United States Patent [19]

Beyers et al.

[11] **3,744,568**

[45] **July 10, 1973**

[54] **MOTOR GRADER WITH POWER ACTUATED SIDE CASTING MEANS**

[75] Inventors: **Marvin E. Beyers; James A. Bockhaus,** both of Peoria; **Robert N. Stedman,** Chillicothe, all of Ill.

[73] Assignee: **Caterpillar Tractor Co.,** Peoria, Ill.

[22] Filed: **Mar. 9, 1972**

[21] Appl. No.: **233,334**

Related U.S. Application Data

[63] Continuation of Ser. No. 15,664, March 2, 1970, abandoned, which is a continuation-in-part of Ser. No. 735,063, June 6, 1968.

[52] **U.S. Cl.** **172/33,** 172/785, 37/109

[51] **Int. Cl.** **A01b 3/00**

[58] **Field of Search** 172/63, 73, 33, 784, 172/785, 759, 438, 787; 37/109, 110, 112

[56] **References Cited**

UNITED STATES PATENTS

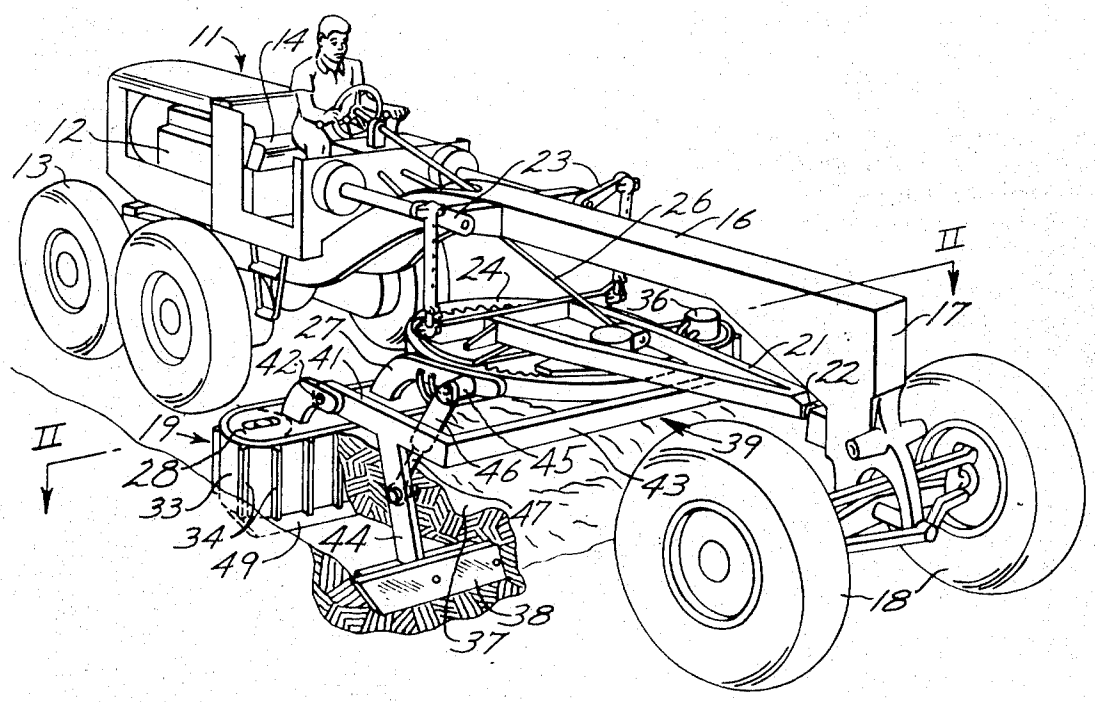
3,459,268	8/1969	Forster	172/63
1,999,226	4/1935	Wold	172/785
460,919	10/1891	Lasher	172/33
1,617,538	2/1927	Mowbray	172/33
1,816,389	7/1931	Moberg	172/33

Primary Examiner—Robert E. Pulfrey
Assistant Examiner—R. T. Rader
Attorney—Franklin D. Wolffe

[57] **ABSTRACT**

A motor grader has a cutting blade spaced forward from a power driven conveyor belt that extends parallel to the blade. The cutting blade loosens a layer of earth which passes over the blade and is subsequently intercepted and cast to one side by the belt. A second blade may be carried beneath the belt to provide a smooth finish cut. The mechanism efficiently side casts earth without requiring that the effective width of cut be reduced by conventional angling of the blade structure.

