

# PATENT SPECIFICATION

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## (54) IMPROVEMENTS RELATING TO EARTHMOVING 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 earthmoving vehicles and in particular to an earthmoving vehicle having mounting means for mounting an attachment.

The massive size and weight of modern earthworking vehicles present considerable design problems in assuring optimum location of the various component parts and assemblies so that excessive stress producing forces are not transmitted between, for example, a tractor and its associated attachment. Such high stresses in tractor components tend to cause premature failure of these components and of the associated mounting brackets for the attachment.

The usual approach has been to increase the size and weight of vulnerable components for added strength. However, such a practice adds significantly to the overall weight of the vehicle, making matters such as transporting the vehicle more difficult in view of legal load limitations.

Further, complementing attachments such as heavy-duty draw-bars, push blocks, hitches and deep penetrating high load ripper assemblies must be securely but conveniently mounted upon the vehicle by mounting means which permit rapid and efficient substitution of alternative attachments.

Additionally, to facilitate manufacture and servicing of earthmoving vehicles, modular component parts, such as the rear-mounted transmission for the crawler tractor described in United States Patent No. 2,971,398, are now employed. Such modular components, however, present additional problems because means must be provided for protecting such

components from impact damage during use. Since such vehicles are commonly operated in severe operating environments, protection means have to be sturdy enough to prevent costly damage in the event of the vehicle and transmission inadvertently encountering a tree stump, rock or other obstacle. Preferably, such protection means are also of minimum size and weight to avoid undesirable increases in total vehicle weight. Such means should also provide component accessibility for facilitating periodic vehicle inspections and servicing.

According to the invention, there is provided an earthmoving vehicle having a main frame and mounting means mounting an attachment on the frame, said mounting means including first and second laterally spaced apart upstanding bracket means, a pair of first apertures in said bracket means, a pair of second apertures in said main frame, a pair of first pins removably disposed in said first and second apertures for releasably pivotably securing said bracket means to said main frame, cross-beam means including a pair of third apertures, a pair of fourth apertures in said bracket means, a pair of second pins removably disposed in said third and fourth apertures for releasably securing said cross-beam means to said bracket means, a pair of fifth apertures in said main frame, a pair of sixth apertures in said cross-beam means, and a pair of third pins removably disposed in said fifth and sixth apertures for releasably pivotably securing said cross-beam means to said main frame, said attachment being secured to said cross-beam means. The cross-beam means structurally integrates the bracket means to provide a rigid, self-contained mounting structure capable of absorbing and supporting side-loading. The bracket means may each comprise a pair of plates straddle-mounted upon the vehicle frame and cross-beam means over ears provided thereupon for maximum strength of the mounting structure and for even transfer of loads to the vehicle frame.

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The cross-beam means preferably includes a pair of longitudinally-extending beams each of which is removably pinned to the main vehicle frame at one end thereof and secured at the opposite end thereof to a laterally extending cross-beam member. In the preferred embodiment, the cross-beam means is pinned to the bracket means through ears formed upon each of the longitudinally-extending beams, and is thus readily mountable and demountable by insertion or removal of the appropriate pins. Additionally, free access to rear-mounted vehicle components may be readily had by unpinning the cross-beam means from the bracket means and pivoting the cross-beam means to the ground.

In one embodiment of the invention, the cross-beam member has a hitch for a drawbar centrally connected thereto while in an alternative embodiment of the invention the cross-beam means has a push-block pad attached to the rear thereof.

Some embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which:—

Fig. 1 is an elevation of part of an earthmoving vehicle according to the invention having mounting means and a hitch attachment;

Fig. 2 is a rear view of the vehicle and mounting means of Fig. 1;

Fig. 3 is a sectional plan view of the mounting means of Fig. 1;

Fig. 4 is a partially exploded view of the mounting means of Fig. 1;

Fig. 5 is an elevation of another vehicle according to the invention including a hitch and push-block attachment;

Fig. 6 is a perspective view of the mounting means of Fig. 5;

Fig. 7 is an elevation, partially cut away, of the tractor of Fig. 5 showing the drawbar hitch in its storage position; and

Fig. 8 is a view similar to that of Fig. 4, showing the hitch and push-block attachment unpinning and pivoted downward for access to rear-mounted vehicle components.

Referring first to Figs. 1 to 4, mounting means, generally indicated at 10, are shown in association with an earthmoving vehicle 11 of the type described in our United States Patent No. 3,774,708. The vehicle has a main frame 12 and other conventional under-carriage components. The mounting means 10 include right and left (as shown in Fig. 2) vertically disposed, laterally spaced parallel mounting brackets 13 and 14 respectively. Brackets 13 and 14 each include a pair of laterally-spaced triangularly-shaped bracket plates 15 and 16, respectively, fixed in parallel relationship by a plurality of internal reinforcing plates or spacers 17.

