

June 24, 1958

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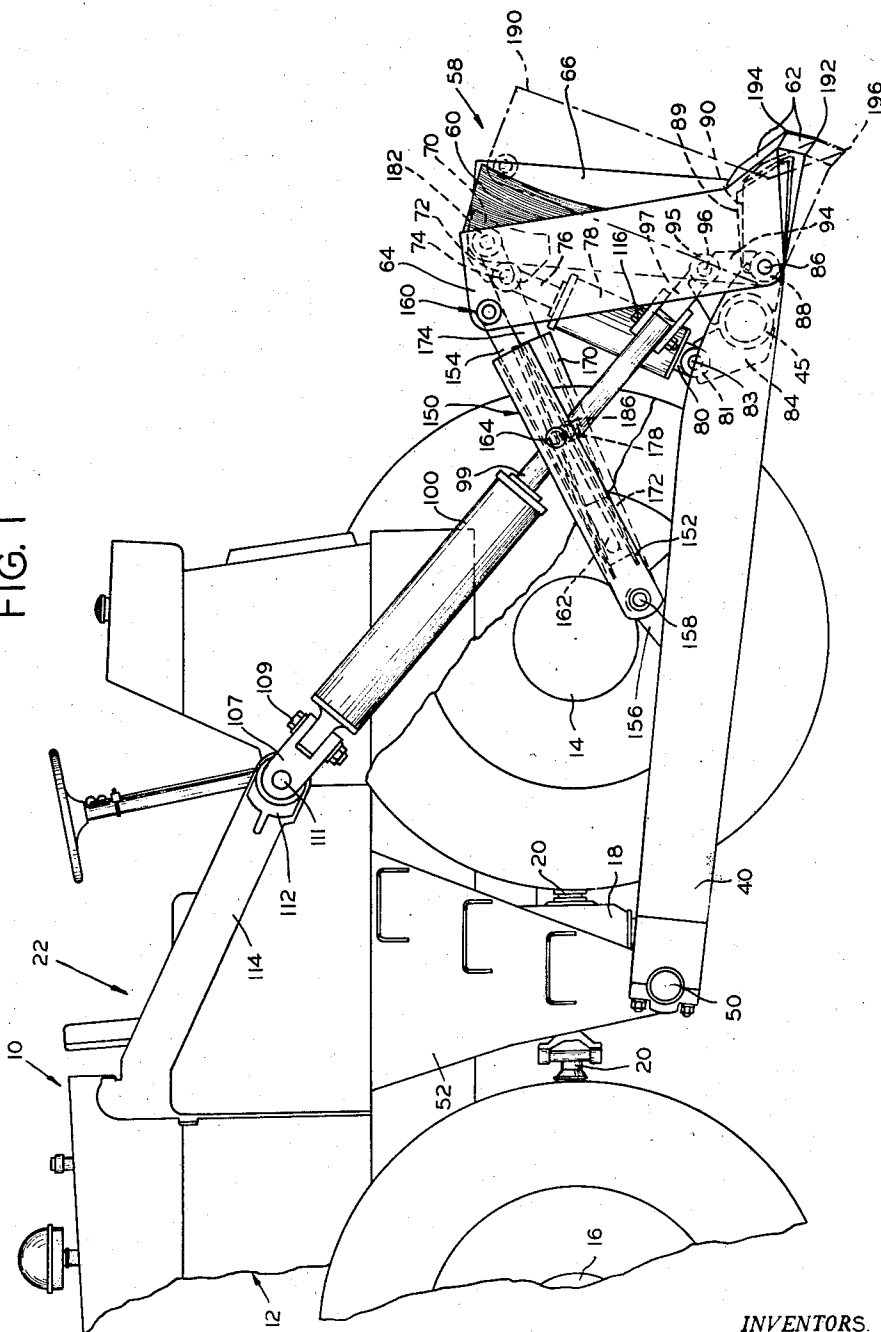
2,839,849

