

Feb. 16, 1960

C. R. HUGHSON
COUNTERWEIGHTED VEHICLE

2,925,149

Filed June 17, 1957

2 Sheets-Sheet 1

FIG. 1

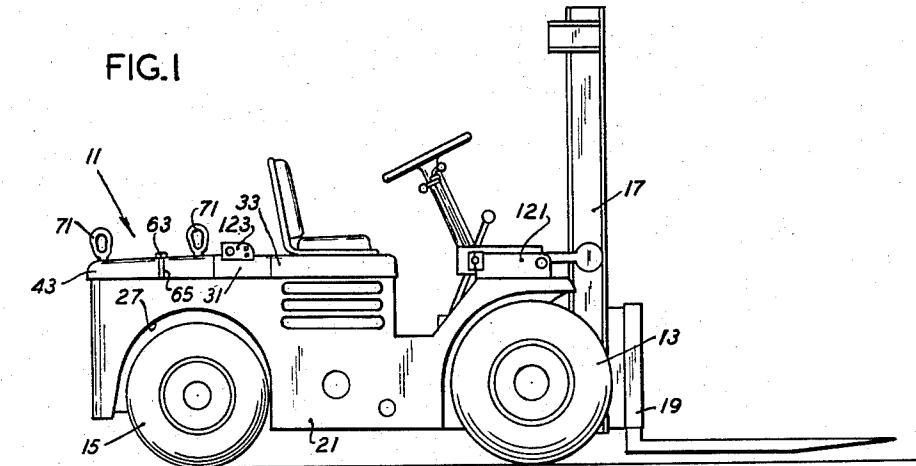
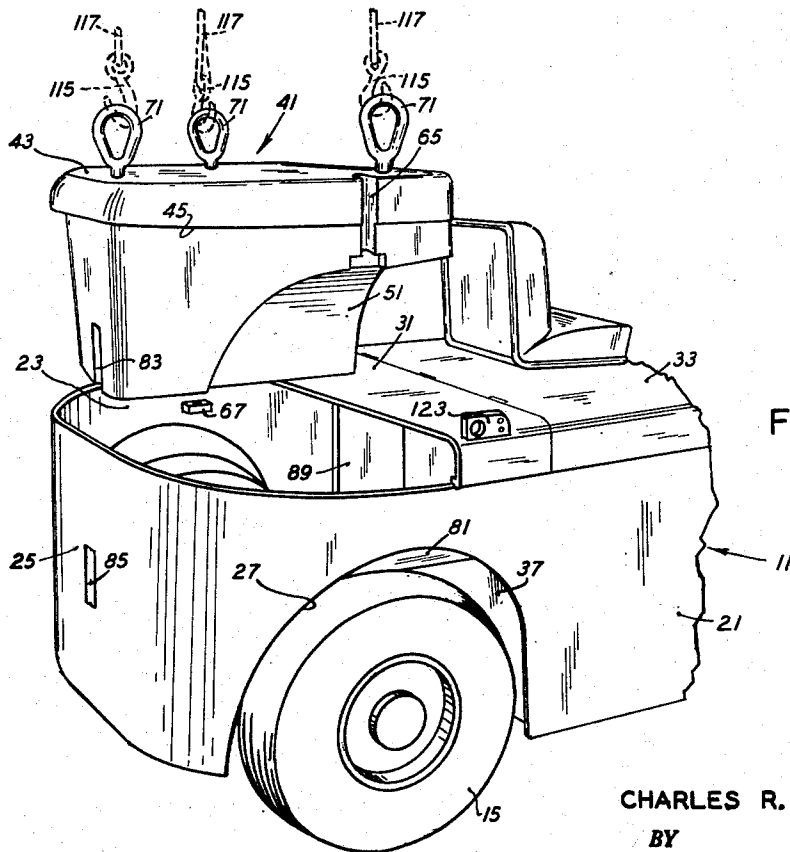


