Feb. 25, 1969 R. L. LAUNDER ET AL 3,429,381

SLOPE GRADER FOR BULLDOZERS

Filed April 11, 1966 Sheet 1 of 2

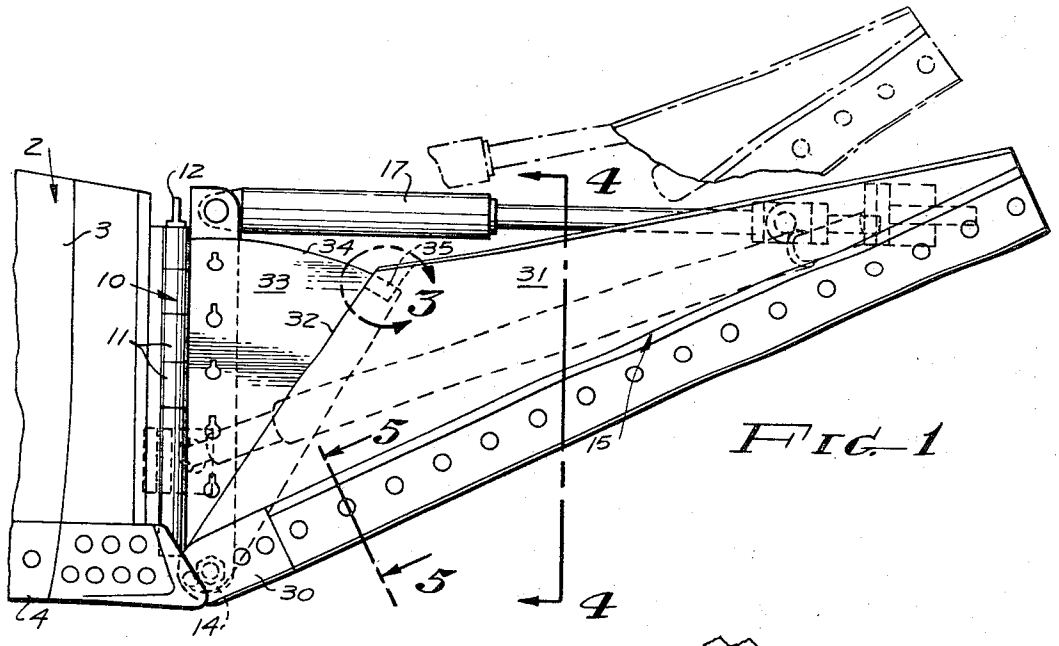

FIG. 1

