Jan. 31, 1961 B. I. ULINSKI 2,969,991

FRAME CONSTRUCTION FOR AN INDUSTRIAL TRUCK

Filed Nov. 6, 1958

4 Sheets-Sheet 1

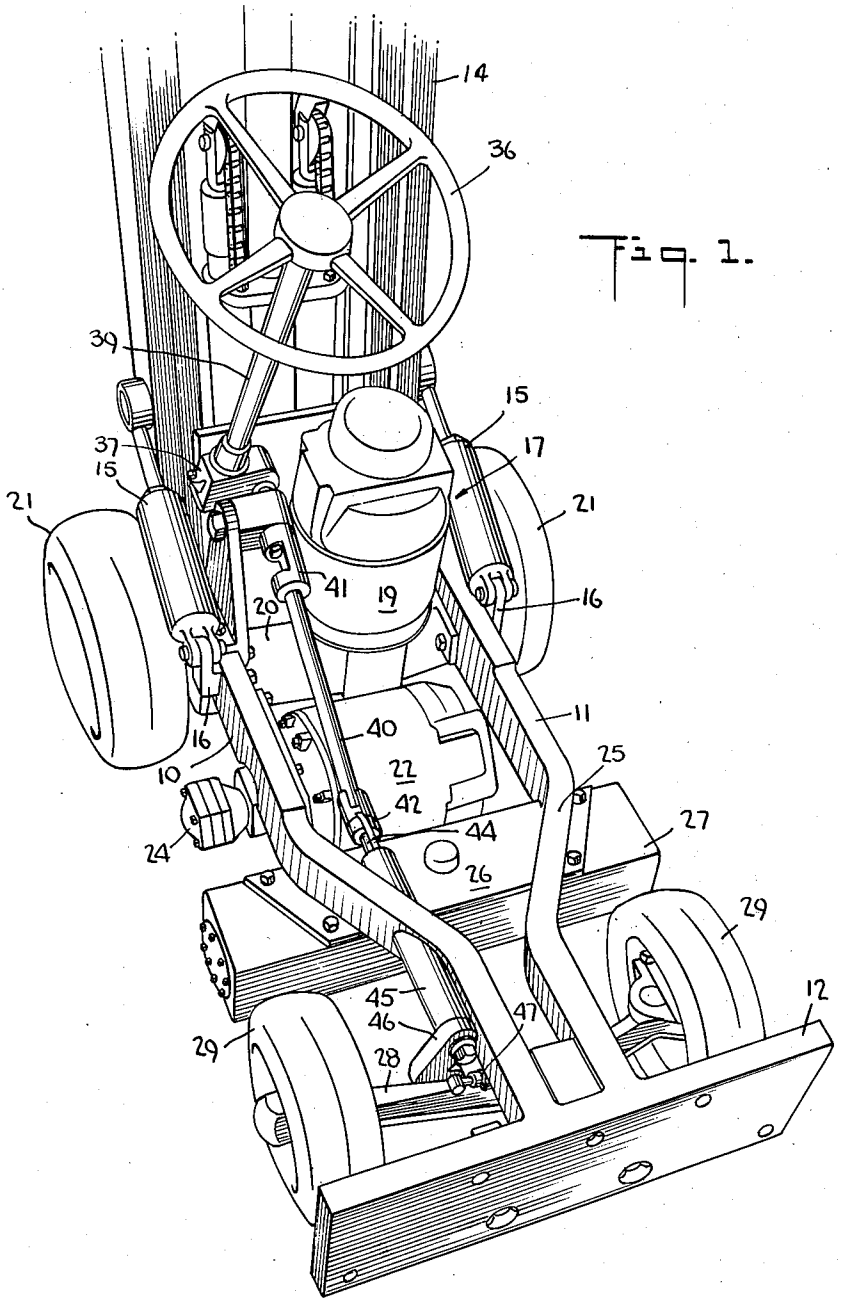

Fig. 1.

