Dec. 5, 1961 N. A. LIKELY 3,011,276

BULLDOZER BLADE CONSTRUCTION

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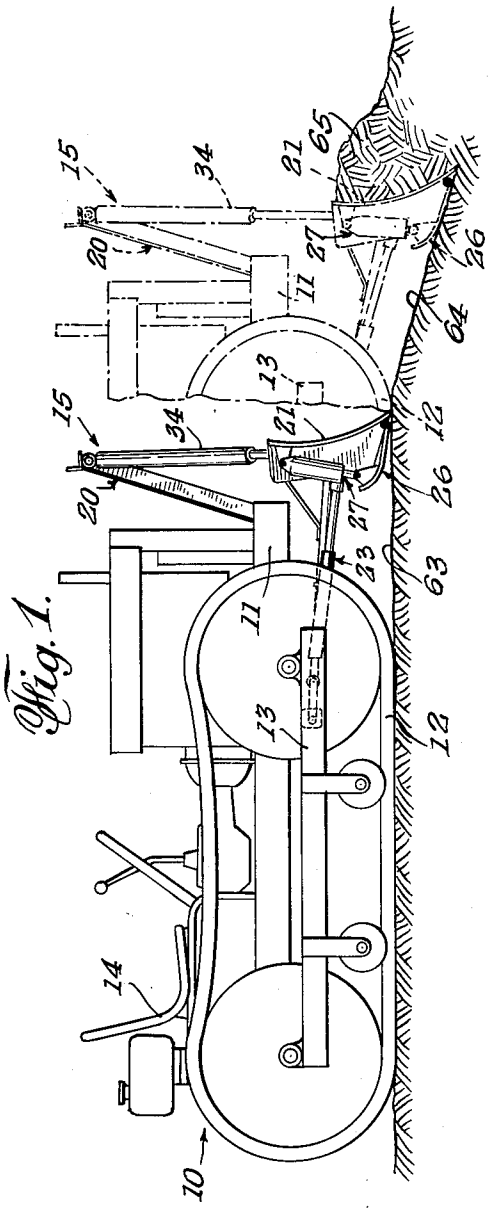


Fig. 1.