ADJUSTABLE BULLDOZER

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3 Sheets-Sheet 1

FIG. 1



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FIG. 2

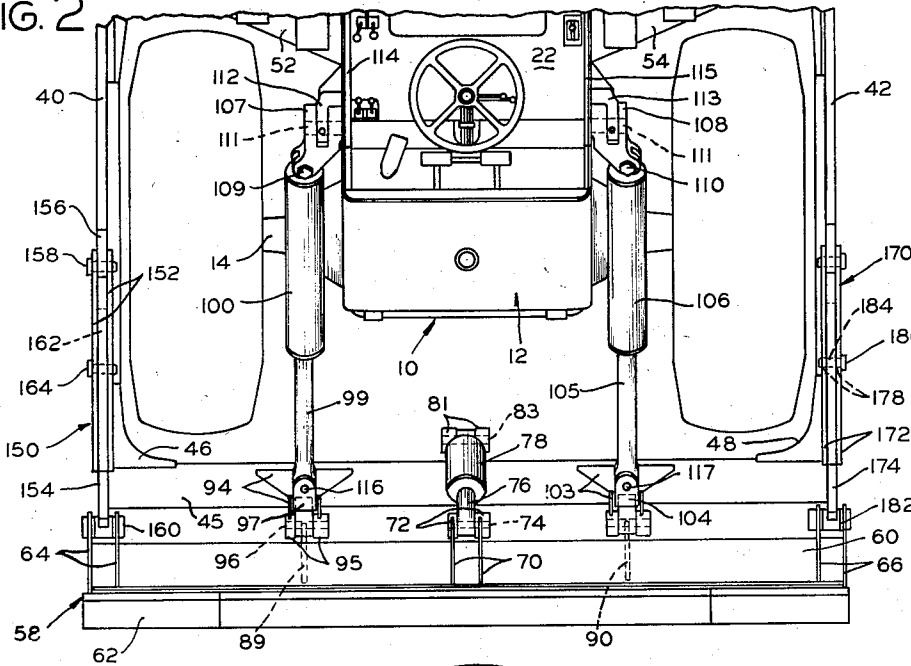
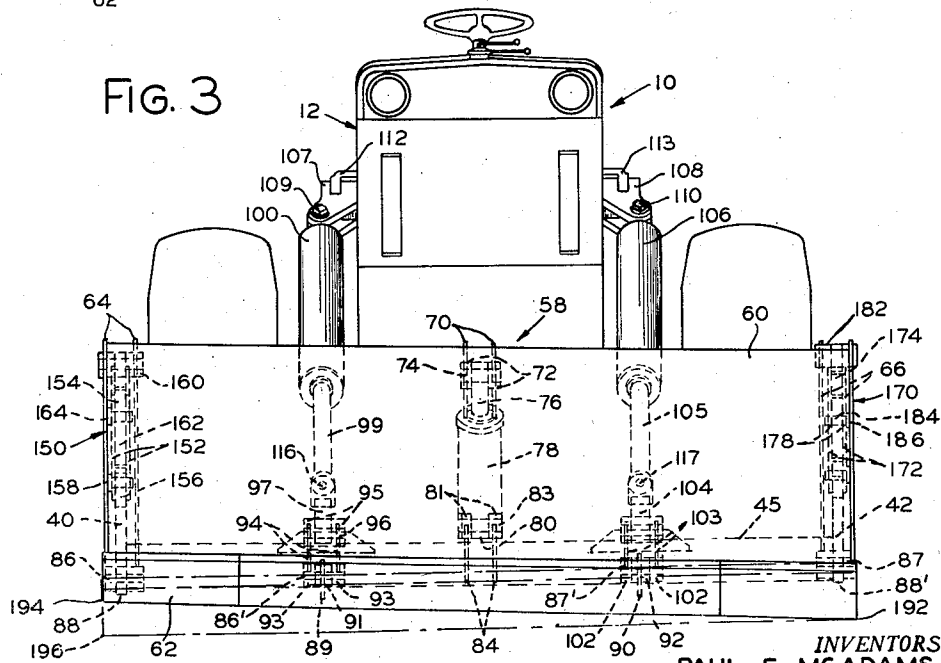