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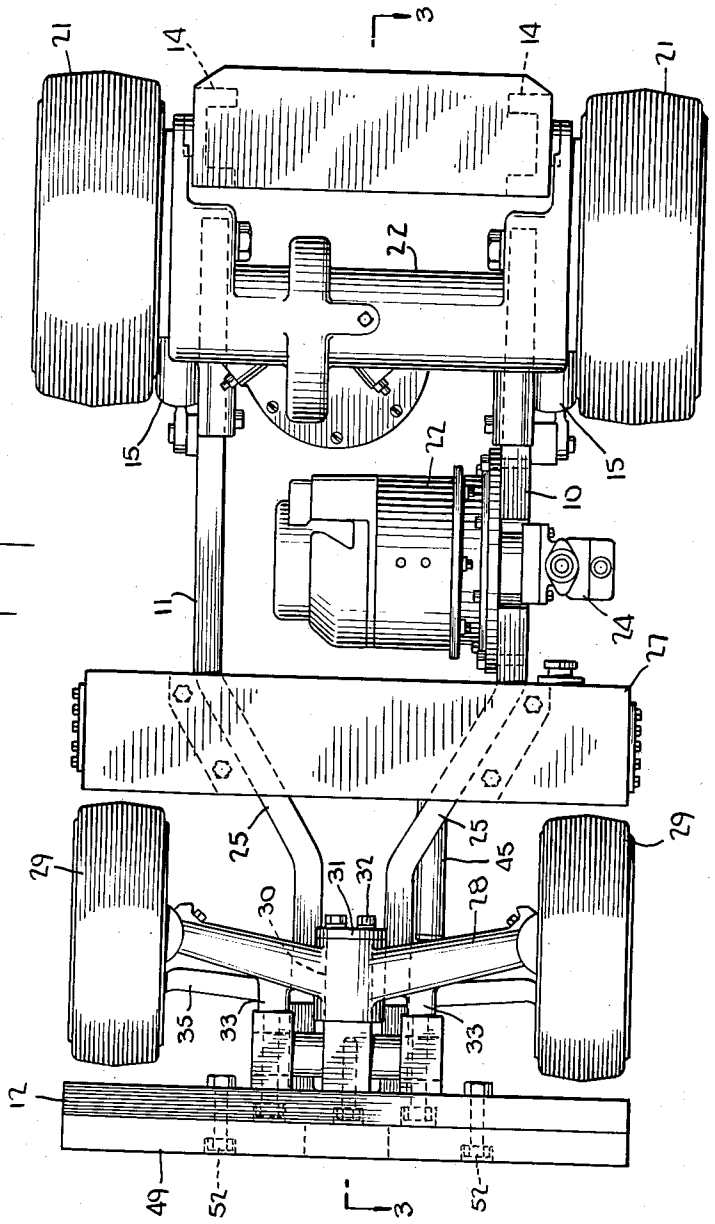
Fig. 2.