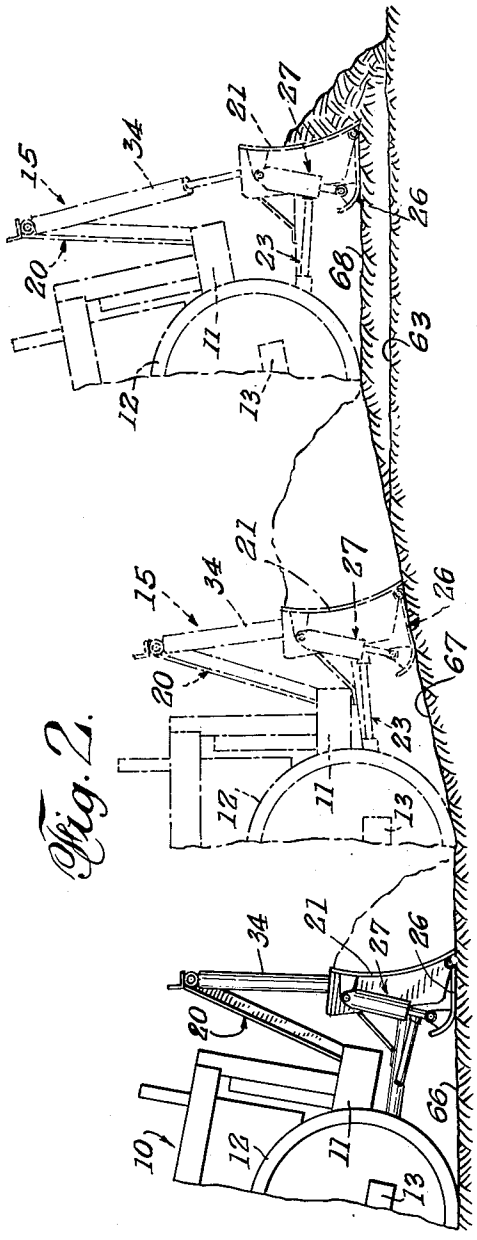


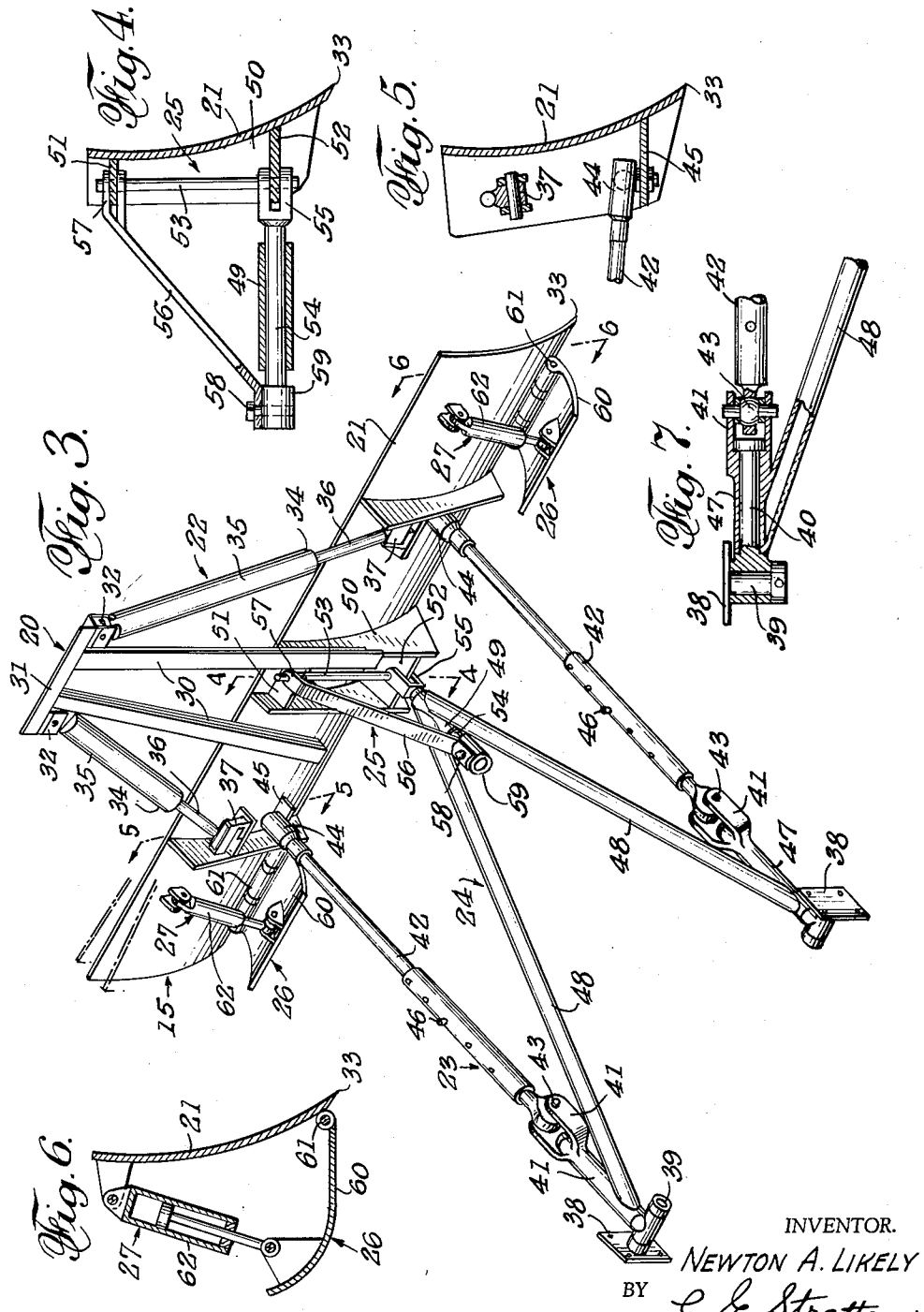
Fig. 2.