The brackets 13 and 14 further include pin receiving means comprising corresponding

aligned first apertures 18 in the apices of the bracket plates 15 and 16 disposed for alignment with second apertures in right and left frame ears 19 and 21, respectively, projecting rearwardly on the right and left sides, respectively, of the main frame 12. The apertures 18 are adapted to receive mating first pins 22 for removably pivotably securing the brackets 13 and 14 to the vehicle in such a way that the bracket plates 15 straddle the right frame ear 19 and the bracket plates 16 straddle the left frame ear 21.

As best shown in Fig. 1, the bracket plates 15 and 16 are slightly relieved, as shown at 24, for overlapping and mating with rearwardly protruding corresponding edges of the frame 12 to thereby maintain the vertical alignment of the brackets 13 and 14.

The mounting means 10 further include a cross-beam means 25 which comprises a cross-beam member in the form of a pair of vertically-spaced lateral beam plates 26 extending between the brackets 13 and 14, and two pairs of laterally-spaced longitudinally extending beam plates 27 and 28 extending parallel to the brackets 13 and 14 respectively and cooperating with the lateral beam plates 26. The right and left end portions of the lateral beam plates 26, generally indicated at 29 and 31 respectively, are vertically disposed to form beam ears 32 and 33 for disposition between the bracket plates 15 and 16. The beam ears 32 and 33 are provided with tubular bushings 34 defining third apertures alignable with fourth apertures 23 in the bracket plates 15 and 16. The bushings 34 and apertures 23 are adapted to receive mating second pins 36 which releasably secure the cross-beam means 25 to the brackets 13 and 14 in such a way that the bracket plates 15 and 16 straddle the beam ears 32 and 33. Fifth apertures are defined in the main frame and the forward portions of the longitudinal beam plates 27 and 28 define sixth apertures and are pivotally secured directly to the extreme rearward right and left side portions of the frame 12 by means of third pins 38.

A rear cross cover plate 39 is secured to the brackets 13 and 14 by bolts 41 and to the cross-beam means 25 by bolts 42. The cover plate 39 joins the brackets and cross-beam member of the cross-beam means into an integral unit with great structural strength and also affords protection for vehicle components such as a rear mounted transmission 43 and its associated externally mounted hydraulic transmission controls (not shown). The transmission 43 is further protected by the cross-beam means 25 which has a relatively heavy gauge bottom panel member 44 reinforced with a plurality of internal plates and gussets 45, as best shown in Fig. 3.

In the illustrated embodiment, attached to

the cross-beam means 25 is an attachment 46 which comprises a clevis hitch 47 for a drawbar. The hitch 47 is structurally reinforced by gussets 45 and by a pair of obliquely disposed structural wall members 48 which converge rearwardly from the inner surfaces of the longitudinal beam plates 27 and 28 to the hitch 47 and are welded thereto. The lateral beam plates 26 are vertically spaced and angularly formed so that their central portion, and a rear closure plate 49 therefor, are at a sufficiently low level to afford substantial vertical alignment of the hitch 47 and its associated implements, and further, to afford sufficient clearance below the transmission 43.

As best shown in Fig. 4, the brackets 13 and 14 are initially individually attached to the frame 12 by straddle mounting the bracket plates 15 and 16 over the frame ears 19 and 21 and inserting the pins 22 through the apertures 18 of the bracket plates and through the frame ears. The forward portions of the longitudinal beam plates 27 and 28 are then secured to the right and left sides, respectively, of the frame 12 by the pins 38. The cross-beam means 25 is then elevated so that the beam ears 32 and 33 are respectively straddled by the bracket plates 15 and 16 and the pins 36 are inserted through the bushings 34 and the apertures 23 in the brackets 13 and 14 to couple the cross-beam means 25 to the brackets.

For normal access to and removal and service of the transmission, detachment of the cover plate 39 will generally be sufficient. However, if increased access is desired, the pins 36 are removed to allow the cross-beam means 25 to pivotally descend to the ground.

In the embodiment of Figs. 5 to 8, the cross-beam means 25 includes a pair of longitudinally-extending main beam members 51 and 52 pivotally securable at the forward ends thereof to the right and left sides of the frame 12, respectively. The forward portions of the main members are interconnected by a relatively heavy-gauge bottom panel 35 which affords substantial protection to rear-mounted modular vehicle components. The main members 51 and 52 are joined toward the rearward portions thereof by a laterally-extending plate member 53 disposed between and secured to, as by welding, ears 32 provided on the main members 51 and 52.