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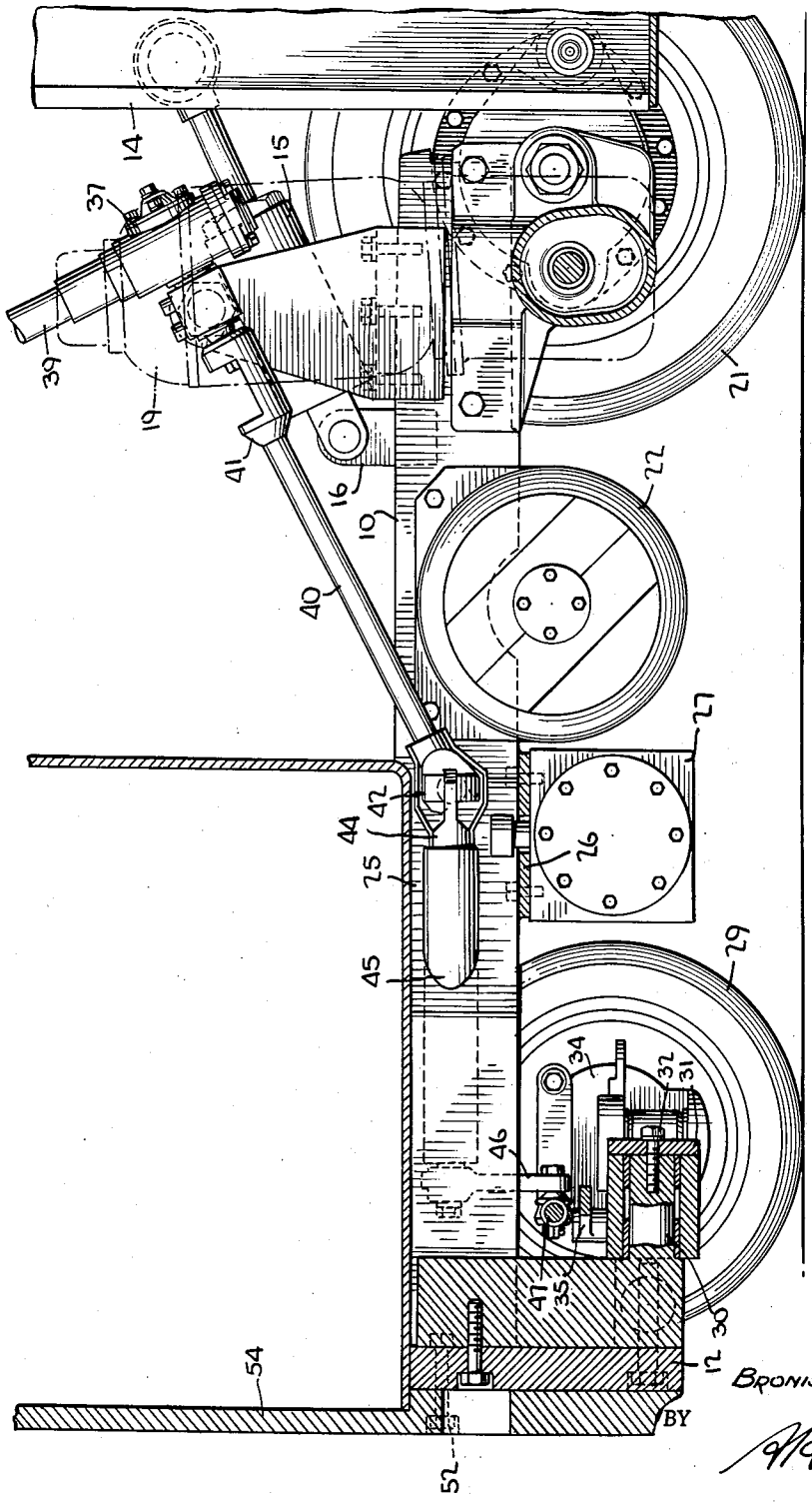

Fig. 3.

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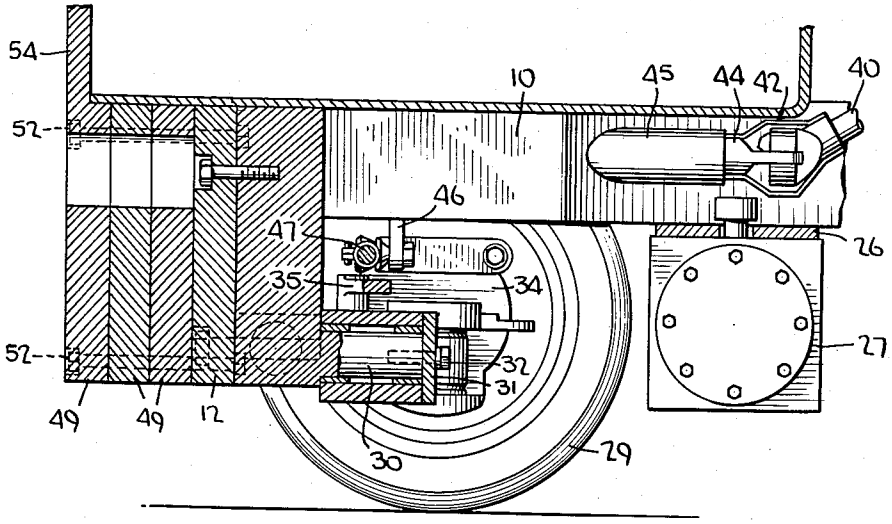

Fig. 5.