6 Claims, 3 Drawing Figures



PATENTED JUL 10 1973

3,744,568

Fig. 1.

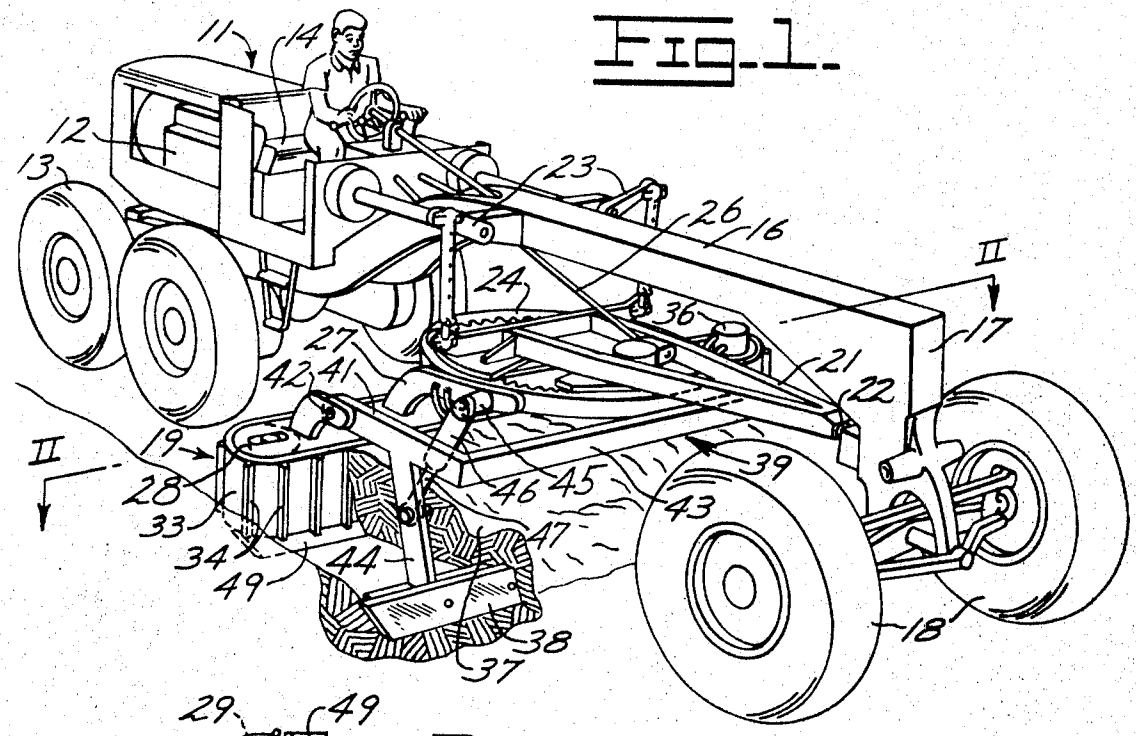


Fig. 2.

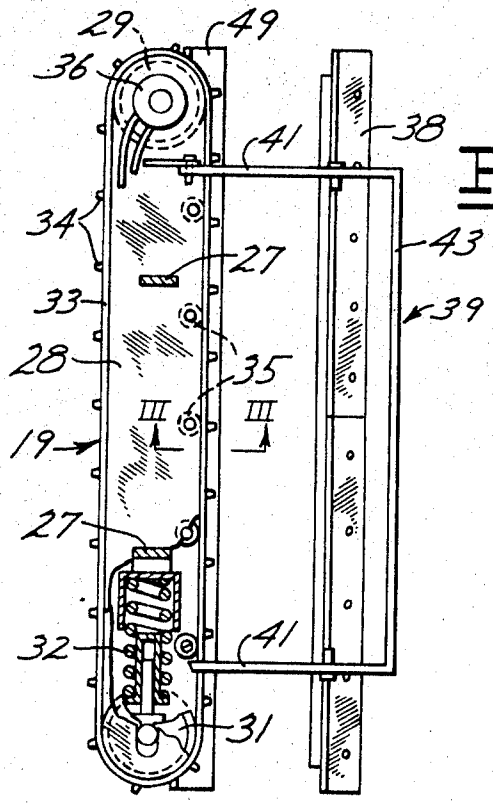
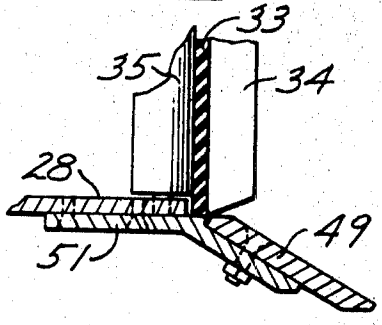