FIG. 3



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FIG. 4

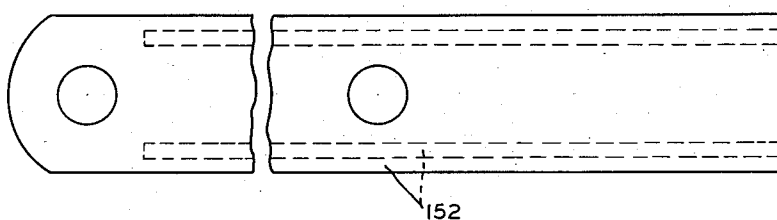


FIG. 5

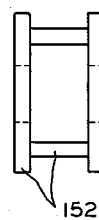


FIG. 6

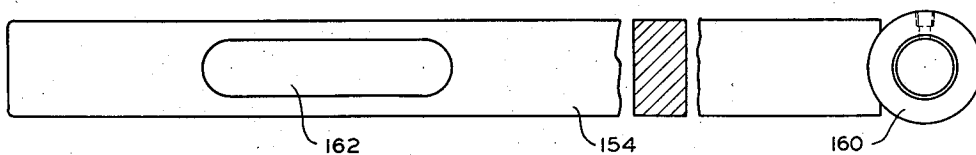
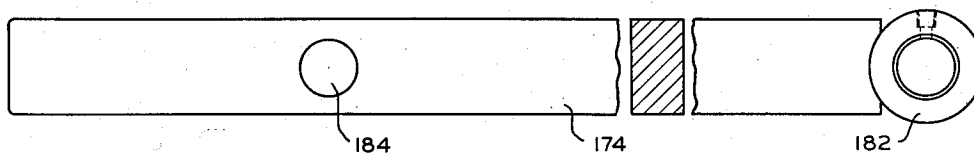


FIG. 7



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ADJUSTABLE BULLDOZER

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This invention relates to new and useful improvements in tractor-mounted bulldozers, and more particularly to improved means for effecting tilting of the bulldozer blade.

In a bulldozer of a type for which our invention is most particularly adapted, a U-shaped frame surrounds the front end of a tractor, the rear ends of the two arms of the U being suitably pivoted to the sides of the tractor to permit raising and lowering movement about a transverse axis. The blade proper is mounted forwardly of the transverse base portion of the U on extensions of the two arms of the U and may be connected from the top portion of one side plate of the blade to one of said arms by a selectively adjustable strut member, from the top portion of the opposite side plate thereof to the other arm by a freely extensible and retractable strut member, and from the top center or mid-portion thereof to the transverse base portion of the U by thrust means adapted to deform or warp the blade forwardly or rearwardly about the selectively adjustable strut member from its normal position to effect a downward or upward tilting movement, respectively, of the cutting edge of the blade relative to a fixed position of that end of the cutting edge which is connected to said selectively adjustable strut member, or to tilt the blade forwardly or rearwardly without warping thereof about a horizontal transverse axis by making, at the choice of the operator, said selectively adjustable strut member freely extensible and retractable. There is also provided cylinder means connected between the transverse base portion of the U and the upper portion of a tractor vehicle for raising and lowering the above generally described structure about the transverse axis of the pivotal mountings of the two arms of the U.

It is a primary object of this invention to provide improved means for tilting the cutting edge of a bulldozer blade out of a horizontal plane.

It is another object of this invention to provide improved means for tilting the cutting edge of a bulldozer blade out of a horizontal plane by warping or deforming the blade out of a normally transverse position thereof.

A further object of this invention is to provide a single centrally located thrust means for tilting a bulldozer blade out of a vertical plane.