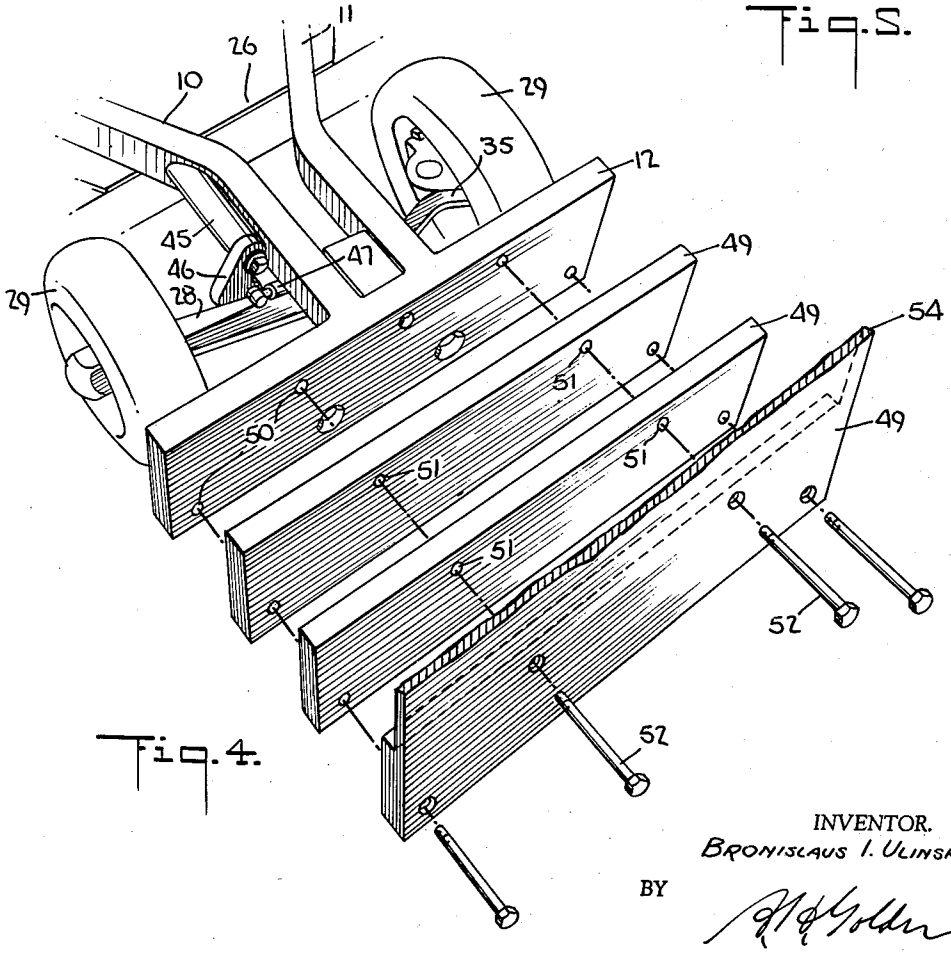

Fig. 4.

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FRAME CONSTRUCTION FOR AN INDUSTRIAL TRUCK

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Filed Nov. 6, 1958, Ser. No. 772,329

1 Claim. (Cl. 280—150)

This invention relates to industrial trucks and, more particularly, to the main frame structure for such trucks.

Those persons skilled in the art will readily appreciate that the construction of the main frame for trucks of this class presents a considerable problem. For example, it is necessary to maintain the truck of a size suitable for operation in narrow warehouse aisles and freight cars, and the like. At the same time the frame must be sufficiently strong and rigid to support the various parts essential to the operation of the truck as well as the heavy loads that must be lifted and transported.

Trucks of the class described carry some form of load handling attachment, such as a pair of forks and uprights for elevating the forks and the load. These uprights are carried by the frame at the front end of the truck immediately forward of the front wheels. To counterbalance the weight of the forks, uprights and load, the truck must carry a heavy counterweight at its opposite end. This counterweight must be in proportion to the load handled, and since the same frame may frequently be used for several different load models, this matter of counterweight is very important as will appear presently.

The frame may also carry mechanism for tilting the load carrier, as well as a traction unit including a motor and steering linkage, a fluid pump for driving load lifting and tilting hydraulic rams, a second motor for driving the pump and a reservoir for supplying fluid to the pump.

I have conceived by my invention a novel frame structure that enables me to meet all these requirements through a construction that is relatively simple and easy to manufacture.

As a particular feature of my invention, I provide as part of my frame, a pair of longitudinal complementary bars widely spaced for part of their length at the front end of the truck and then bent toward one another so as to be narrowly spaced at the rear end of the truck. The value and utility of this feature will be amplified later.

As another feature of my invention, I weld a heavy transverse tie bar to the narrowly spaced rear ends of the longitudinal bars. This transverse tie bar serves as a support for a series of counterweights in a number and weight to balance the load carried by the load handling attachment, as well as for a horizontal pivot or bearing upon which I mount the rear axle.

