

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN OR RELATING TO VEHICLES

(71) We, CATERPILLAR TRACTOR CO., a Corporation organised and existing under the laws of the State of California, United States of America, of 100 N.E. Adams Street, Peoria, State of Illinois 61602, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to vehicles and, more particularly but not exclusively, is concerned with vehicles used for earthworking and for moving loads.

Many work vehicles such as fork trucks, tractor shovels, and other construction machinery, utilize counterweights to increase the lifting and/or carrying capacity of the vehicle. In such vehicles, the counterweight means are arranged adjacent at one end of the vehicle in order to counterbalance load-engaging means at the opposite end.

Such a counterweighting system should, if possible, fulfill a number of requirements. Firstly, the counterweight means should be completely removable from the vehicle, to lighten the weight of the vehicle for transport over highways or by air. Furthermore, in some uses of the vehicle, it may be advantageous to exclude such counterweight means. Secondly, such systems should provide a degree of variation of the weight applied, depending on the function of the vehicle. Thirdly, such a system should provide means for counterweight means safely and stably, and should ensure that the counterweight means may be fitted to and removed from the vehicle in safety.

The present invention provides a vehicle incorporating a frame, a counterweight sized to fit into an opening in the frame so as to be positioned when operationally associated with the frame, at least partially within the frame, said counterweight being insertable into and removable from said frame portion through said opening, support means fixed to the frame and in contact with the bottom portion of the counterweight to thereby sup-

port the counterweight when the counterweight is so positioned, and means for securing the counterweight relative to the frame when said counterweight is so positioned.

For a better understanding of the invention reference will now be made by way of example to the accompanying drawings, in which:

Figure 1 is a side elevation of a vehicle in accordance with the invention;

Figure 2 is an exploded perspective view of part of the frame of the vehicle, showing counterweights and structure associated therewith; and

Figure 3 is a rear elevation of a portion of the part of the frame shown in Figure 2, partially broken away.

Referring to Figure 1 of the drawings, there is shown a vehicle 10 having a forward loading end 12 and a rearward engine end 14. The vehicle 10 includes a body 16 having a rearwardly extending frame 18, as best shown in Figures 2 and 3. Frame 18 is made up of generally parallel sidewalls 20, 22 and rear end wall 24. The end wall 24 and sidewalls 20, 22 together define an opening 26.

Support means 28, 30 are associated with sidewalls 20, 22 respectively. Support means 28, 30 comprise angle members 32, 34 fixed to the sidewalls 20, 22 inwardly thereof and running therealong. A rectangular counterweight 35 is sized to fit forwardly into the opening 26 to be positioned between the sidewalls 20 and 22 and to be fully disposed within the frame portion 18. When the counterweight 35 is so positioned, the angle members 32, 34 are in contact with the bottom portion of the counterweight 35 so that the counterweight 35 is resting on and is supported by the angle members 32 and 34. The counterweight 35 is removable rearwardly from the frame portion 18 through the opening 26. Thus both the insertion and removal of the counterweight 35 are achieved by its substantially horizontal movement. Stop members 36 and 38 are fixed to sidewalls 20, 22 inwardly thereof to limit the movement of the counterweight 35 forwardly of the frame portion 18 when it is supported by angle members 32 and 34, i.e., forwardly of

the vehicle 10. These stop members 36 and 38 determine forward location of the counterweight 35 to align apertures in the angle members 32 and 34 with threaded apertures in the counterweight 35 so that the counterweight 35 may be secured in place relative to the main portion 18 by means of bolts 40. Removal of the bolts 40 allows counterweight 35 to be removed rearwardly through opening 26.

Upper angle members 42 and 44 are fixed to sidewalls 20 and 22 respectively inwardly thereof above angle members 32 and 34. These upper angle members 42 and 44 extend to adjacent the ends of the angle members 32 and 34 closest to the opening 26, i.e. adjacent the rearward ends of the support angle members 32 and 34. The function of these upper angle members 42 and 44 will now be described in detail.