FIG. 2

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2 Sheets-Sheet 2

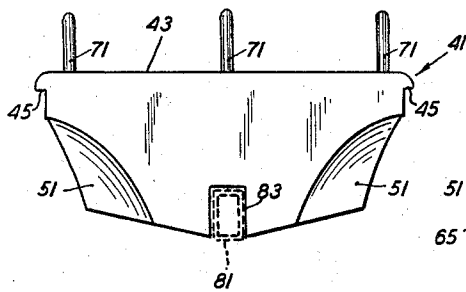


FIG. 4

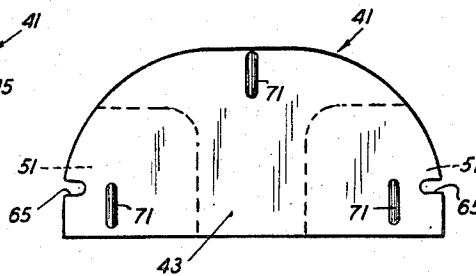


FIG. 5

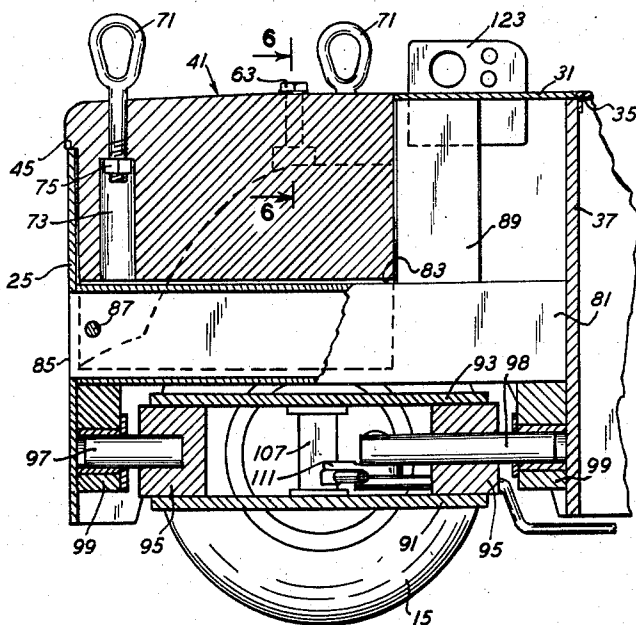


FIG. 3

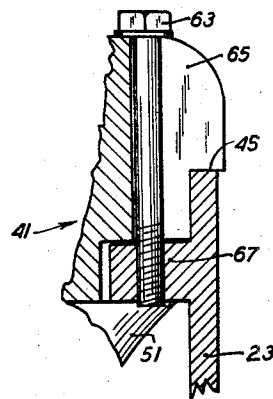


FIG. 6

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2,925,149

COUNTERWEIGHTED VEHICLE

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Application June 17, 1957, Serial No. 666,047

7 Claims. (Cl. 187—9)

This invention relates to vehicles, such as industrial lift trucks, which require counterweighting in order to prevent tipping of the vehicle when the vehicle is being operated.

There has been an increasing demand for a lift truck in which the counterweight or counterweights may be quickly and easily removed. One reason for this is that when transporting industrial lift trucks, particularly the heavier models, frequently the crane or other hoisting device does not have sufficient capacity to lift the entire truck safely. Thus it becomes necessary to remove a part of the truck, and this has proved a time consuming and thus expensive operation.

It has also been the practice in recent years to transport lift trucks by air, and sometimes to unload lift trucks from ships by means of a helicopter. In many instances, the lift trucks are too heavy to be carried conveniently in their entirety and thus partial disassembly of the truck is required. There are also various other reasons not necessary to mention for requiring the separation of the truck into two or more assemblies which may be readily transported singly.

Heretofore, counterweights in lift trucks and similar vehicles have not been, in general, readily removable, and in many instances have been permanently secured in place. In other instances, when removal has not been too difficult, it has been found that the truck may not be lightened sufficiently by removal of the counterweight, because the truck has also been counterweighted by making certain operating parts, such as wheel-support assemblies and braces of massive form. Thus further disassembly of the truck has been necessary.