As a further feature of the invention, I secure a tank for containing hydraulic fluid just forwardly of the rear wheels. More particularly, I provide a center transverse tie plate welded to the underside of the longitudinal members at converging portions thereof between their widely and narrowly spaced portions. The fluid tank is bolted to the underside of this center tie plate.

As a still further feature of the invention, I secure a traction unit to the widely spaced ends of the bars, the traction unit housing extending between these widely spaced ends to add rigidity to the frame as an integral part thereof. I then suspend my fluid pump and its operating motor from the longitudinal bars between the traction unit and the fluid reservoir.

I have thus outlined rather broadly the more important features of my invention in order that the detailed description thereof that follows may be better understood, and in order that my contribution to the art may be better appreciated. There are, of course, additional features of my invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception on which my disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of my invention. It is important, therefore, that the claim be regarded as including such equivalent constructions as do not depart from the spirit and scope of my invention, in order to prevent the appropriation of my invention by those skilled in the art.

A specific embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings.

In the drawings:

Fig. 1 is a perspective view of the truck frame in accordance with my present invention;

Fig. 2 is a bottom plan view of the structure shown in Fig. 1;

Fig. 3 is a cross-sectional view taken along the lines 3—3 of Fig. 2;

Fig. 4 is an exploded view of the rear section of the frame illustrating the assembly of the counterweights to the rear tie; and

Fig. 5 is a fragmentary cross-sectional view similar to Fig. 3, but illustrating a greater number of counterweights mounted on the rear end of the frame.

Referring to the drawings, and more particularly to Figs. 1 to 3 thereof, there is shown a truck frame comprising a pair of longitudinal complementary bars 10 and 11 widely spaced for part of their length at the front end of the truck and then bent to converge toward one another and narrowly spaced at the rear end of the truck. A transverse end plate or rear tie 12 is fixed to the rear ends of the side bars 10 and 11 as by welding. Uprights 14 are supported at the front end of the truck for tilting movement by a pair of tilt rams 15 connected through brackets 16 to the side bars.

A driving and traction unit 17 is supported at the forward end of the frame and includes a drive motor 19, a front axle housing 20 extending between the side bars 10 and 11 and connected to those bars at their widely spaced ends. Front wheels 21 are mounted outside of the side bars 10 and 11 and supply traction and driving movement to the truck under the control of the motor 19.

To provide hydraulic power for driving the rams 15 and other hydraulically controlled accessories, such as a load carriage, for example, the side bars support a second motor 22 just to the rear of the traction unit 17 and at a level below the top of the side bars. A fluid pump 24 is mounted in driven relation to the motor 22 and serves to provide hydraulic fluid under pressure to the various rams for operating parts of the truck.

As I have mentioned before, the side bars are bent toward one another so that they converge in a rearward direction for part of their length, as at 25. At this converging portion of the side bars, I weld a center tie plate 26 to the undersurface of the bars. This plate 26 overextends the bars somewhat at each side and a fluid reservoir 27 is bolted to the plate outwardly of the bars. As seen in Figs. 1 to 3, the reservoir 27 is somewhat longer than the width of the frame and is disposed transversely beneath the frame.

I provide my truck with a rear axle 28 to the ends of which I mount rear steered wheels 29. To mount the

axle on the truck frame, a pivot **30** is welded to the end plate **12** in the longitudinal axis of the truck, as shown in Figs. 2 and 3. The axle **28** is formed with a bearing to enable it to rock upon the pivot **30** when the rear wheels **29** move over irregular ground. The axle **28** is retained on the pivot **30** by an end plate **31** secured to the pivot by screws **32**. The axle is also formed with a pair of lugs **33** that provide bearing surfaces in contact with the end plate **12** at points laterally spaced from the pivot **30** so as to accept forces that occur when the wheels **29** strike an obstruction, thereby minimizing bending stresses on the pivot.

The wheels **29** may be mounted for steering movement on the axle **28** in any suitable manner, and may conveniently utilize the novel mounting arrangement taught in my Letters Patent No. 2,829,903, dated April 8, 1958, and entitled "Steering System for Industrial Truck." In this construction, I utilize duplicate mounting members **34** formed with stub shafts for rotatably mounting the wheels **29** and also formed to mount axle king pins and a tie rod **35**.