The counterweight 35 is initially installed through or finally removed through the opening 26 by the use of any suitable mechanical lifting device such as a winch and cable system attached to a lifting eye (not shown) threadably inserted into a tapped hole 46 provided substantially at the center of gravity of the counterweight 35. With the counterweight 35 positioned between angle members 32 and 42, and angle members 34 and 44, there are instances during the insertion and removal process when the center of gravity of the counterweight 35 is positioned sufficiently rearwardly that the rear portion of counterweight 35 would have a tendency to drop (this is a situation where the weight of the counterweight 35 is being only partially supported by the angle members 32 and 34). In such a situation, the forward portion of the counterweight 35 would have a tendency to lift up. Upper angle members 42 and 44 are positioned to contact the upper surface of the counterweight 35, and under such a condition keep the rear portion thereof from dropping, thus avoiding a relatively dangerous condition. The particular placement of upper angle members 42 and 44 to extend to adjacent the rearward ends of the angle members 32 and 34 ensures that these upper angle members 42 and 44 are in position to act upon the counterweight 35 at an early stage of entrance of the counterweight 35, and to act upon the counterweight 35 until it is almost completely removed.

Consequently, the lifting eye may be removed from tapped hole 46 after the counterweight 35 is positioned between angle members 32 and 42, and angle members 34 and 44. Likewise, the counterweight 35 may be moved rearward without danger, to the extent necessary to make tapped hole 46 accessible so that counterweight 35 may be properly carried.

A second counterweight 48 is adapted to be fixed to the extending portion 18 of frame

16 and removable therefrom by means of bolts 50 passing through apertures in the counterweight 48 and into threaded holes in end wall 24. In such a fixed position, the counterweight 48 is rearward of the opening 26 and is, in fact, over the opening 26, to limit removal of the counterweight 35 positioned within extending portion 18 from that portion 18. Removal of the counterweight 48 allows access to the counterweight 35 through the opening 26 to in turn allow removal of the counterweight 35 therethrough. Such covering of the opening 26 by counterweight 48 provides another positive movement limiting means of counterweight 35 along with the already described bolts 40.

The counterweight 48 defines a recessed portion 52 and a hitching lug 54, which is rearwardly exposed when the counterweight 48 is fixed to the extending portion 18. Apertures are defined by lug 54 and a top portion of the counterweight 48 to receive a retaining pin 56 therethrough for towing purposes.

It will be seen that herein is provided a vehicle counterweighting system which allows complete removal of one or both of a pair of counterweights from the vehicle. The application and removal of such counterweights can be done, as has been pointed out, in a safe and convenient manner. Counterweight 35 is supported by positive support means upon which counterweight 35 rests. Furthermore, the safe movement of the counterweight 35 is ensured by the use of upper members 42, 44 as described above. The counterweight 48 is in the position to be easily and conveniently handled, so that the overall device is effective and safe for use.

WHAT WE CLAIM IS:—

1. A vehicle incorporating a frame, a counterweight sized to fit into an opening in the frame so as to be positioned, when operationally associated with the frame, at least partially within the frame, said counterweight being insertable into and removable from said frame portion through said opening, in a substantially horizontal direction, support means fixed to the frame and in contact with the bottom portion of the counterweight to thereby support the counterweight when the counterweight is so positioned, and means for securing the counterweight relative to the frame when said counterweight is so positioned.

2. A vehicle as claimed in Claim 1, further comprising a second counterweight adapted to be fixed to the frame and removable therefrom.

3. A vehicle as claimed in Claim 2, wherein the second counterweight is adapted to be fixed to the frame over the said opening to inhibit removal of the positioned first-mentioned counterweight from said frame, the second counterweight being removable from



the vehicle 10. These stop members 36 and 38 determine forward location of the counterweight 35 to align apertures in the angle members 32 and 34 with threaded apertures in the counterweight 35 so that the counterweight 35 may be secured in place relative to the main portion 18 by means of bolts 40. Removal of the bolts 40 allows counterweight 35 to be removed rearwardly through opening 26.

Upper angle members 42 and 44 are fixed to sidewalls 20 and 22 respectively inwardly thereof above angle members 32 and 34. These upper angle members 42 and 44 extend to adjacent the ends of the angle members 32 and 34 closest to the opening 26, i.e. adjacent the rearward ends of the support angle members 32 and 34. The function of these upper angle members 42 and 44 will now be described in detail.