It is a main object of the present invention to provide a lift truck having a counterweight which is more readily removable than counterweights of prior trucks.

Another object of the invention is to provide a lift truck in which the counterweighting material is concentrated in a single unitary piece which is readily removable.

A further object of the invention is to provide a lift truck in which the counterweight is mounted in place in a simple and inexpensive manner.

Another object of the invention is to provide a truck in which all the counterweighting material is concentrated in a single piece, and in which the truck, although being composed of relatively thin or slender parts, is so constructed that it may safely support the counterweight.

Another object of the invention is to provide an industrial truck in which the counterweight has a major portion thereof concealed and a minor portion exposed, and in which the exposed part blends into and forms a continuation of the adjacent surfaces of the body so that the counterweight is unnoticeable.

Still another object of the invention is to provide a counterweight equipped with fender well recesses for accommodating certain wheels of the truck.

Various other objects of the invention will be apparent

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from the following description taken in connection with the accompanying drawings wherein:

Fig. 1 is a side view in elevation of a lift truck embodying the concepts of the present invention, showing the counterweight in place;

Fig. 2 is a perspective view of the rear portion of the truck of Fig. 1 on a somewhat enlarged scale, showing the counterweight in the process of being removed;

Fig. 3 is a longitudinal mid-sectional view through the rear portion of the truck, except that certain parts are left partially or entirely in elevation;

Fig. 4 is a front elevational view of the counterweight, showing an associated part in dotted lines;

Fig. 5 is a top view of the counterweight; and

Fig. 6 is a vertical section on an enlarged scale, taken along line 6—6 of Fig. 3, showing certain details of construction.

Referring to Figs. 1 and 2, the particular truck shown includes a combined frame and body generally entitled 11 supported by driven front wheels 13 and steerable rear wheels 15. A mast 17, at the front of the truck, guides a load carriage 19 for vertical movement. A conventional lift unit, not shown, elevates the carriage and thus the load on the carriage forks. The load being lifted exerts a moment force tending to tilt the truck forwardly, and this tilting movement is counterbalanced by a counterweight to be presently described.

The body 11 of the particular truck disclosed is of unitary construction and includes vertical side walls 21 and 23, and a vertical rear wall 25 integrally joining the side walls as is most clearly apparent in Fig. 2. The side walls 21 have generally U-shaped cutouts 27 formed therein to accommodate the rear wheels 15, as is clearly shown in Fig. 2.

A hood or cover assembly covers the forward portion of the opening defined by the body walls 21, 23 and 25, and in the specific form shown the assembly includes a fixed cover plate 31 bolted in place, in a manner not shown, to the body walls. The assembly also includes a hinged cover plate 33 which is connected as shown in Fig. 3 by a hinge 35 to the edge of a cross wall 37 which divides the body recess into a front portion containing the engine, and a rear portion which contains the counterweight of the truck, and which may also contain a tank or tanks for holding fuel, hydraulic fluid and the like. Such tank or tanks are not disclosed in the drawings since they are of no importance to the present invention. The cross wall 37 is a permanent part of the unitary truck body.

The side and rear body walls 21, 23 and 25, together with the cover plate 31, define a vertical recess or pocket, open at the upper end thereof, as is apparent from Fig. 2. A counterweight 41 slidably fits within such recess and has an upper exposed top portion 43 which projects outwardly at the sides and rear portions of the counterweight to provide a lip or downwardly facing shoulder 45 which rests on the upper edges of the side and rear body walls. The shoulder thus provides the entire vertical support for the counterweight.

As is best shown in Figs. 1 and 3, the top portion 43 of the counterweight is formed so that the surfaces thereof merge in and form a continuation of the adjacent surfaces of the body, including the side and rear walls and the cover plate 31. Thus the counterweight, although partly exposed, is not unsightly.

The rear and side faces of the counterweight are formed complementally to the opposed inner faces of the side and rear body walls, except that such faces are tapered downwardly and inwardly to facilitate ready insertion of the counterweight into a pocket provided by the body. The front face of the counterweight provides a flat vertical wall, as is best shown in Figs. 3, 4 and 5, which

abuts against or is closely adjacent to the rear edge of the cover plate 31.