Other objects and advantages of this invention will become apparent to those skilled in the art in view of the following description taken in conjunction with the accompanying drawing wherein:

Figure 1 is a side elevation of my bulldozer blade control connected to a tractor vehicle;

Figure 2 is a partial plan view of the bulldozer shown in Figure 1;

Figure 3 is a front elevation of the bulldozer shown in Figures 1 and 2;

Figures 4 and 5 show side and front elevations, respectively, of a strut member used in my bulldozer blade control structure;

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Figure 6 is a side elevation of another strut member which is used with the member shown in Figures 4 and 5; and

Figure 7 is a side elevation of yet another strut member which is used with a member like that shown in Figures 4 and 5.

Referring now to the drawings, a tractor vehicle of well known type is shown generally at numeral 10 and includes a vehicle body 12 mounted in a conventional manner on a chassis which includes front and rear axles 14 and 16 having wheels rotatably mounted at either end thereof, a transmission 18 and drive shafts 20 extending forwardly and rearwardly of the transmission for driving the said wheels through differential mechanisms, not shown, mounted on the axles, and which vehicle body includes an operator's station 22 having a plurality of conventional controls therein, as shown, for operating the tractor vehicle and the bulldozer blade connected thereto. While we have illustrated our invention embodied in a rubber tired vehicle it will be readily understood that it may be applied with equal facility to an endless track or crawler type vehicle.

The U-frame of the bulldozer comprises a pair of longitudinally extending parallel side or pusher arms 40 and 42 connected near the front ends thereof by a transverse tube 45 which is welded to gusset members 46 and 48 of the side arms and to pusher arms 40 and 42 at opposite ends of tube 45, said arms 40 and 42 being rearwardly pivotally mounted at the opposite ends of a transverse shaft 50 which is welded to and supported by a pair of plate members 52 and 54, which extend downwardly and outwardly in opposite directions from opposite sides of the vehicle body 12.

A bulldozer blade 58 is a built-up structure which generally includes a moldboard 60, a longitudinal cutting edge 62 adjacent the bottom of the moldboard, and pairs of side-plates 64 and 66 connected, as by welding, to opposite ends of the moldboard. A pair of brackets 70 are welded to moldboard 60 and cradle in formed ends thereof tubular sleeve members 72 which are welded thereto. A pin 74 mounts a piston rod 76 of a centrally located blade tilting and warping hydraulic cylinder construction 78 between sleeves 72 on bracket 70. The cylinder construction is connected at the opposite end thereof to tube 45 by cylinder bracket 80, tubular sleeves 81, and a pin 83 which connects the bracket to the sleeves, said sleeves being cradled in and welded to brackets 84, the opposite ends of which latter brackets cradle tube 45 and are welded thereto.

Blade structure 58 is mounted on coaxial pins 86, 87, 86' and 87' for pivotal movement in the direction of the longitudinal axis of vehicle 10. Pin 86 is mounted in the lower rearwardly extending portion of the pair of side plates 64 and passes through a tubular sleeve member 88 intermediate said side plates which is welded to a formed end of side arm 40. Pin 87 is similarly mounted between side plates 66 and passes through an intermediate tubular sleeve member 88' which is welded in the formed end of side arm 42.

Welded to the lower back side of moldboard 60 between the pairs of end plates 64 and 66 are a pair of brackets 89 and 90 to the opposite ends of which are welded tubular sleeves 91 and 92, respectively, which receive the pivot pins 86' and 87'. A pair of tubular sleeves 93 register with pin 86' at opposite ends thereof and are cradled in and welded to lower portions of a pair of bracket members 94, which are also welded to the tube 45 and to a pair of tubular sleeves 95. The sleeves 95 are positioned on opposite ends of a pin 96 which passes through an opening in the end of a link 97 disposed between sleeves 95, said link 97 and brackets 94 operatively connecting blade 58 and tube 45 to a

piston rod 99 of a hydraulic cylinder construction 100 for a purpose to be described. A pair of tubular sleeve members 102 are disposed on opposite ends of pivot pin 87', and are welded to the lower portions of a pair of bracket members 103, which are of the same form as brackets 94 and which operatively connect tube 45 and blade 58 to a link 104 of a piston rod and hydraulic cylinder construction 105 and 106 in the same manner that bracket members 94 connect said tube and blade to rod and cylinder 99 and 100.