Fig. 3.



INVENTORS
MARVIN E. BEYERS
JAMES A. BOCKHAUS
ROBERT N. STEDMAN

BY
Fryer, Tjensvold, Feix, Phillips & Lempio
ATTORNEYS

MOTOR GRADER WITH POWER ACTUATED SIDE CASTING MEANS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of copending application Ser. No. 15,664 now abandoned of the present inventors, filed Mar. 2, 1970, which is in turn a Continuation-in-part of copending application Ser. No. 735,063 of the present inventors, filed June 6, 1968 and entitled Motor Grader with Power Actuated Side Casting Means.

BACKGROUND OF THE INVENTION

This invention relates to earthworking equipment and more particularly to a side casting blade mechanism for a motor grader or the like.

In the operation of a conventional motor grader, it is customary to angle the blade or moldboard with respect to the line of travel of the vehicle so that earth which is removed by the blade will travel to one side of the vehicle and be deposited in a windrow. Angling of the blade is reasonably effective for this particular purpose under many working conditions although difficulties are encountered in certain types of operation, such as cleaning ditches, where the graded material must move uphill. Under the best of conditions, angling of the blade has the very undesirable result of reducing the effective width of the cut. As a consequence, more passes of the motor grader are required to work a given area than would otherwise be the case.

Attempts have heretofore been made to relieve this problem by utilizing an endless chain type of conveyor at the blade. In such constructions, material may be carried to one side of the cut without requiring any angling of the blade so that a maximum area can be worked at each pass. As heretofore constructed, these mechanisms have not been fully satisfactory. In these prior constructions, the conventional moldboard or blade is replaced by the conveyor which must then perform the actual earth cutting operation in addition to side casting the material. Such a conveyor is exposed to severe wear and possible damage while being costly to replace. The combination cutting element and conveyor generates considerable resistance to forward movement of the vehicle. Adjustment of depth of cut tend to alter the slope of the cut and load forces on the conveyor are not particularly effective to counteract bounce of the vehicle which is a particularly severe problem with rubber tired motor graders. Possibly because of these factors, motor graders of this form have not been extensively used.

SUMMARY OF THE INVENTION

This invention increases the operating efficiency of motor graders by providing for the side casting of material without requiring angling of the cutting element in a construction which relieves the disadvantages discussed above. In particular, earth cutting is effected with a blade spaced well forward from a powered conveyor belt which intercepts earth that passes over the cutting blade and carries the material to a windrow at one side of the vehicle. In a preferred form, the forward cutting blade may be adjusted vertically relative to the conveyor to change the depth of cut without disturbing slope and a second cutting blade is situated immediately below the conveyor belt to provide a relatively small finish cut. The construction efficiently moves earth to one side of the vehicle without requiring angling of the cutting edge and without utilizing the conveyor belt for performing the earth cutting operation. The layer of earth passing over the forward blade has the further advantage of pulling down on the vehicle to dampen bounce.

Accordingly, it is an object of this invention to increase the efficiency and versatility of motor grader operations.

It is another object of the invention to provide a powered side casting mechanism for a motor grader which is more durable and less subject to damage, wherein changes in depth of cut may be effected without disturbing the slope of the cutting edge, wherein undesirable bounce of the vehicle is dampened and which reduces resistance to forward movement of the vehicle.