The counterweight is provided with an extensive concave recess 51 on each front lower corner thereof, and each recess registers with the associated cutout 27 in the side body wall of the truck and defines a well for the associated rear wheel.

Referring to Figs. 2, 3 and 6, the counterweight 41 is fastened to the body by a pair of holding bolts 63, each of which fits freely within a vertical slot 65, cut into the side of the counterweight, and threads into a lug 67 fastened to the inner face of the adjacent side body wall.

The counterweight is provided with three heavy removable eyebolts 71 which have shank portions extending through holes formed in the top face of the counterweight and extending into counter bores 73 formed upwardly in the bottom face of the counterweight. A nut 75 threads on the lower end of each bolt and holds it in place.

Referring to Fig. 3, a central longitudinally extending brace, in the form of a tubular piece 81, extends between and has its end portions permanently secured to the cross plate 37 and to the inner face of the rear body wall 25. The counterweight is provided with a deep channel 83 in the lower space thereof to accommodate the brace 81. The rear wall 25 has an opening 85 therein registering with the opening in the tubular piece 81, and a tow bar 87 is fixed in the rear end of the tubular piece to enable the truck to be towed when desired.

A brace plate 89 extends between and is secured to the upper surface of the brace 81 and the lower surface of the cover plate 31, as is best shown in Fig. 3.

The rear wheels 15 are mounted on a wheel support which includes a pair of laterally and longitudinally extending spaced plates 91 and 93 connected together at the front and rear portions thereof by trunnion blocks 95. The blocks carry trunnions 97 and 98 which extend longitudinally of the truck, are positioned centrally of the truck and are supported by spaced bearings 99. The rear bearing 99 is permanently mounted on the inner face of the rear wall 25 and is also connected to the rear end of the brace 81. The front bearing 99 is permanently mounted on the rear face of the cross wall 37 and is connected to the front end of the brace 81.

Each rear wheel 15 is mounted by means of a kingpin assembly 107 to the adjacent side portions of the wheel support plates 91 and 93 in a conventional manner, not necessary to describe. A steering assembly 111, of conventional construction, is fragmentarily shown in Fig. 3 and is connected to the rear wheels to enable them to be turned or steered. The steering assembly may be partly supported by the trunnion 98.

The counterweight 41 may be removed in a matter of seconds by removing the holding bolts 63 and fitting the hooks 115 of suitable lift chains 117 in the eyes of the eyebolts 71 and operating a hoisting unit connected to the chains. The counterweight may also be readily set back in place by merely lowering the same into the recess or pocket at the rear of the body. The tapering of the counterweight aids its ready entrance into the pocket.

The body is provided with two pairs of eyeplates 121 and 123, as best shown in Figs. 1 and 2, by which the truck body may be lifted independently of the counterweight 41. It is here pointed out that the bolts 63 and the lugs 65 are sufficiently strong to enable the entire truck to be lifted by means of the front eyeplates 123 and by the eyebolts 71, if this is attempted. Each plate 123 is secured to the body and extends upwardly through a slot in the cover plate 31, as is apparent from Fig. 3.

Having described the invention in what is considered to be the preferred embodiment thereof, it is desired that it be understood that the invention is not to be limited other than by the provisions of the following claims.

I claim:

1. An industrial lift truck having a wheel-supported body, load engaging means at the front of said truck tending to tip the truck when the truck is lifting a load, said body being formed with a vertical recess at the rear portion thereof open at the upper end thereof, and a counterweight slidably fitting within said recess in a vertical direction and closing said recess, said sliding fit serving to confine said counterweight against horizontal movement in either a lateral or a longitudinal direction, said counterweight having parts in vertical thrust engagement with said body for supporting said counterweight in a vertical direction, said counterweight having at least one concave depression formed therein providing a well for one of the wheels of said body.