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BULLDOZER BLADE CONSTRUCTION

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3,011,276

BULLDOZER BLADE CONSTRUCTION

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This invention relates to a bulldozer blade construction.

An object of the present invention is to provide a vehicle-mounted blade construction for cutting into the ground and moving earth in an efficient and highly flexible manner and whereby the operator of the vehicle can, from his seat thereon, effect all the necessary adjustment and controls of the blade construction, as desired.

Another object of the invention is to provide a bulldozer blade construction that provides for changing the angle of the blade in either a horizontal plane, a vertical plane, or both, thereby enabling earth cutting and/or moving operations that vary from the ordinary operations in the path of movement of a bulldozer blade.

A further object of the invention is to provide a construction of the character above indicated that enables control of the bite of the blade in the ground, thereby enabling variations of depth of cut during continued progress of the construction along the ground.

A still further object of the invention is to provide a bulldozer blade construction that, while being capable of substantially universal adjustment of the position and/or angle of the blade, is, nevertheless, so stabilized that the same may exert its full power in an earth-cutting and -moving operation.

The invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. However, the drawings merely show and the following description merely describes, one embodiment of the present invention, which is given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

FIG. 1 is a side elevational view of a bulldozer blade construction in operative position on a mounting tractor and preparatory to an earth-cutting and -moving operation, said view, in dot-dash lines, showing the beginning of such an operation.

FIG. 2 is a similar view, with the tractor partly broken away, of three subsequent positions of the present bulldozer blade construction, the same illustrating the flexibility of operation of the construction.

FIG. 3 is an enlarged perspective view of the present bulldozer blade construction as seen from the tractor or mounting side thereof.

FIGS. 4, 5 and 6 are further enlarged cross-sectional views as taken on the respective lines 4—4, 5—5 and 6—6 of FIG. 3.

FIG. 7 is a fragmentary longitudinal sectional view showing mounting details.

The tractor 10, best shown in FIG. 1, typically includes a chassis frame 11 and mobile tracks or treads 12, the latter ordinarily having track wheel connected frame parts 13. While the foregoing is generally typical, differently designed tractors may vary as to the frame 11 and frame parts 13, and wheels may be substituted for treads 12. It is usual for such vehicles to be controlled by an operator on a seat 14, and it is contemplated that the present bulldozer blade construction 15 be operated and controlled from said seat.

The bulldozer blade construction 15 that is illustrated comprises, generally, a rigid support frame 20 affixed to and extending upwardly from the forward portion of the tractor chassis 11, a bulldozer blade 21 forward of and below said frame, control means 22 for raising and lowering said blade relative to the frame 20 and, therefore, relative to the surface on which the tracks or treads 12 are moving, means 23 connecting the blade 21 and the frame parts 13 of the tractor, a stabilizer frame 24 connecting the means 23 and a universal connection 25 between said frame 24 and the blade 21, control pads 26 to control the depth of bite of the blade 21, and means 27 for operating said pads.

The support frame 20 is shown as two vertical members 30 that are affixed at the lower ends to the chassis frame 11, and a transverse member 31 that rigidly connects the upper ends of members 30. As may be seen from FIGS. 1 and 2, said frame, while generally vertical, has a slight forward tilt so that its upper end is disposed forwardly of the frame 11. The member 31 extends laterally beyond the members 30, the extensions being provided with universal hinges 32 for the upper ends of the control means 22.

The blade 21 comprises a transverse member having a forwardly directed lower earth-cutting edge 33. The transverse extent of the blade may vary, as desired.