The invention, together with further objects and advantages thereof, will best be understood by reference to the following description of a preferred embodiment in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a perspective view of a motor grader having powered side casting means in accordance with the present invention;

FIG. 2 is a plan section view taken along line II—II of FIG. 1 further illustrating the cutting blades and powered side casting mechanism of the motor grader; and

FIG. 3 is an enlarged fragmentary section view taken along line III—III of FIG. 2 clarifying the construction of certain elements thereof.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now initially to FIG. 1 of the drawing, a motor grader vehicle **11** to which the invention is applicable typically includes an engine **12** riding on rear wheels **13** with an operator's station **14** being situated forward from the engine and has an arched mainframe member **16** which extends forward from the operator station to a bolster **17** riding on front wheels **18.** The cutting blade assembly **19,** to be hereinafter described in more detail, is carried on the underside of a triangular drawbar assembly **21** which has a forward end coupled to bolster **17** by a universal coupling such as a ball and socket joint **22.** Motor grader **11** has a pair of conventional lift mechanisms **23,** each coupled to an opposite side of drawbar **21,** which may be controlled from the operator station **14** to raise or lower the cutting blade assembly **19.** As is well understood in the art, simultaneous operation of both lift mechanism **23** raises or lowers the blade assembly **19** while differential operation of the lift mechanisms provides for changing the slope of the cutting blade assembly. Cutting blade assembly **19** is attached to the drawbar **21** through a blade circle **24** which may be selectively rotated from the operator's station, through conventional linkage **26,** to selectively vary the angle of the cutting blade assembly relative to the direction of travel of the vehicle. While the present invention is designed to avoid a need for angling under most working conditions, there are specialized situations where this may still be desirable and thus it is useful to provide the conventional blade circle rotating mechanism.

Considering now the construction of the cutting blade assembly **19**, with reference to FIGS. **1** and **2** in conjunction, brackets **27** depend from opposite sides of the blade circle **24** to support a conveyor mounting member **28.** Mounting member **28** is normally carried in a substantially transverse relationship to the direction of travel of the vehicle but may be angled and sloped and raised and lowered by adjustment of the controls hereinbefore described. A drive drum **29**, rotatable about a vertical axis, is disposed at one side of the mounting member **28** and an idler drum **31** is disposed at the opposite side and is acted on by spring tensioner means **32** which urges the idler drum away from drive drum **29.** An endless belt **33**, preferably having grousers **34**, is trained over drums **29** and **31** and may be formed of reinforced rubber or have a chain link construction of the kind commonly used on conveyors. A plurality of vertical rollers **35** are carried on member **28** immediately behind the forward portion of belt **33** to resist deformation of the belt. A hydraulic motor **36** supported on member **28** drives drum **29** to turn the drum and thereby drive the belt **33.** Thus, any earth **37** which piles against the forward face of the belt **33** as the motor grader moves forward is carried to one side of the vehicle and deposited in a windrow.

An independently adjustable forward cutting blade **38** is situated a substantial distance in front of the belt **33** to perform the actual earth cutting operation. In contrast to the conventional motor grader cutting blade, blade **38** is narrow and is inclined only slightly relative to a horizontal plane. Thus, a superficial layer of cut earth readily passes over the blade as the vehicle moves forward and little or no bulldozing of earth by the blade **38** occurs.

To support the forward blade **38** a frame **39** has a pair of arms **41** extending forward from the top of mounting member **28** on opposite sides of blade circle **24** with the arms being joined to the frame by pivot joints **42** which provide for pivoting of the frame about an axis parallel to the blade **38** and belt **33.** The forward ends of arms **41** are connected by a cross member **43** and the frame has downwardly directed extensions **44** which secure the forward cutting blade **38** to each of the frame arms **41.**

To provide for adjusting the depth of cut of blade **38** without disturbing the alignment of side casting belt **33,** frame **39** may be pivoted about joints **42** by a pair of hydraulic jacks **46** controlled from the operator's station. For this purpose brackets **45** are provided to support jacks **46** having rods **47** disposed substantially vertical on opposite sides of circle **24.** Rods **47** are pivotally attached to frame extensions **44** and with jacks **46** thereby afford the desired vertical adjustment of frame **39.** Thus contraction of the jacks **46** raises the frame **39** including forward cutting blade **38** while extension of the jacks lowers the cutting blade. It should be appreciated that a simpler screw adjustment may be provided for pivoting frame **39** relative to the blade circle but the hydraulic jack arrangement is highly desirable in that adjustments may be made from the operator's station in the course of operation.