2. An industrial lift truck having a body supported by a pair of rear wheels and one or more front wheels, load engaging means at the front of said truck tending to tip the truck when the truck is lifting a load, said body being formed with a vertical recess at the rear portion thereof open at the upper end thereof, and a counterweight slidably fitting within said recess in a vertical direction and closing said recess, said counterweight having parts in vertical thrust engagement with said body for supporting said counterweight in a vertical direction, said counterweight having a concave depression for each rear wheel and providing a well for such wheel.

3. An industrial lift truck having a wheel-supported body, load engaging means at the front of said truck tending to tip the truck when the truck is lifting a load, said body being formed with a vertical recess at the rear portion thereof open at the upper end thereof, and a counterweight slidably fitting within said recess in a vertical direction and closing said recess, said sliding fit serving to confine said counterweight against horizontal movement in either a lateral or a longitudinal direction, said counterweight having parts in vertical thrust engagement with said body for supporting said counterweight in a vertical direction, said counterweight being tapered on the lower portion thereof to facilitate ready insertion of said portion into said recess, said counterweight having at least one concave depression formed therein providing a well for one of the wheels of said body.

4. A vehicle having a wheel-supported body, means at one end of said vehicle for performing an operation which tends to tilt the other end of said vehicle upwardly, said body being formed with a vertical recess at said other end, said recess being open at the upper end thereof, said recess being defined at least in part by a vertically extending wall, and a counterweight slidably fitting within said recess in a vertical direction, said sliding fit serving to confine said counterweight against horizontal movement in either a lateral or a longitudinal direction, said counterweight having a portion thereof projecting upwardly out of said recess, said portion having laterally projecting parts to overlie the upper edge of said wall, said parts being in vertical thrust engagement with said edge for supporting said counterweight in a vertical direction, said portion having its exposed surface formed to simulate a continuation of the adjacent surfaces of said body so that said counterweight serves the dual purpose of counterweighting the vehicle and also providing a portion of the exterior surface of said body.

5. An industrial lift truck having a wheel-supported body, load engaging means at the front of said truck tending to tip the truck when the truck is lifting a load, said body being formed with a vertical recess at the rear portion thereof open at the upper end thereof, and a counterweight slidably fitting within said recess in a vertical direction and closing said recess, said counterweight having parts in vertical thrust engagement with said body for supporting said counterweight in a vertical direction, said body includes spaced vertical side walls and a vertical rear wall connecting said side walls, a cross-member connecting said side walls forwardly of

said recess, a longitudinal brace connecting said rear wall to said cross-member to reinforce said rear wall, said counterweight being formed with a notch within which said brace is accommodated.

6. An industrial lift truck having a wheel-supported body, load engaging means at the front of said truck tending to tip the truck when the truck is lifting a load, said body being formed with a vertical recess at the rear portion thereof open at the upper end thereof, a counterweight removably fitting within said recess in a vertical direction and closing said recess, and means engaging the sides of said counterweight serving to confine said counterweight against horizontal movement in either a lateral or a longitudinal direction, said counterweight having parts at the upper end thereof in vertical thrust engagement with portions of said body for suspending said counterweight from said body and within said recess, said counterweight having at least one concave depression formed therein providing a well for one of the wheels of said body.

7. An industrial lift truck having a body supported by a pair of rear wheels and one or more front wheels, load engaging means at the front of said truck tending to tip the truck when the truck is lifting a load, said body being formed with a vertical recess at the rear portion thereof

open at the upper end thereof, a counterweight removably fitting within said recess in a vertical direction and having a cross-sectional area and form at the location of the mouth of said recess to close the recess, said body presenting horizontal edge portions adjacent the upper end of said counterweight, said counterweight having laterally extending parts in vertical thrust engagement with such edges for suspending said counterweight within said recess from said body, said counterweight having an integral upper portion projecting upwardly beyond said recess, said upper portion being curved to simulate a continuation of the adjacent features of the body, said counterweight having a concave depression for each rear wheel and providing a well for such wheel, said body having portions in engagement with the sides of said counterweight to confine said counterweight against horizontal movement in either a lateral or a longitudinal direction.

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