The control means 22 is shown as two hydraulic units 34, each comprising an elongated cylinder 35 and a piston therein, the latter being exemplified by the stem 36. Thus, each unit comprises a length extensible device which, while shown as of the type that may be operated by pressure fluid, may be electrical or mechanical. One end of each unit 34 is connected to one universal hinge or joint 32. The other end thereof, in a somewhat similar manner, is connected by a universal joint 37 to the rearward face of the blade. It will be noted from FIG. 3 that the units 34 diverge downwardly and that the joints 37 are spaced farther apart than are joints 32. Thus, widely spaced points of the blade are connected by the units 34 to relatively narrowly spaced points of the support frame, a generally triangular blade-holding support being thereby provided.

The means 23 is shown as a mounting pad 38 adapted to be connected to the tractor parts 13 on each side, an inreaching horizontal stud 39 on each pad, a swivel member 40 mounted on each stud for movement therearound in a vertical plane, a forked member 41 carried by and rotational around the axis of each swivel member 40, a strain rod 42, a universal joint 43 connecting one end of each strain rod and each respective fork 41, a universal joint 44 connecting the other end of each strain rod and a fixed plate 45 on the rear side of the blade, and means 46 to adjust the length of each strain rod 42. Each fork 41 is formed to have a sleeve 47 over the respective swivel members 40, the same comprising parts of the stabilizer frame 24.

The frame 24 comprises members 48 that are rigidly connected at one end to a tube 49 and at the other to said sleeves 47, the frame 24 thereby having a V form. It will be realized that the frame 24 is capable of swinging in a vertical plane around the axis of the studs 39. Also, it will be clear that the strain rods 42 may move universally, although to a limited degree on the joints 43 relative to the stabilizer frame.

The universal connection 25 is shown as comprising a box-like frame 50 affixed to the rear face of the blade 21 and provided with upper and lower walls 51 and 52, a hinge pin 53 extending vertically between and through said plates, a horizontal hinge pin 54 provided with a fork 55 that engages over the plate 52 and is hingedly connected to the pin 53, and a bite angle stabilizer strap 56 provided at one end with a fork engaged over the

plate 51 and hingedly connected to the pin 53 and, at the other end is affixed by a bolt 58 to a collar 59 on said hinge pin 54. The pin 54 extends through the tube 49 and is longer than said tube so as to provide place for movement of said tube between the abutments provided by the fork 55 and the collar 59.

The blade 21, according to the adjusted lengths of the strain rods 42, may be adjusted to an angle in a horizontal plane that is exemplified by the dot-dash line positions at the left end of the blade in FIG. 3. This angle of adjustment takes place on the axis of hinge pin 53. The blade, by varying the extended lengths of the means 22 may be adjusted to an angle, in either direction, in a vertical plane around the axis of the hinge pin 54. Of course, the adjustment of the blade may be had in both planes as a result of compound angles created by the adjustments of means 22 and 23.

The control pads 26 are preferably provided adjacent the end of the blade. Each pad comprises a curved plate 60 carried by a horizontal hinge 61 adjacent the cutting edge 33 of the blade. Said blades curve upwardly at their rearward portions.

The means 27 comprise extensible units 62 that connect the rear face of the blade 21 and the plates 60. Said units, similar to units 34, may be hydraulically, electrically or mechanically extended and contracted to cause hinged movement of the plates, as desired. At all times that the blade is in contact with the ground, the position of the cutting edge thereof is maintained by the control pads 26 and said position is wholly independent of the attitude of the tractor. Also, control of the blade is exercised through the grade just cut, as will later be seen, and the angular positioning of said pads may be effected by actuation of the units 62 from the tractor seat 14. It is merely a matter of extending or contracting said units, there being many conventional ways to do this, through tubing, piping or electric wiring of a flexible nature.

The means 22, which comprise lift units 34, do not apply restraint to free accommodation of the blade during an earth-moving operation. By stabilizing the extended positions of the units 34, the blade 21 may be used as a conventional bulldozer blade with the entire weight of the forward portion of the tractor applied downwardly on the blade. Since, as above indicated, the blade is independent of tractor attitude, there is no need for operators of great skill, yet smoother grades will result from use of the present construction.

