembly 21 and the rear frame assembly 31 are joined to each other, for example, by welding to thereby form a module component, painting of such modularized component requires a large painting facility. However, according to the present embodiment, the straddle arm assembly 21 and the rear frame assembly 31 may be joined together after being painted individu-

ally and separately. Therefore, no such large coating facility is required and an increase in the cost and investment for the facility as a whole is prevented.

5 **[0037]** The above embodiment may be modified variously as followings:

As shown in FIG. 5, it may be so configured that the first joint members 31 A and the second connecting member 21 B are set in contact with and joined to each other by the bolts 41 in the vertical direction. In this case, the paired first joint members 31A extend frontward from the upper lateral opposite corners of the front surface 33B of the vertical member 33A facing the straddle arm assembly 21. Furthermore, the upper lateral corners of the vertical member 22 of the straddle arm assembly 21 are cut out to form the insertion holes 21 D for allowing the first joint members 31 A to pass therethrough.

20 **[0038]** In the above embodiment, the straddle arm assembly 21 and the rear frame assembly 31 may be joined to each other by joining the first joint members 31 A and the first connecting member 21 A together by the bolts 41. The vertical member 33A of the rear frame assembly 31 and the vertical member 22 of the straddle arm assembly 21 need not be joined together by the bolts 42. In other words, joining between the straddle arm assembly 21 and the rear frame assembly 31 may be performed in the vertical direction only.

30 **[0039]** Alternatively, in the above embodiment, the straddle arm assembly 21 and the rear frame assembly 31 may be joined by joining the vertical member 33A and the vertical member 22 by the bolts 42, and the first joint members 31A and the first connecting member 21 A need not be joined by the bolts 41. Specifically, joining between the straddle arm assembly 21 and the rear frame assembly 31 may be performed in the longitudinal direction only.

35 **[0040]** In the above embodiment, the first joint members 31A of the rear frame assembly 31 and the first connecting member 21A of the straddle arm assembly 21 are joined to each other by the bolts 41 in the vertical direction. However, the first joint members 31A may be joined at any portions of the straddle arm assembly 21.

40 **[0041]** In the above embodiment, the vertical member 33A and the vertical member 22 of the straddle arm assembly 21 are joined to each other in the longitudinal direction by the bolts 42. However, the vertical member 33A may be joined at any other portions in the straddle arm assembly 21.

50 **[0042]** In the above embodiment, the second connecting member 21 B may not be used.

[0043] In the above embodiment, the number of the first joint members 31A is not particularly limited.

55 **[0044]** In the above embodiment, the number of the bolts 41, 42, 43, and 44 is not particularly limited.

[0045] In the above embodiment, the fastening members are not particularly limited to the bolts such as 41,

42, 43, and 44. For example, press-fit pins may be used as the fastening members.

[0046] In the above embodiment, the upper frame assembly 15 may be joined to the rear frame assembly 31 by welding so as to form a module component.

[0047] In the above embodiment, power cylinders using an electric motor may be used as the reach cylinders 16 as long as such power cylinders are able to move the mast assembly 13 in the longitudinal direction along the pair of straddle arms 20.

[0048] In the above embodiment, the reach truck 10 may be driven to travel by an engine or a hybrid engine that uses an engine and a traction motor.

[0049] In the above embodiment, the reach truck 10 may be an order picker reach truck having a platform that is movable up and down with the loading equipment 12 while carrying an operator and a load or an unmanned reach truck that does not require an operator to be present thereon.

Claims

1. A reach truck (10) comprising:

a vehicle body (11);
a mast assembly (13) that is disposed in a front part of the vehicle body (11) and has a loading implement (12);
a straddle arm assembly (21) having a pair of right and left straddle arms (20) that guides the mast assembly (13) to move in a longitudinal direction of the straddle arm assembly (21); and
a rear frame assembly (31) that is joined to a rear end of the straddle arm assembly (21) and accommodates therein a drive unit (35), **characterized in that**

the rear frame assembly (31) includes a joint member (31A, 33A) through which the rear frame assembly (31) and the straddle arm assembly (21) are joined to each other by a fastening member (41, 42, 43, 44).