The cross-beam means 25 further has attached thereto a push-block comprising two push-block assemblies generally indicated at 57 and 58 and disposed rearwardly of the laterally-extending plate 53 and laterally spaced apart to define an open area 59 therebetween. The push-block assemblies 57 and 58 each include an assembly plate 60, 61 longitudinally extending rearwardly of the lateral plate 53 and a rearward portion of the main members 51 and 52. Laterally-ex-

tending reinforcing plates 62 and 63 respectively join the main member 51 to the assembly plate 60 and the main member 52 to the assembly plate 61. Laterally-extending solid metal abutment pads 64 and 66 respectively connect the main member 51 to the assembly plate 60 and the main member 52 to the assembly plate 61 to complete the box-like structures of the push-block assemblies 57 and 58.

A hitch 67 is pivotally mounted in the open area 59 between the assembly plates 60 and 61 by means of a pin 68 and is held in operative position, as shown in Figs. 5 and 6, by means of a pin 69 which is engageable within apertures 71. When it is desired to employ counterweights in the system, cavities 72 and 73 within the push-block assemblies 57 and 58 accommodate such weights, one of which is shown at 74. The weight 74 includes a slot 76 which permits easy removal of the hitch pin 69. The pin 69 includes a handle 77 which facilitates removal thereof. When the counterweights 74 are not in use, cover plates (not shown) may be placed over the cavities 72 and 73 to prevent foreign matter from entering.

It should be noted that if the hitch 67 were not required in a particular application, the separate push-block pads 64 and 66 could be replaced by a single push-block pad (not shown) which would span the distance between the main members 51 and 52.

When the work load is such that the power of a second tractor is required to accomplish the intended task, the push-block assemblies 57 and 58 provide a surface comprising the abutment pads 64 and 66 which the blade of the second machine may engage during the pushing operation. Under such conditions, the hitch 67 is preferably rotated 90° out of the way to its storage position as illustrated in Fig. 7. The hitch 67 is held in the storage position by the pin 69 being disposed between bifurcated portions 86 and 87 of the hitch 67. In this position, the hitch does not extend beyond the abutment pads 64 and 66 and is protected from impact damage which could be inflicted by the auxiliary tractor during the pushing operation. While in the working position, the hitch 67 provides means for securing cables or other equipment for pulling or towing to the tractor 11.

Ready access to a rear-mounted vehicle component such as a transmission 43 may be afforded by merely removing the pins 36 from the apertures 23 and the ears 32 and 33 to unpin the cross-beam means 25 from the brackets 13 and 14 and to subsequently pivot the cross-beam means to the ground, as shown in Fig. 4.

By removing the second and third pins 36 and 38 the cross-beam means 25 may be removed allowing easy inter-change of the hitch of Figs. 1 to 4 with the push block

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assembly of Figs. 5 to 8 as desired. Further, by removing the first pins 22 and the bracket means 13, 14, the above described implements can simply be replaced by the ripper attachment described in our copending application No. 26592/75, Serial No. 1,512,065 (filed herewith).

It is apparent that the preferred embodiments of the invention provide mounting means for attachments which permit the ready interchangeability of the attachments. The mounting means directly and evenly transfer loads exerted by a push-block or hitch attachment to the main frame of the vehicle and thus the wear life of the mounting structure components is extended without increasing the size or weight of the components. Further the described apparatus provides protection for rear-mounted vehicle components without increasing total vehicle weight and facilitates access to such components.

#### WHAT WE CLAIM IS:—

1. An earthmoving vehicle having a main frame and mounting means mounting an attachment on the frame, said mounting means including first and second laterally spaced apart upstanding bracket means, a pair of first apertures in said bracket means, a pair of second apertures in said main frame, a pair of first pins removably disposed in said first and second apertures for releasably pivotably securing said bracket means to said main frame, cross-beam means including a pair of third apertures, a pair of fourth apertures in said bracket means, a pair of second pins removably disposed in said third and fourth apertures for releasably securing said cross-beam means to said bracket means, a pair of fifth apertures in said main frame, a pair of sixth apertures in said cross-beam means, and a pair of third pins removably disposed in said fifth and sixth apertures for releasably pivotably securing said cross-beam means to said main frame, said attachment being secured to said cross-beam means.

2. A vehicle as claimed in claim 1 wherein said second apertures are formed in a pair of protruding ears integral with the main frame.

3. A vehicle as claimed in claim 1 or 2 wherein said bracket means each include a pair of spaced plate members spaced apart by structural members and containing said first and fourth apertures.

4. A vehicle as claimed in claims 2 and 3 wherein each of said pairs of plate members include portions containing a said first aperture and disposed to straddle one of said protruding ears.

5. A vehicle as claimed in claim 3 or 4

wherein said spaced plate members are generally triangularly shaped, said first and fourth apertures being disposed adjacent apices of the generally triangularly shaped plate members.

6. A vehicle as claimed in any preceding claim wherein said cross-beam means includes a pair of longitudinally-extending beams and a laterally-extending cross-beam member interconnecting said beams, said beams containing said third and sixth apertures.