The flexibility of use of the present bulldozer blade construction is illustrated, largely in FIGS. 1 and 2, as witness the following:

The full-line position of FIG. 1 shows the tractor 10 on level ground 63 with the blade 21 in position with its cutting edge 33 in contact with the ground. The control pads 26 are retracted. As the tractor moves forward but is still on level ground, as in the dot-dash line position of FIG. 1, the pads 26 remain retracted as the units 34 are extended so that the edge 33 cuts the slope 64. The cut soil 65 is pushed forwardly by the blade. The cut thus made may be level and square with the path of the tractor, level and at a transverse angle to said path, sloped transversely to the path and square therewith, or at a transverse angle to the path and sloped both forwardly and transversely.

When the desired depth of the slope 64 is achieved, the control pads may be dropped or extended to a more obtuse angular relationship with the blade. Thus, as shown in the full-line position of FIG. 2, continued forward movement of the tractor results in a leveling at the new, but lower grade 66 as the units 34 are retracted, accordingly. The full-line position of FIG. 1, except that the control pads are in flat contact with the ground, is the position of the tractor as the same progresses along said lower grade. In the first dot-dash line position of FIG. 2, the control pads have been further extended to

force the blade edge out of the cut. The lift units 34 are further retracted as the blade climbs out of the cut along the upward slope 67. Now, the upward travel of the blade continues past the original grade 63, creating a fill 68. The control pads have been retracted somewhat to put the blade in level cut position. The units 34 are extended due to the nose high attitude of the tractor.

While the foregoing specification illustrates and describes what I now contemplate to be the best mode of carrying out my invention, the construction is, of course, subject to modification without departing from the spirit and scope of my invention. Therefore, I do not desire to restrict the invention to the particular form of construction illustrated and described, but desire to cover all modifications that may fall within the scope of the appended claims.

Having thus described my invention, what is claimed and desired to be secured by Letters Patent is:

1. A bulldozer blade construction comprising a rigid generally upright support frame adapted to be mounted on the forward portion of a tractor with its upper end forward of the tractor, a transverse earth-cutting and -moving blade disposed below said upper end of the frame and forward of said frame where said frame connects to the tractor length-adjustable means interconnecting said upper end of the frame and transversely spaced points of the blade, stabilizing means for connecting transversely spaced points of the blade and portions of the tractor independently of the upright frame and below the upright frame rearward of the support frame, adjustable means embodied in the stabilizing means to vary the angle of the blade relative to the path of movement thereof, pivotal joints incorporated in the stabilizing means to enable the blade to assume different positions as controlled by the length-adjustable means and the adjustable means in the stabilizing means and means carried by the ends of said blade to control the depth of bite of said blade in the ground.

2. A bulldozer blade construction comprising a rigid generally upright support frame adapted to be mounted on the forward portion of a tractor with its upper end forward of the tractor, a transverse earth-cutting and -moving blade disposed below said upper end of the frame and forward of said frame where said frame connects to the tractor, length-adjustable means interconnecting said upper end of the frame and transversely spaced points of the blade, stabilizing means for connecting transversely spaced points of the blade and portions of the tractor independently of the upright frame and below the upright frame rearward of the support frame, adjustable means embodied in the stabilizing means to vary the angle of the blade relative to the path of movement thereof, pivotal joints incorporated in the stabilizing means to enable the blade to assume different positions as controlled by the length-adjustable means and the adjustable means in the stabilizing means a pivotal mount connection for the stabilizing means whereby the blade is movable up and down relative to the frame and whereby the length-adjustable means extends and contracts accordingly, and means carried by the ends of said blade to control the depth of bite of said blade in the ground.