2. The reach truck (10) according to claim 1, **characterized in that**

the joint member (31 A, 33A) includes a first joint member (31 A), and
the straddle arm assembly (21) and the rear frame assembly (31) are set in contact with and joined to each other by the fastening member (41, 42, 43, 44) in a vertical direction.

3. The reach truck according to claim 1 or 2, **characterized in that**

the joint member (31 A, 33A) includes a second joint member (33A), and
the straddle arm assembly (21) and the rear frame

assembly (31) are set in contact with and joined to each other by the fastening member (41, 42, 43, 44) in the longitudinal direction.

4. The reach truck (10) according to any one of claims 1 to 3, **characterized in that**

the reach truck (10) further includes an upper frame assembly (15) that forms a body portion of the vehicle body (11), and
the upper frame assembly (15) is joined to at least one of the straddle arm assembly (21) and the rear frame assembly (31) by the fastening member (41, 42, 43, 44).

5. The reach truck (10) according to any one of claims 1 to 4, **characterized in that**

the straddle arm assembly (21) includes a connecting member (21A, 21 B) through which the straddle arms (20) are connected to each other.

FIG. 1

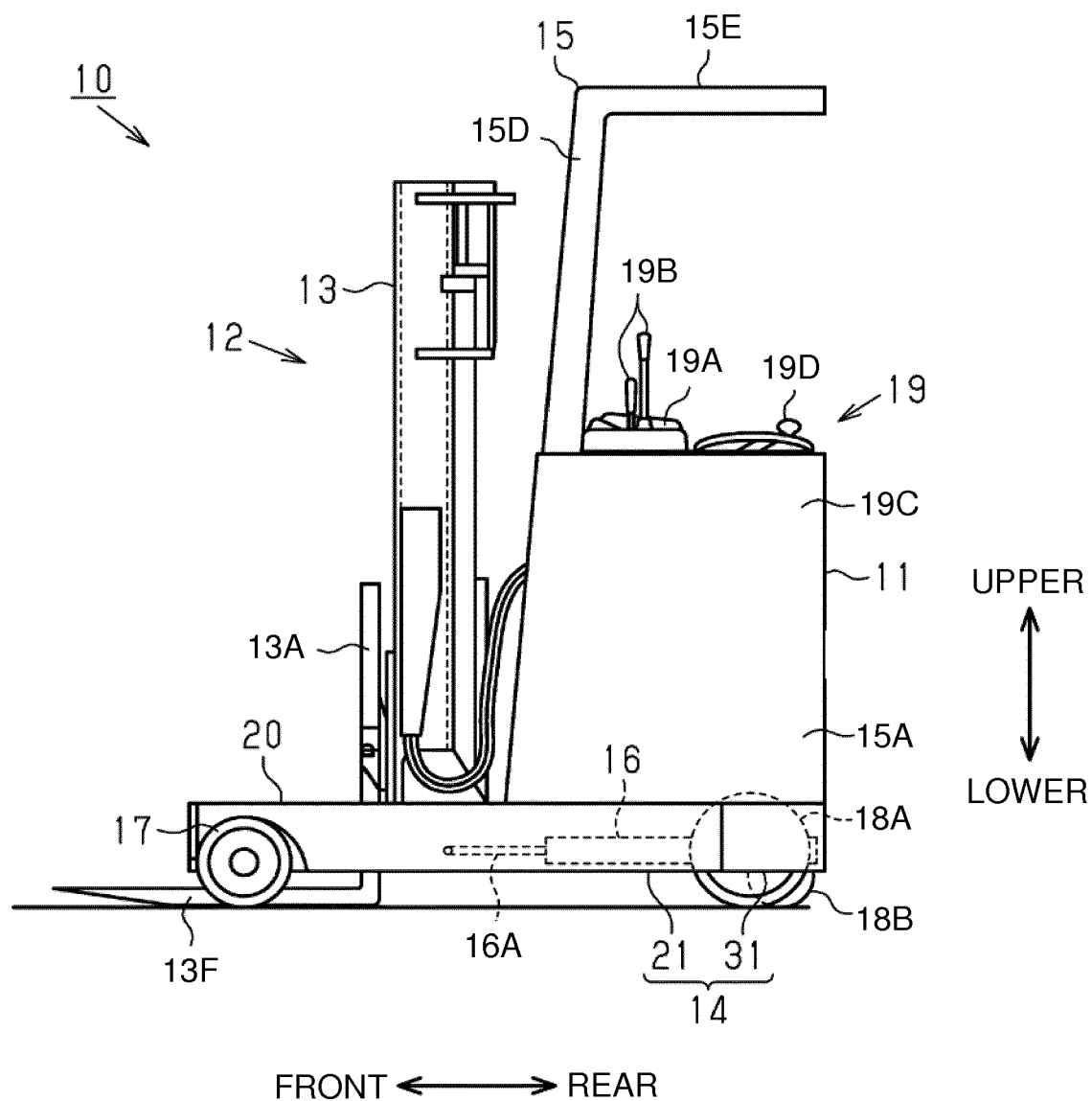


FIG. 2

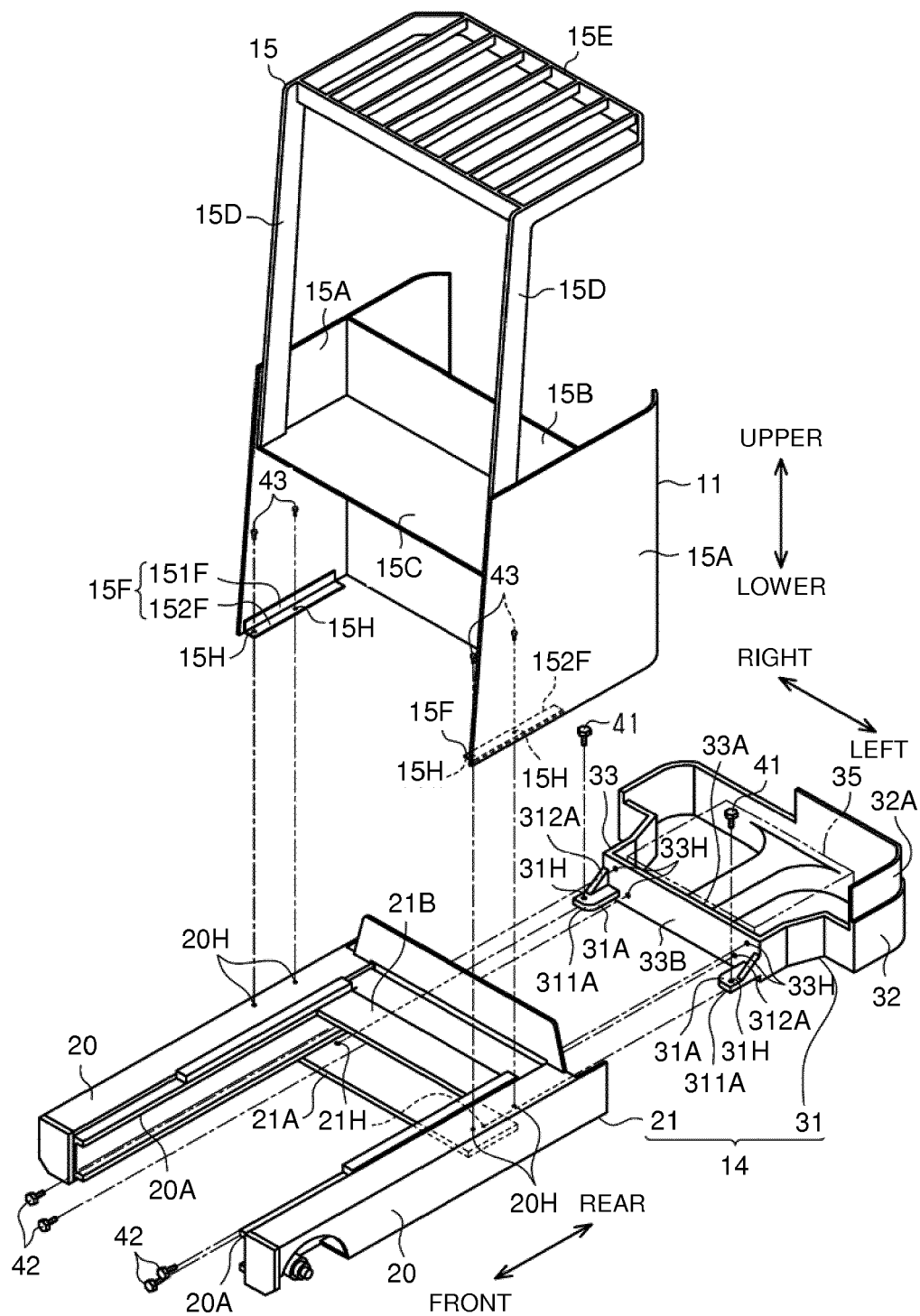


FIG. 3A

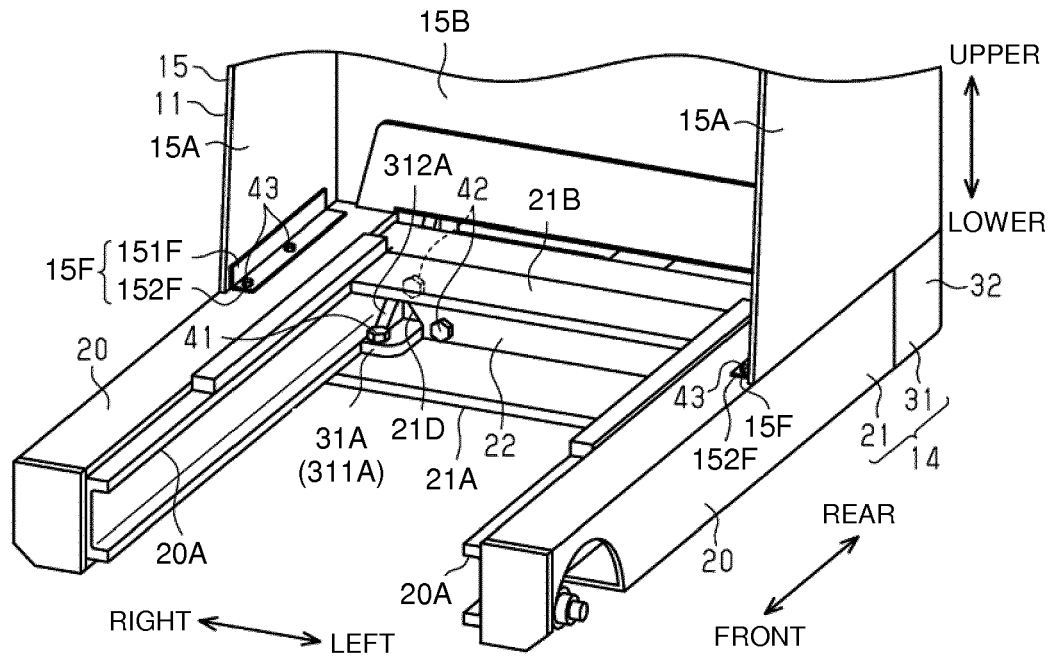


FIG. 3B

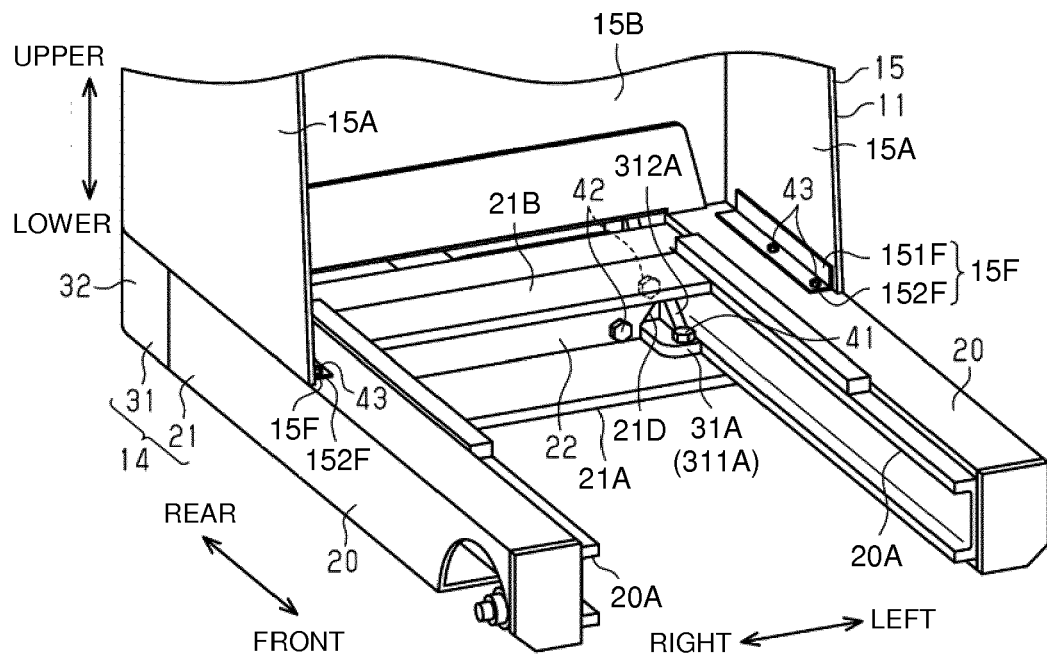


FIG. 4

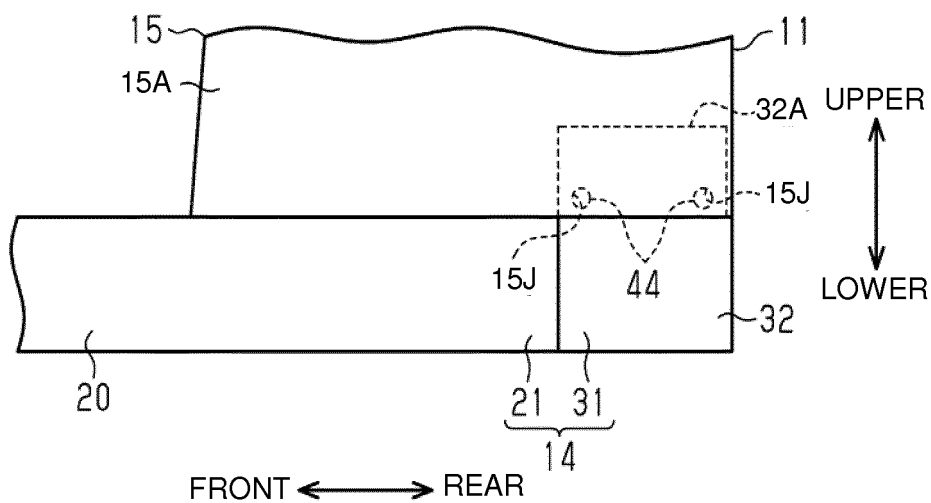
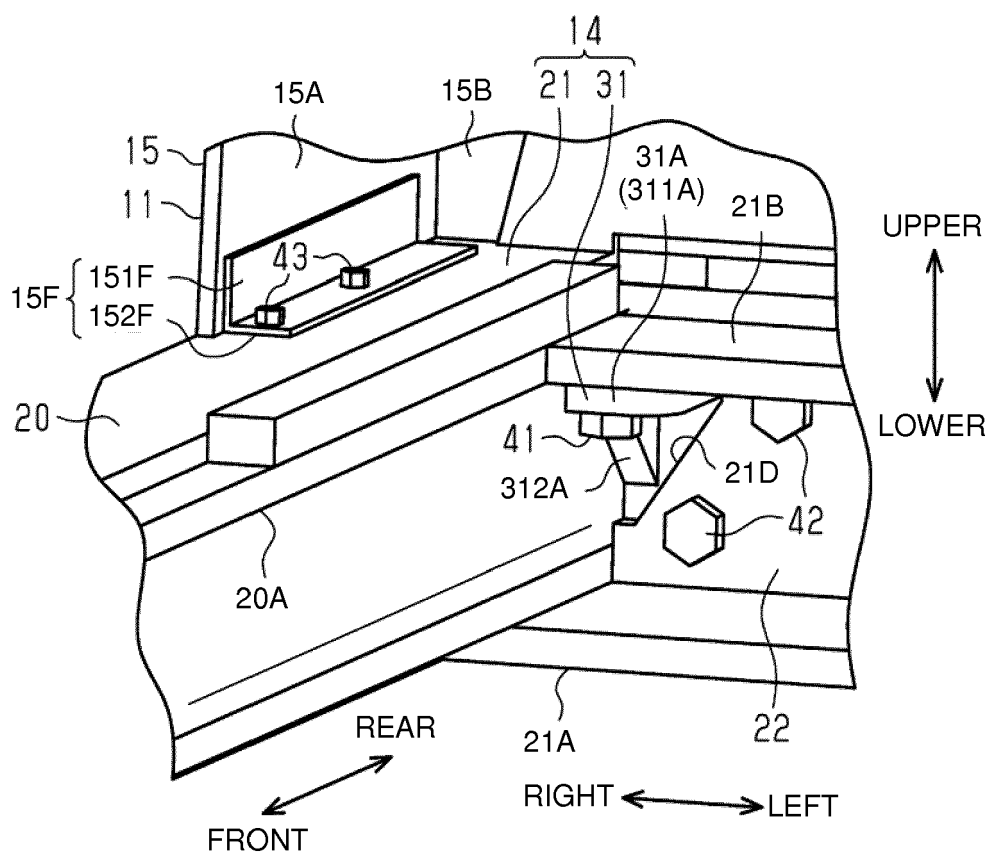


FIG. 5





EUROPEAN SEARCH REPORT

 Application Number
 EP 16 20 0298