The hydraulic cylinders 100 and 106 are of well known construction and are pivotally mounted on bifurcated links 107 and 108 by means of bolts 109 and 110 which connect upper cylinder bracket members to said links, said links being connected for pivotal movement about a transverse axis to coaxial supporting pins 111 which are suitably mounted on bracket members 112 and 113 on rigid body members 114 and 115, respectively. The outer ends of piston rods 99 and 105 are formed with openings for receiving bolts 116 and 117 which connect said piston rods to the bifurcated ends of links 97 and 104, said piston rods being operatively connected to moldboard 60 of blade 58 and to tube 45 by the brackets, pivot pins and tubular sleeves hereinabove described.

A strut 150 (see Figures 4-6) comprises a rectangular member 154 which is slidable within a hollow box-like member 152, said member 152 being connected to a bracket 156 on side arm 40 by a pin 158 which passes through the end of said member. The member 154 is slidable within member 152 as blade 58 is tilted about pivot pins 86, 86', 87 and 87', it being connected to and between the upper rear corners of side plates 64 by a pin, eye and tubular sleeve connection generally shown at 160. A longitudinal slot 162 is formed in member 154 and is adapted to register with a removable pin 164 which passes through coaxial openings in the walls of member 152. As blade 58 is tilted in either direction about pivot pins 86, 86', 87, and 87', the ends of slot 162 cooperate with pin 164 when it is in position as shown, to determine the maximum forward and rearward tilt or warp of the blade in a manner to be described.

A second strut 170 comprises a rectangular member 174 (Figure 7) located in a hollow box-like member 172 which is connected to a bracket on side arm 42 in the same manner as is member 152 connected to bracket 156. Member 174 of strut 170 is connected at 182 to side plate members 66 of blade 58 in the same manner as is rod 154 connected at 160, is slidable within member 172 as is member 154 slidable within member 152, and is of the same design as member 154 except that a single opening 184, which is registrable at a given angle of tilt of blade 58 with coaxial openings 178 in member 172, has been substituted for the slot 162 in rod 154.

When opening 184 is in registry with openings 178, a pin 186 may be inserted to lock or fix the position of member 174 within member 172. Whenever member 174 is thus fixed, any attempt to tilt blade 58 forwardly or rearwardly by energizing cylinder means 78 will result in warping said blade in a manner to be hereinafter more fully explained.

In operation, blade structure 58 may be raised or lowered to any desired position, within limits, by cylinder means 100 and 106 which act, when energized by conventional means, not shown, through piston rods 99 and 105, respectively, and the connections between said rods, tube 45 and moldboard 60, including brackets 89, 94 and 90, 103, respectively, to vary the elevation of blade 58. Cylinders 100 and 106 will pivot a slight amount on the mounting pins 111 while rotating blade 58 and arms 40 and 42 in a counterclockwise direction about shaft 50, following energization of the cylinders to retract rods 99 and 105.

At any given raised or lowered position of blade 58, cylinder means 78 is energizable to transversely tilt blade 58 forwardly or rearwardly about pivot pins 86, 86', 87

and 87' when pin 186 is removed from strut 170, or to warp said blade forwardly or rearwardly about the right hand end of blade 58, as viewed in Figures 2 and 3, when pin 186 is inserted in strut 170 as shown in the drawings. For example, it will be apparent that if pins 164 and 186 are removed from struts 150 and 170, respectively, energization of cylinder means 78 in either direction and at any given lift position of cylinders 100 and 106 will cause piston rod 76, which acts through brackets 70, to tilt blade

58 directly forwardly or rearwardly without warpage thereof about the axis of pivot pins 86, 86', 87 and 87' as members 154 and 174 slide together in one direction or the other within members 152 and 172, respectively. If, on the other hand, pins 164 and 186 are inserted by the operator through the openings in struts 150 and 170, respectively, energization of cylinder 78 to, for example, retract piston rod 76 will cause blade 58 to be deformed or warped out of its normally transverse position relative to the vehicle 10 as the blade is actuated in a generally rearward direction about the fixed right hand end thereof.