3. A bulldozer blade construction comprising a rigid generally upright support frame adapted to be mounted on the forward portion of a tractor with its upper end forward of the tractor, a transverse earth-cutting and -moving blade disposed below said upper end of the frame and forward of said frame where said frame connects to the tractor, length-adjustable means interconnecting said upper end of the frame and transversely spaced points of the blade, stabilizing means for connecting transversely spaced points of the blade and portions of the tractor independently of the upright frame and below the upright frame rearward of the support frame, adjustable means embodied in the stabilizing means to vary the angle of the blade relative to the path of move-

ment thereof, pivotal joints incorporated in the stabilizing means to enable the blade to assume different positions as controlled by the length-adjustable means and the adjustable means in the stabilizing means a universal pivotal connection between the middle of the blade and the stabilizing means, a pivotal mount connection on the tractor for the latter means whereby the blade is movable up and down relative to the frame and whereby the length-adjustable means extends and contracts accordingly, and means carried by the ends of said blade to control the depth of bite of said blade in the ground.

4. A bulldozer construction according to claim 3 in which the stabilizing means includes a V-shaped frame extending between the tractor and said universal pivotal connection, the latter connection being pivotal.

5. In combination, a horizontal bulldozer blade, a pivot at the middle of the blade on which the same is movable in a horizontal plane, a second pivot on which the blade is movable around its middle in a vertical plane, means to connect spaced points of the blade to a mounting vehicle to stabilize the blade, articulated members having universal joints therein included in the latter means to restrain the position of the blade and move according to the pivotal movement of the latter, means to raise and lower the blade relative to the vehicle mounting the same, rigid and generally upright frame means carrying the blade-raising and -lowering means and adapted to be fixedly mounted on a vehicle, and means carried by the blade adjacent the ends thereof to vary the ground-penetrating ability of the blade.

6. In combination, a horizontal bulldozer blade, a pivot at the middle of the blade on which the same is movable in a horizontal plane, a second pivot on which the blade is movable around its middle in a vertical plane, means to connect spaced points of the blade to a mounting vehicle to stabilize the blade, articulated members having universal joints therein included in the latter means to restrain the position of the blade and move according to the pivotal movement of the latter, means to raise and lower the blade relative to the vehicle mounting the same, rigid and generally upright frame means carrying the blade-raising and -lowering means and adapted to be fixedly mounted on a vehicle, means carried by the blade adjacent the ends thereof to vary the ground-penetrating ability of the blade, and means to angularly adjust the latter means relative to the cutting edge of said blade.

7. A bulldozer blade structure comprising a transverse blade, a generally upright support frame adapted to be rigidly mounted on the forward end of a vehicle, two oppositely angled length-extensible devices extending between the upper portion of said frame and spaced points of the blade on each side of the middle thereof, two generally parallel and adjustable braces extending from similarly spaced points of the blade and having ends adapted to be rigidly connected to said vehicle, a pivotal joint in each brace enabling the braces to swing in a vertical plane, a rigid V-shaped stabilizer frame disposed between said braces and connected to said braces adjacent the mounting connection of the latter to the vehicle, said latter frame having an apex directed toward the middle of the blade, and a universal joint connecting the apex of the stabilizer frame and the blade whereby the blade is movable by the length-extensible devices around said joint in an arc on a vertical plane and is adjustable in an arc on a horizontal plane upon adjustable setting of the length of the braces.

8. A bulldozer blade structure comprising a transverse blade, a generally upright frame adapted to be rigidly mounted on the forward end of a tractor with the frame extending upwardly and forwardly of the tractor, two oppositely angled length-extensible devices extending between the upper end of said frame and spaced points on said blade on each side of the middle thereof, two generally parallel and adjustable braces extending rearwardly from spaced points on said blade, said braces each comprising a universal joint having ends adapted for rigid connection to said tractor, a rigid V-shaped brace having its free ends connected to said ends of said universal joints and the apex of said V-shaped brace having a universal connection with the middle of said blade whereby said blade may be moved both in a vertical plane by said length-extensible devices and in a horizontal plane by adjustable setting of said braces about said universal connection.

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