7. A vehicle as claimed in claim 6 wherein said third apertures are formed in a pair of protruding ears on said beams.

8. A vehicle as claimed in claim 6 or 7 wherein said attachment comprises a hitch connected to said cross-beam member centrally thereof.

9. A vehicle as claimed in claim 8 including a protective cover plate releasably attached to said cross-beam means and said bracket means.

10. A vehicle as claimed in claim 9 wherein said cover plate is attached to said cross-beam means and said bracket means by a plurality of bolts.

11. A vehicle as claimed in claim 6 or 7 wherein said attachment comprises a push-block pad disposed at the rear of said beams and extending substantially completely laterally therebetween.

12. A vehicle as claimed in claim 6 or 7 wherein said attachment comprises a pair of push-block pads disposed at the rear of said beams, and a hitch disposed between the pads.

13. A vehicle as claimed in claim 12 wherein said hitch is pivotally mounted between said pads for selective disposition in a first position in which it extends longitudinally beyond said pads or in a second storage position in which it does not extend longitudinally beyond said pads.

14. A vehicle as claimed in claim 13 including locking means for latching said hitch in said second storage position.

15. A vehicle as claimed in any of claims 11 to 14 wherein the or each push-block pad comprises a solid member.

16. A vehicle as claimed in any of claims 11 to 15 including cavity means in said cross-beam means for containing a counterweight for the vehicle.

17. An earthmoving vehicle substantially as herein described with reference to the accompanying drawings.

18. An earthmoving vehicle substantially as herein described with reference to and as illustrated in Figs. 1 to 4 or Figs. 5 to 8 of the accompanying drawings.



assembly of Figs. 5 to 8 as desired. Further, by removing the first pins 22 and the bracket means 13, 14, the above described implements can simply be replaced by the ripper attachment described in our copending application No. 26592/75, Serial No. 1,512,065 (filed herewith).

It is apparent that the preferred embodiments of the invention provide mounting means for attachments which permit the ready interchangeability of the attachments. The mounting means directly and evenly transfer loads exerted by a push-block or hitch attachment to the main frame of the vehicle and thus the wear life of the mounting structure components is extended without increasing the size or weight of the components. Further the described apparatus provides protection for rear-mounted vehicle components without increasing total vehicle weight and facilitates access to such components.

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2. A vehicle as claimed in claim 1 wherein said second apertures are formed in a pair of protruding ears integral with the main frame.

3. A vehicle as claimed in claim 1 or 2 wherein said bracket means each include a pair of spaced plate members spaced apart by structural members and containing said first and fourth apertures.

4. A vehicle as claimed in claims 2 and 3 wherein each of said pairs of plate members include portions containing a said first aperture and disposed to straddle one of said protruding ears.

5. A vehicle as claimed in claim 3 or 4

wherein said spaced plate members are generally triangularly shaped, said first and fourth apertures being disposed adjacent apices of the generally triangularly shaped plate members.

6. A vehicle as claimed in any preceding claim wherein said cross-beam means includes a pair of longitudinally-extending beams and a laterally-extending cross-beam member interconnecting said beams, said beams containing said third and sixth apertures.

7. A vehicle as claimed in claim 6 wherein said third apertures are formed in a pair of protruding ears on said beams.

8. A vehicle as claimed in claim 6 or 7 wherein said attachment comprises a hitch connected to said cross-beam member centrally thereof.

9. A vehicle as claimed in claim 8 including a protective cover plate releasably attached to said cross-beam means and said bracket means.

10. A vehicle as claimed in claim 9 wherein said cover plate is attached to said cross-beam means and said bracket means by a plurality of bolts.

11. A vehicle as claimed in claim 6 or 7 wherein said attachment comprises a push-block pad disposed at the rear of said beams and extending substantially completely laterally therebetween.

12. A vehicle as claimed in claim 6 or 7 wherein said attachment comprises a pair of push-block pads disposed at the rear of said beams, and a hitch disposed between the pads.

13. A vehicle as claimed in claim 12 wherein said hitch is pivotally mounted between said pads for selective disposition in a first position in which it extends longitudinally beyond said pads or in a second storage position in which it does not extend longitudinally beyond said pads.

14. A vehicle as claimed in claim 13 including locking means for latching said hitch in said second storage position.

15. A vehicle as claimed in any of claims 11 to 14 wherein the or each push-block pad comprises a solid member.

16. A vehicle as claimed in any of claims 11 to 15 including cavity means in said cross-beam means for containing a counterweight for the vehicle.

17. An earthmoving vehicle substantially as herein described with reference to the accompanying drawings.

18. An earthmoving vehicle substantially as herein described with reference to and as illustrated in Figs. 1 to 4 or Figs. 5 to 8 of the accompanying drawings.

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