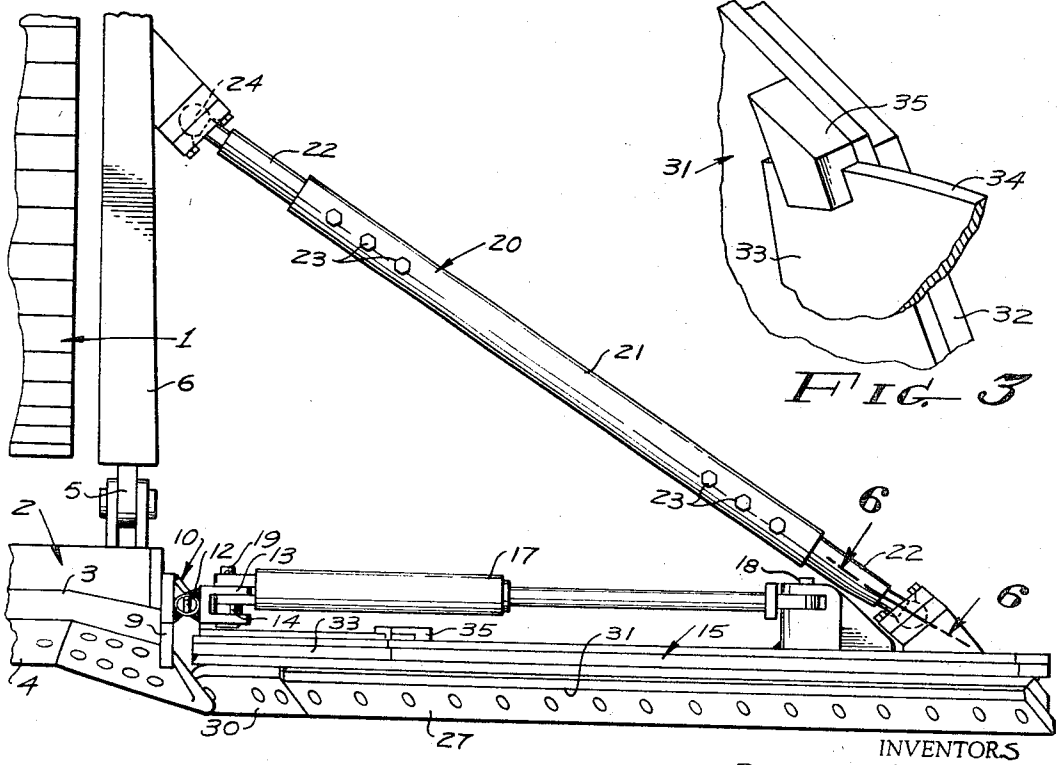

FIG. 2

FIG. 3

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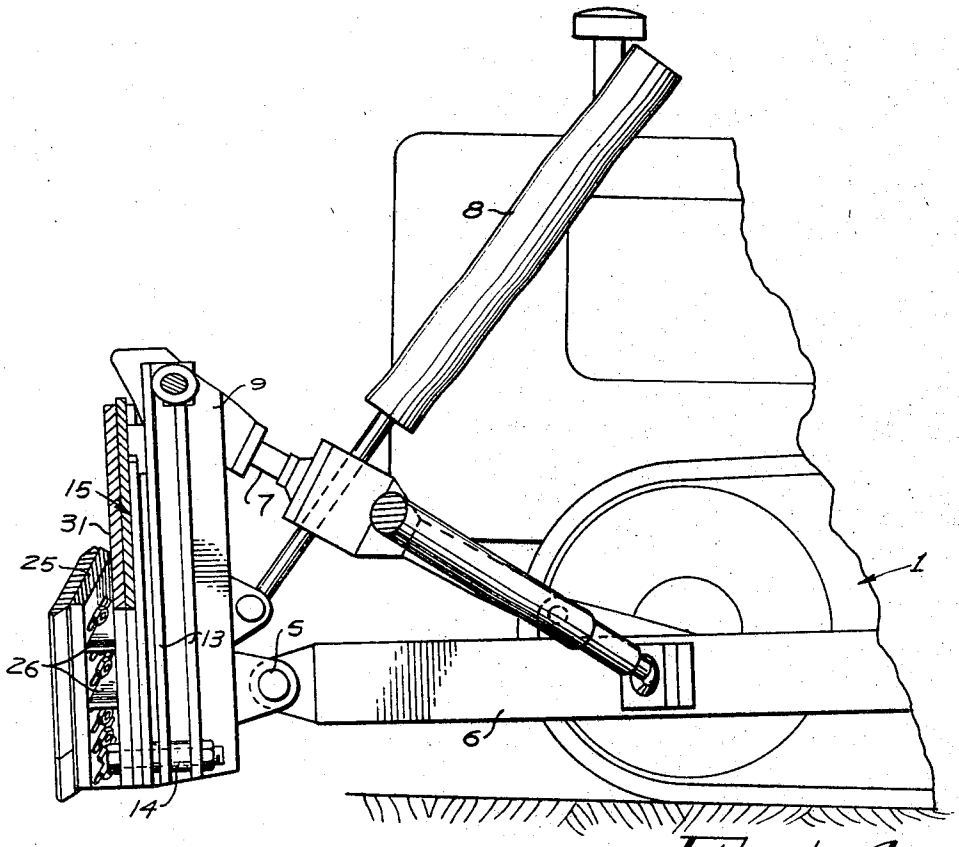