Referring now to FIGS. **2** and **3** in conjunction, a second rear cutting blade **49** is secured to the underside of mounting member **28** and extends a small distance forward and downward thereform to provide a precision finish cut. The second blade **49** is secured to an angled bracket **51** which is in turn secured to the underside of mounting member **28.** Bracket **51** preferably extends forward from the underside of member **28** a short distance beneath the belt **33** whereby the belt rides upon the bracket and is supported against sagging.

In operation, the work of cutting virgin soil is performed by the relatively strong and abrasion resistant cutting blade **38** causing a superficial layer of earth **37** to ride over the blade and accumulate immediately forward of belt **33.** The accumulated earth **37** is continually cast to one side by movement of the belt **33** which under many conditions need not be angled. Thus, the width of the cut on each pass may be maximized and a correspondingly smaller number of passes is required for working a given area. Angling of the blade may be desirable in bank cutting or such operations as cleaning irrigation ditches and the like to facilitate uphill movement of earth. The side casting mechanism provides a much more efficient system for this purpose. Further advantages are inherent in the structure in that the forward blade **38** inherently tends to resist upward bouce of the motor grader **11** and high precision grading is accomplished in that a small finishing cut is made by the second blade **49.**

Modifications of the invention are possible and it is not intended to limit the invention except as defined in the following claims.

What is claimed is:

1. A grading mechanism for an earth-working vehicle comprising:

a forward single continuous earth loosening cutting blade at least as wide as said vehicle positioned transverse to and across the vehicle,

mounting means attaching said forward blade to said vehicle in substantially transverse relationship thereto whereby said blade undercuts a surface layer of earth over which said vehicle travels and guides said layer of earth above and over said forward cutting blade,

an endless conveyor belt supported by said mounting means rearwardly of said forward blade in a spaced relationship thereto and in substantially transverse relationship to said vehicle for intercepting said earth cut by said forward blade, and

motor means driving said belt whereby said intercepted earth is carried to one side of said vehicle, the earth intercepting area of said belt being at least as wide as said vehicle and is substantially parallel to said forward blade when said blade is positioned transversely of said vehicle.

2. The combination defined in claim **1** wherein said mounting means comprises a support for said conveyor belt and a frame extending forwardly therefrom to support said forward blade, said frame being pivotally coupled to said conveyor belt support, further comprising selectively adjustable means attached to said frame and said conveyor belt support for pivoting said frame relative to said conveyor belt support whereby the depth of said forward blade may be adjusted without altering the position of said conveyor belt.

3. The combination defined in claim **1** further comprising a rear earth cutting blade secured to said mounting means below said conveyor belt in substantially transverse relationship to said vehicle for providing a finish cut.

4. The combination defined in claim **2** wherein said rear cutting blade extends forwardly beneath the lower edge of said belt to provide a belt supporting shelf

below said lower edge of said belt to prevent sagging thereof.

5. In a motor grader having earth-working blade support means with means for selectively raising and lowering said blade support means and means for selectively changing the slope of said blade support means, earth-cutting mechanism comprising:

mounting means secured to said blade support means and extending substantially transversely relative to the direction of travel of said vehicle, an endless conveyor belt supported on said mounting means for intercepting a surface layer of earth as said vehicle travels over the ground, the earth intercepting area of said belt being at least as wide as said vehicle,

a forward single continuous earth-loosening cutting blade at least as wide as said vehicle, attached to said mounting means and spaced forwardly from said conveyor belt, said blade cutting said surface layer of earth as said vehicle travels over the ground whereby said layer of earth passes over said forward cutting blade to be intercepted by said conveyor belt, and

a motor operatively coupled to said belt whereby said intercepted earth is delivered in a windrow at one side of said vehicle by said belt, said forward blade and the earth intercepting portion of said belt being substantially parallel when said blade is positioned in said transverse direction.

6. The combination defined in claim **5** further comprising means for raising and lowering said forward cutting blade relative to said conveyor belt, means for raising and lowering said conveyor belt and said forward blade as a unit and means for sloping said conveyor belt and said forward blade as a unit.

* * * * *