In order to steer the rear wheels, the frame also supports a steering linkage that includes a hand steering wheel **36** connected to a conventional steering unit **37** by a steering column or post **39**. The steering unit **37** is supported on the truck frame side bar **10** and imparts rotary motion to a bar **40** that is connected to the steering unit through an adapter **41**. The bar **40** is universally jointed as at **42** to a shaft **44** that extends longitudinally of the truck. In order to obtain maximum rigidity for the steering mechanism, and to utilize the frame to best advantage, I place the shaft **44** in the plane of the side bars **10** and **11** and I provide bearing means such as a bearing sleeve **45** that supports the shaft **44** for rotation by the bar **40** on a constant axis. This sleeve **45** is fixed to the frame and, as shown in Figs. 1 to 4, actually passes through the side bar **10** at its converging part **25** to which it is welded so that the rear portion of the bearing sleeve **45** is adjacent the bar **10** where it is narrowly spaced from the bar **11**. The rear portion of the sleeve terminates in substantial alignment with the steered wheels.

At its rear end, the shaft **44** protrudes from the bearing **45** and is connected to an end of a pitman arm **46**. The other end of the pitman arm is connected to one end of a link **47**. This link extends across the longitudinal axis of the truck and has its opposed end connected to the tie rod **35** at a point between the longitudinal truck axis and an end of the tie rod so that when the hand steering wheel is rotated, this movement is transmitted through the steering post **39** and steering unit **37** to the bar **40**. Rotation of the bar **40** rotates the shaft **44** through the universal joint **42** and rocks the pitman arm **46** to one side or the other, thus shifting the link **47** and the tie rod **35** to pivot the rear steered wheels **29** about their respective king pins as explained in more detail in my copending application Serial No. 767,696, filed October 16, 1958, and entitled "Steering Mechanism for Industrial Truck."

As I have already indicated, the rear transverse tie

bar or end plate **12** may be utilized to support a series of counterweights, the number and weight of which may be altered as required to balance the load carried at the opposite end of the truck, or as may be required by different load models. Referring to Fig. 4, the bar **12** is shown in exploded relation to counterweight or ballast plates **49**. It will be observed that the bar **12** has a series of bolt holes **50** and that registering holes **51** are provided in the plates **49** for reception of bolts **52** that secure the desired number of counterweights to the bar **12**. The rear counterweight **49** has an upstanding part **54** that may comprise the rear wall of a compartment such as a battery compartment, for example. As shown in Fig. 5, a greater number of counterweights may be supported on the bar **12** and, in this manner, the location of the upstanding part **54** may be altered to vary the size of the battery compartment.

From the foregoing description, it will be seen that I contribute by my invention a frame construction for an industrial truck that is of a size for operation in narrow warehouse aisles, freight cars, and the like and that is at the same time sufficiently strong and rigid to support the various parts essential to the operation of the truck as well as the heavy loads that must be lifted and transported. It will also be seen that my novel frame enables me to carry all of the necessary operating mechanisms in a manner whereby they may operate freely of one another without adversely affecting the stability of the truck under any load conditions.

I believe that the construction and operation of my novel frame construction will now be understood and that the advantages of my invention will be fully appreciated by those persons skilled in the art.

I now claim:

In a truck of the class described, a main frame comprising a pair of spaced longitudinal bars, a heavy transverse bar secured to one end of said longitudinal bars with the upper surface thereof substantially flush with the upper surfaces of said longiutdinal bars, a transverse counterweight plate detachably secured to said transverse bar, said counterweight plate having a portion thereof extending upwardly a substantial distance above said transverse bar and forming the outer rear wall of a compartment for the truck, and a plurality of counterweight plates interposed between said first mentioned counterweight plate and said transverse bar and detachably secured to said transverse bar, the upper surfaces of said plurality of counterweight plates being substantially flush with the supper surface of said transverse bar.

References Cited in the file of this patent

UNITED STATES PATENTS

1,198,885	Billinghurst	Sept. 19, 1916
1,321,857	Snell	Nov. 8, 1919
1,715,639	Burrows	June 4, 1929
2,304,443	Butler	Dec. 8, 1942
2,381,729	Dunham	Aug. 7, 1945
2,554,930	Ulinski	May 29, 1951
2,804,984	Ulinski	Sept. 3, 1957
2,820,556	Davis	Jan. 21, 1958