FIG. 4

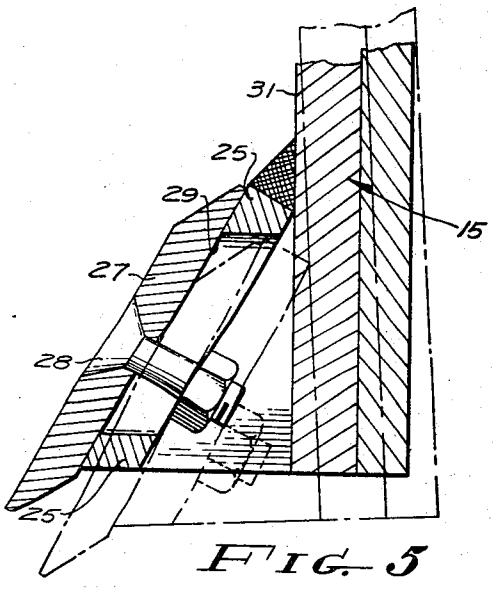

FIG. 5

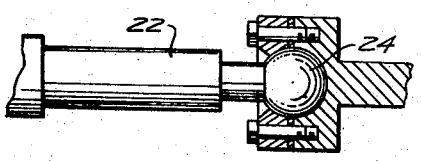

FIG. 6

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SLOPE GRADER FOR BULLDOZERS

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Int. Cl. E02f 3/80

ABSTRACT OF THE DISCLOSURE

A slope grader which is provided with a triangular blade hinged about a vertical axis to one lateral end of a bulldozer blade and a slope grader blade is pivotally connected to the lower apex of the triangular blade, the slope grader blade being angularly adjustable and braced and the three blades presenting a continuous surface irrespective of the angular position of the slope grader blade.

Summary of the invention

This invention relates to slope graders for bulldozers; more particularly to apparatus adapted to be located at one side of a bulldozer blade and extend laterally and upwardly therefrom for the purpose of grading a slope bordering a level area.

Included in the objects of this invention are:

First, to provide a slope grader for bulldozers which is secured to the bulldozer blade so as to be both elevated and tilted therewith.

Second, to provide a slope grader having means for adjusting the angular position of the slope grading blade.

Third, to provide a slope grader which incorporates a novel panel which closes the space between the mold plate above the bulldozer blade and the mold plate above the slope grading blade irrespective of the adjustment of the slope grading blade.

Fourth, to provide a slope which comprises a hinge having a vertical axis and secured to a lateral margin of a bulldozer mold plate; a beam pivotally connected to the lower end of the hinge for movement about a horizontal axis; a grading blade and mold plate carried by the beam; a hydraulic thrust unit attached to the top of the hinge and to the extremity of the beam for changing the slope angle of the grading blade; an adjustable brace connected between the bulldozer chassis and the extremity of the beam for adjusting the beam grading blade and mold plate about the axis of the hinge; and a panel secured to the hinge and overlapping the mold plate to close the gap between the bulldozer mold plate and the grading blade mold plate.

With the above and other objects in view as may appear hereinafter, reference is directed to the accompanying drawings in which:

FIGURE 1 is a front view of the slope grader for bulldozers, a portion of the bulldozer being shown fragmentarily, and the slope grader being shown fragmentarily and by broken lines in an elevated position;

FIGURE 2 is a plan view of a slope grader with the bulldozer and tractor shown fragmentarily;

FIGURE 3 is an enlarged fragmentary perspective view taken from the backside of the slope grader and representing the portion within circle 3 of FIGURE 1;

FIGURE 4 is a sectional view of the slope grader taken through 4—4 of FIGURE 1 and also showing in side elevation and fragmentarily adjacent to portions of the bulldozer and tractor;

FIGURE 5 is an enlarged fragmentary sectional view taken through 5—5 of FIGURE 1;

FIGURE 6 is a fragmentary sectional view taken through 6—6 of FIGURE 2.