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	JP 2008 221981 A (TOYOTA IND CORP) 25 September 2008 (2008-09-25)	1,3	INV. B66F9/075
Y	* abstract; figures * -----	2,4,5	B66F9/10
Y	GB 2 110 620 A (CLARK EQUIPMENT CO) 22 June 1983 (1983-06-22)	2,5	
A	* page 1, lines 68-83; figures * -----	1	
Y	JP 2004 338856 A (NIPPON YUSOKI CO LTD) 2 December 2004 (2004-12-02)	4	
	* abstract; figures * -----		
A	EP 1 905 726 A1 (BT IND AB [SE]) 2 April 2008 (2008-04-02)	1	
	* paragraph [0017]; figures * -----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B66F
Place of search		Date of completion of the search	Examiner
The Hague		28 April 2017	Özsoy, Sevda
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 20 0298

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

28-04-2017

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2008221981 A	25-09-2008	JP 4899953 B2	21-03-2012
		JP 2008221981 A	25-09-2008

GB 2110620 A	22-06-1983	DE 3242568 A1	16-06-1983
		FR 2517612 A1	10-06-1983
		GB 2110620 A	22-06-1983

JP 2004338856 A	02-12-2004	NONE	

EP 1905726 A1	02-04-2008	NONE	

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2008221981 A [0002]