The counterweight 35 is initially installed through or finally removed through the opening 26 by the use of any suitable mechanical lifting device such as a winch and cable system attached to a lifting eye (not shown) threadably inserted into a tapped hole 46 provided substantially at the center of gravity of the counterweight 35. With the counterweight 35 positioned between angle members 32 and 42, and angle members 34 and 44, there are instances during the insertion and removal process when the center of gravity of the counterweight 35 is positioned sufficiently rearwardly that the rear portion of counterweight 35 would have a tendency to drop (this is a situation where the weight of the counterweight 35 is being only partially supported by the angle members 32 and 34). In such a situation, the forward portion of the counterweight 35 would have a tendency to lift up. Upper angle members 42 and 44 are positioned to contact the upper surface of the counterweight 35, and under such a condition keep the rear portion thereof from dropping, thus avoiding a relatively dangerous condition. The particular placement of upper angle members 42 and 44 to extend to adjacent the rearward ends of the angle members 32 and 34 ensures that these upper angle members 42 and 44 are in position to act upon the counterweight 35 at an early stage of entrance of the counterweight 35, and to act upon the counterweight 35 until it is almost completely removed.

Consequently, the lifting eye may be removed from tapped hole 46 after the counterweight 35 is positioned between angle members 32 and 42, and angle members 34 and 44. Likewise, the counterweight 35 may be moved rearward without danger, to the extent necessary to make tapped hole 46 accessible so that counterweight 35 may be properly carried.

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The counterweight 48 defines a recessed portion 52 and a hitching lug 54, which is rearwardly exposed when the counterweight 48 is fixed to the extending portion 18. Apertures are defined by lug 54 and a top portion of the counterweight 48 to receive a retaining pin 56 therethrough for towing purposes.

It will be seen that herein is provided a vehicle counterweighting system which allows complete removal of one or both of a pair of counterweights from the vehicle. The application and removal of such counterweights can be done, as has been pointed out, in a safe and convenient manner. Counterweight 35 is supported by positive support means upon which counterweight 35 rests. Furthermore, the safe movement of the counterweight 35 is ensured by the use of upper members 42, 44 as described above. The counterweight 48 is in the position to be easily and conveniently handled, so that the overall device is effective and safe for use.

WHAT WE CLAIM IS:—

1. A vehicle incorporating a frame, a counterweight sized to fit into an opening in the frame so as to be positioned, when operationally associated with the frame, at least partially within the frame, said counterweight being insertable into and removable from said frame portion through said opening, in a substantially horizontal direction, support means fixed to the frame and in contact with the bottom portion of the counterweight to thereby support the counterweight when the counterweight is so positioned, and means for securing the counterweight relative to the frame when said counterweight is so positioned.

2. A vehicle as claimed in Claim 1, further comprising a second counterweight adapted to be fixed to the frame and removable therefrom.

3. A vehicle as claimed in Claim 2, wherein the second counterweight is adapted to be fixed to the frame over the said opening to inhibit removal of the positioned first-mentioned counterweight from said frame, the second counterweight being removable from



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said frame to allow said removal of the first counterweight from the frame through the said opening.

5 4. A vehicle as claimed in Claim 2 or 3 comprising hitching means defined by the second counterweight.

10 5. A vehicle as claimed in any preceding Claim comprising load-carrying means associated with the forward end of the vehicle, and wherein the opening allows removal of the first counterweight rearwardly of the vehicle.

15 6. A vehicle as claimed in any preceding Claim, including means for limiting the downward movement of the first counterweight under its own weight when said first counterweight is being fitted into said opening and into position within the frame and is being only partially supported by said support means.

20 7. A vehicle as claimed in any preceding Claim, wherein said frame comprises first and second generally parallel sidewalls and an endwall fixed to and interconnecting the sidewalls, wherein said support means comprise first and second support members fixed to the first and second sidewalls inwardly thereof and running therealong, wherein said opening is defined by the end wall and side walls,

30 and wherein the counterweight can be positioned between the sidewalls and fully disposed within the frame.

35 8. A vehicle as claimed in Claim 6 and 7, wherein said means for limiting downward movement of the counterweight comprise first and second upper members respectively fixed to the first and second sidewalls inwardly thereof and above the first and second support members respectively.

40 9. A vehicle as claimed in Claim 8, wherein the first and second upper members extend to adjacent the ends of the first and second support members respectively closest to the opening.

45 10. A vehicle as claimed in Claim 7, 8 or 9, including means for limiting the movement of the counterweight further into the frame when the counterweight is so positioned.

50 11. A vehicle substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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