The slope grader is intended to be mounted on a tractor 1 equipped with a bulldozer 2. The bulldozer includes a suitable frame which supports an essentially vertically disposed mold plate 3 having a scraping blade 4 along its lower margin. The backside of the bulldozer frame is connected by pivots 5 to a pair of forwardly extending thrust beams 6 which are in turn connected to the tractor by means not shown.

A hydraulically operated tilting unit 7 extends from the thrust beam 6 to the upper margin of the bulldozer frame for tilting the bulldozer frame about the axis of the pivots 5. The bulldozer frame is also connected to the tractor by a pair of elevator units 8. The tilting and elevator units are controlled by the tractor operator.

The slope grader is secured to the bulldozer frame and to the mold plate 3 by a mounting plate 9 which is welded to one lateral side thereof. The mounting plate forms an element of a hinge structure 10 comprising hinge elements 11 defining an axis essentially parallel to the plane of the bulldozer frame that is an essentially vertical axis. The hinge elements are joined by a pin 12.

The hinge structure also includes a movable bar 13 connecting one set of hinge elements. The movable bar may be in the form of a channel member and its lower extremity may form a one element of a pivotal connection 14 at right angles to the pin 12; that is, parallel to the forward-rearward axis of the tractor. The pivotal connection 14 joins the bar 13 to a beam structure 15. The beam structure has a general configuration of an obtuse triangle with one apex located contiguous to one lower lateral corner of the scraping blade 4. This end of the scraping blade is provided with a laterally and downwardly extending side toe 16 which overlaps the adjacent apex of the beam structure 15 a short distance.

An elevating unit 17 is joined by a pivotal connection 18 to the upper extremity of the hinge structure 10 and is joined by a second pivotal connection 19 to the rearside of the beam structure 15 near its lateral extremity. The beam structure is connected to the tractor 1 preferably to one of the thrust beams 6, by means of an adjustable brace 20 which comprises a central tube 21 and end bars 22 which may be adjustably secured to the tube 21 by bolts 23. The extremities of the end bars 22 are joined by ball joints 24 to the lateral extremity of the beam structure 15 and to the side of the thrust beam 6. The ball joints preferably have a range of movement in excess of 30°.

The lower margin of hypotenuse side of the beam structure 15 is provided with a downwardly and forwardly directed continuous mounting bracket 25 reinforced at its underside by ribs 26 extending between the bracket and the lower margin of the beam structure. The forward side of the mounting bracket 25 receives a grading blade 27 secured thereto by bolts 28 which are received in slots 29 formed in the bracket 25 so that the grading blade 26 may be vertically adjusted. Adjacent the bulldozer blade a short section 30 of the grading blade is separably removable to provide access set to the pivotal connection 14 and for purposes of replacement inasmuch as this end of the grading blade receives the most wear.

The front side of the beam structure 15 forms a mold plate 31. The mold plate may be coextensive with the beam structure and thus is in the form of an obtuse triangle. The angular margin 32 extending upwardly from the pivotal connection 14 diverges from the hinge structure 10. Secured to the movable bar 13 of the hinge structure is a mold panel 33 in the form of a segment having an upper arcuate edge 34. The extremity of the mold panel extends behind the margin 32 of the mold plate 31. The lower end of the mold panel 33 is incor-

porated into the pivotal connection **14** so as to be retained contiguous to the backside of the mold plate **31**. The upper extremity of the mold panel **33** is held in contiguous relation to the mold plate **31** by means of a retainer **35** welded to the mold plate **31** and overlying the arcuate upper edge **34** as shown best in FIGURE 3.

Operation of the slope grader is as follows:

The mounting plate **9** and its set of hinge elements and the universal joint **24** secured to the thrust beam **6** form a permanent part of the tractor and bulldozer. That is, the slope grader may be attached or separated by insertion or removal of the hinge pin **12** and by connecting or disconnecting one of the universal joints **24**.