The position of blade 58 as shown by the full lines in Figure 1 is that which results when member 154 slides into member 152 during retraction of piston rod 76 to a limiting position as determined by pin 164 when it abuts the forward end of slot 162. Energization of cylinder 78 to extend rod 76 will have the reverse effect to that just described; i. e., blade 58 will be deformed or warped about the fixed right hand end thereof to a position such as is shown by the broken outline 190 of blade 58 in Figure 1, which outline illustrates the position of the left hand end of the blade, the right hand end thereof remaining fixed. The extent of blade warpage in the forward direction is limited by pin 164 when it abuts the rearward end of slot 162. The warpage of blade 58 results, of course, from the torque imposed thereon by cylinder means 78, the blade material being sufficiently flexible to permit such deformation.

The result of such blade warpage causes a tilting of the cutting edge 62 of the blade out of the normal horizontal plane relative to the ground so that, as shown in Figures 1 and 3, the right hand point 192 of the cutting edge remains fixed, whereas the left hand point thereof is actuatable to the position shown at 194 when piston rod 76 is retracted to the position limited by pin 164 and slot 162, and is actuatable to the position shown at 196 when the piston rod is extended to the position limited by said pin and slot. When piston rod 76 is actuated to positions intermediate that of full extension or retraction, the left hand point of the cutting edge assumes corresponding positions intermediate of points 194 and 196. Such blade deformation may obviously be accomplished at any given lift position of the blade.

Various means have been previously disclosed for tilting the cutting edge of bulldozer blades out of a plane parallel to the ground, but never before, insofar as is known, has such low-cost and relatively simple means as herein described been devised for warping bulldozer blades. In this connection it is important to note that a single centrally located hydraulic cylinder means in combination with pins 164 and 186 and associated structure are utilized to tilt blade 58 in either direction to various positions transverse to the tractor-vehicle, or to variously warp said blade into a plurality of planes out of such transverse relation.

It will be noted that Figure 2 illustrates blade 58 in a normal unwarped position in a plane transverse to the tractor-vehicle, whereas Figures 1 and 3 illustrate said blade in the extreme positions of deformation or warpage thereof.

Although we have illustrated and described but one embodiment of our invention it will be apparent to persons skilled in the art that certain changes in the construction and arrangement of parts may be made without departing from the scope of our invention as defined in the claims appended hereto.

We claim:

1. In a bulldozer vehicle having a U-shaped frame comprising parallel side arms which are pivoted on the vehicle and a transverse base portion rigidly connecting said side arms forwardly of the vehicle body; a blade structure pivotally mounted on the front ends of said side arms forwardly of the transverse base portion, a selectively lockable telescoping strut member connecting one of said side arms to said blade structure, and fluid pressure responsive cylinder means substantially centrally mounted on the transverse base portion and connected to the blade structure for tilting the blade structure about an axis transverse to the vehicle when the said strut member is not locked and for warping the blade structure when the said strut member is locked.

2. In a bulldozer vehicle having a U-shaped frame comprising parallel side arms which are pivoted on the vehicle and a transverse base portion rigidly connecting said side arms forwardly of the vehicle body; a blade structure pivotally mounted at the forward ends of said side arms, a telescoping strut member connecting each of said side arms to said blade structure, one of said strut members including means for limiting the extent of telescoping movement of inner and outer elements thereof, and a single fluid pressure responsive cylinder means mounted on the transverse base portion and connected to the upper portion of said blade structure for tilting the blade structure about an axis transverse to the vehicle.

3. In a bulldozer vehicle having a U-shaped frame comprising parallel side arms which are pivoted on the vehicle and a transverse base portion rigidly connecting said side arms forwardly of the vehicle body; a blade structure including a cutting edge pivotally mounted on said side arms and normally disposed transversely to the longitudinal axis of the vehicle, a first telescoping strut connecting one side of said blade structure to one of said side arms including an element connected to the blade structure which is slidable within means connected to said one side arm, a second strut connecting the other side of said blade structure to the other of said side arms including an element connected to said other side of said blade structure slidable within means connected to said other side arm, hydraulic cylinder means substantially centrally mounted on the transverse base portion and connected to the blade structure for normally tilting the blade structure about an axis transverse to the vehicle, said elements of each of said first and second strut members being respectively slidable within said means of each of said strut members during energization of said hydraulic cylinder means, and means for locking together the said element and the said means of one of the said struts whereby energization of the said hydraulic cylinder means warps the said blade structure.