The slope angle of the grading blade **27** may be adjusted by operation of the hydraulic operating unit **17**. The degree of arcuate adjustment is dependent upon the mold panel **33** as it is essential that the adjacent margins of the mold panel and the mold plate overlap so that a continuous mold surface is presented extending from the tip of the grading blade **27** to the bulldozer mold plate **3**. It will be noted that the vertical depth of the mold plate **31** increases towards the bulldozer mold plate **3** and that the mold panel **33** also increases in vertical depth towards the mold plate **3**. This is highly desirable for as the earth is removed, it tends to accumulate at the juncture of the slope grader and the bulldozer unit.

In addition to the angular adjustment afforded by the elevating unit **17**, the slope grader is also adjusted in position by movement of the bulldozer; that is, the slope grader may be raised bodily or its upper margin may be tilted forward or backward. The resulting compound movements are made possible by the ball connections **24**, which provide the necessary bracing of the slope grader for all positions thereof.

For some operations it is desirable that the slope grader be pivoted about the axis of the hinge structure so as to extend forwardly or rearwardly with respect to the transverse plane of the bulldozer. This is not an adjustment which is required during the course of operation of the slope grader, therefore, this adjustment is accomplished by removing the bolts **23** and extending or retracting the end bars **22**. However, should it be desirable to control this adjustment from the tractor, a hydraulic power unit may be substituted.

The term "tractor" as herein used is intended to cover not only the type shown by any type or vehicle capable of supporting the slope grader; and, similarly, the term "bulldozer" is intended to cover any type of blade or scraper intended to push a body of earth.

While there has been described what is at present considered the preferred embodiment of the invention, it will be understood that various changes and alternations may be made therein, without departing from the essence of the invention and is intended to cover herein all such changes and alterations.

We claim:

1. A slope grader for a tractor having an essentially vertically disposed bulldozer blade at the forward end thereof capable of being raised and lowered as well as tilted, said slope grader comprising:

(a) a hinge structure secured to one lateral margin of said bulldozer blade, said hinge structure being substantially coextensive with the height of said bulldozer blade and defining an essenitally vertical axis;

(b) a triangular blade joined continuously along one side of said hinge structure and forming therewith a closed lateral extension of said bulldozer blade;

(c) a pivot at the lower apex of said triangular blade defining a horizontal axis;

(d) a laterally extending slope grading blade having a margin overlapping the extended margin of said triangular blade and joined thereto by said pivot; said slope grading blade and said triangular blade having mutually engaging relatively slidable means to permit pivotal movement of said slope grader blade about the axis of said pivot while maintaining a closed connection with said triangular blade;

(e) extensible and retractable means joining the upper end of said hinge structure and upper margin of said slope grader blade for raising and lowering said slope grader blade about the axis of said pivot;

(f) and a variable length brace means extending between said slope grader blade and said tractor;

(g) said bulldozer blade, triangular blade and slope grading blade presenting a continuous wall irrespective of the position of said slope grading blade.

2. A slope grader, as defined in claim **1**, wherein:

(a) said bulldozer blade includes a side toe partially overlapping said pivot.

3. A slope grader for a tractor having an essenitally vertically disposed bulldozer blade at the forward end thereof capable of being raised and lowered as well as tilted, said slope grader comprising:

(a) a triangular blade having a margin forming a continuous closed connection with one lateral margin of said bulldozer blade, and having a lower apex coinsiding with the bottom margin of said bulldozer blade;

(b) a pivot at the lower apex of said triangular blade defining a horizontal axis;

(c) a laterally extending slope grading blade having a margin overlapping the extended margin of said triangular blade and joined thereto by said pivot; said slope grading blade and said triangular blade having mutually engaging relatively slidable means to permit pivotal movement of said slope grader blade about the axis of said pivot while maintaining a closed connection with said triangular blade;

(d) means for raising and lowering said slope grader blade about the axis of said pivot;

(e) and a variable length brace means extending between said slope grader blade and said tractor;

(g) said bulldozer blade, triangular blade and slope grading blade presenting a continuous wall irrespective of the position of said slope grading blade.

4. A slope grader, as defined in claim **3**, wherein:

(a) said bulldozer blade includes a side toe partially overlapping said pivot.

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