4. A bulldozer vehicle as claimed in claim 3 wherein said centrally mounted hydraulic cylinder means is double acting for providing warping of the said blade structure either forwardly or rearwardly from the normal position thereof.

5. A bulldozer vehicle as claimed in claim 3 wherein said locking means comprises registrable apertures extending through the elements of the said one strut and a member insertable through said aperture for locking together the elements of said strut.

6. A bulldozer vehicle as claimed in claim 5 wherein the elements of the other strut member are provided with means which allows limited movement between such elements for providing limits to the warping of the said blade structure.

7. In an earth working bulldozer vehicle having four ground supported wheels, a body portion, substantially parallel side arms extending forwardly of the vehicle and pivotally mounted on depending portions of said body structure between respective pairs of said wheels, a transverse base portion rigidly connecting said side

arms at the forward ends thereof, and cylinder means connected between the body portion and said transverse base portion for varying the height or pivoted position of said side arms and transverse base portion with energization of said cylinder means; a blade structure pivotally mounted on said side arms and including vertically extending side plate portions and cutting means extending across the front lower portion thereof, a first telescoping strut means connecting one of said side plate portions to one of said side arms, a second telescoping strut means connecting the other of said side plate members to the other of said side arms, and hydraulic cylinder means connecting said transverse base portion to said blade structure for tilting said blade structure about its pivotal mounting on said side arms, said second strut means being lockable against telescoping movement thereof while said first strut means is telescopic during energization of said latter hydraulic cylinder means.

8. A bulldozer vehicle as claimed in claim 7 wherein the said first telescoping strut is provided with means for restricting the extent of movement between the telescoping portions thereof.

9. In a bulldozer vehicle having a U-shaped frame comprising parallel side arms which are pivoted on the vehicle and a transverse base portion rigidly connecting said side arms forwardly of the vehicle body; a blade structure pivotally mounted on the front ends of said side arms forwardly of the transverse base portion, hydraulic cylinder means connected to the top center section of said blade structure and to the center section of said transverse base portion, a first telescopically movable strut angularly connected between one side of the blade structure and one of said side arms, and a second rigid strut member angularly connected between the other side of said blade structure and the other of said side arms, whereby energization of said hydraulic cylinder means warps or deforms said blade structure out of a normally transverse plane to the vehicle about said second strut member while inducing telescoping movement of said first strut member to also tilt said blade structure out of a normally horizontal plane.

10. In a bulldozer vehicle having a U-shaped frame comprising forwardly extending side arms which are pivoted on the vehicle and a transverse base portion rigidly connecting the side arms forwardly of the vehicle body; a blade structure pivotally mounted on the base portion forwardly thereof, a variable length selectively lockable strut mechanism connected between the frame and the said blade structure, and extendible and retractable power actuated means connected between the frame and the said blade structure and arranged upon actuation merely to tilt the said blade structure or to warp it dependent upon the condition of the said lockable strut mechanism.

11. In a bulldozer vehicle having a U-shaped frame comprising forwardly extending side arms which are pivoted on the vehicle and a transverse base portion rigidly connecting the side arms forwardly of the vehicle body; a blade structure pivotally mounted on the base portion forwardly thereof, a variable length selectively lockable strut mechanism connected between the frame and the said blade structure, and double acting power actuated means connected between the frame and the said blade structure and arranged upon actuation to tilt the said blade structure forwardly or rearwardly from a neutral position when the said strut mechanism is not locked and to warp the said blade structure forwardly or rearwardly from the said neutral position when the said lockable strut mechanism is locked.

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