Sept. 10, 1968 R. Y. HERMIZ 3,400,767

POWER ANGLING BULLGRADER

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Fig. 1.

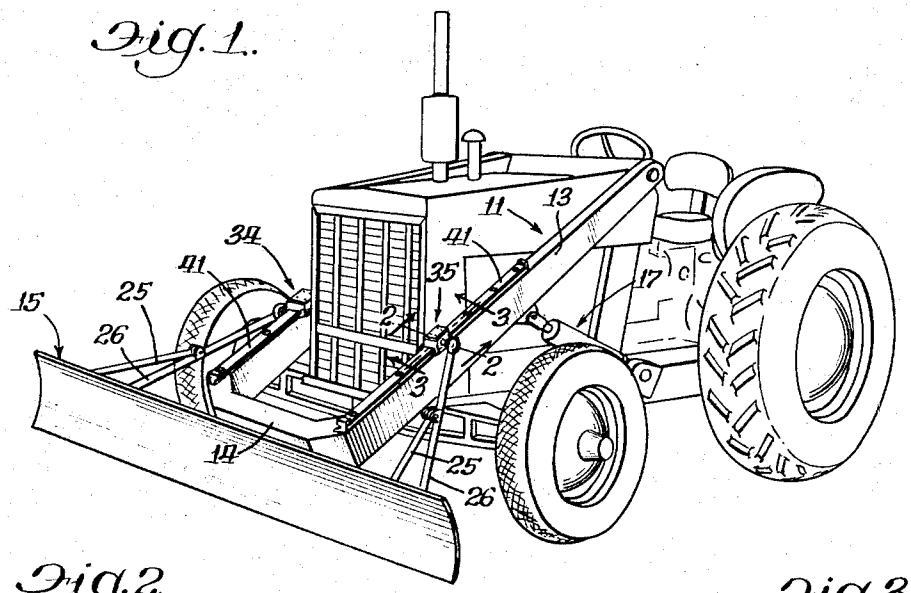


Fig. 2.

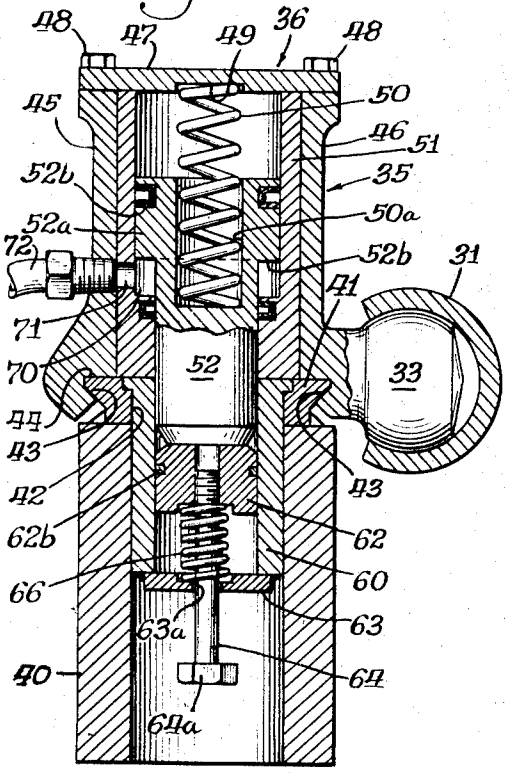
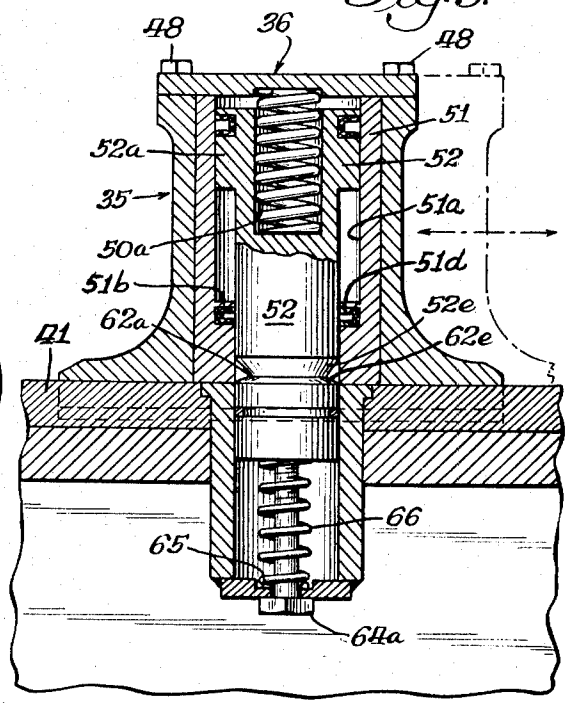


Fig. 3.



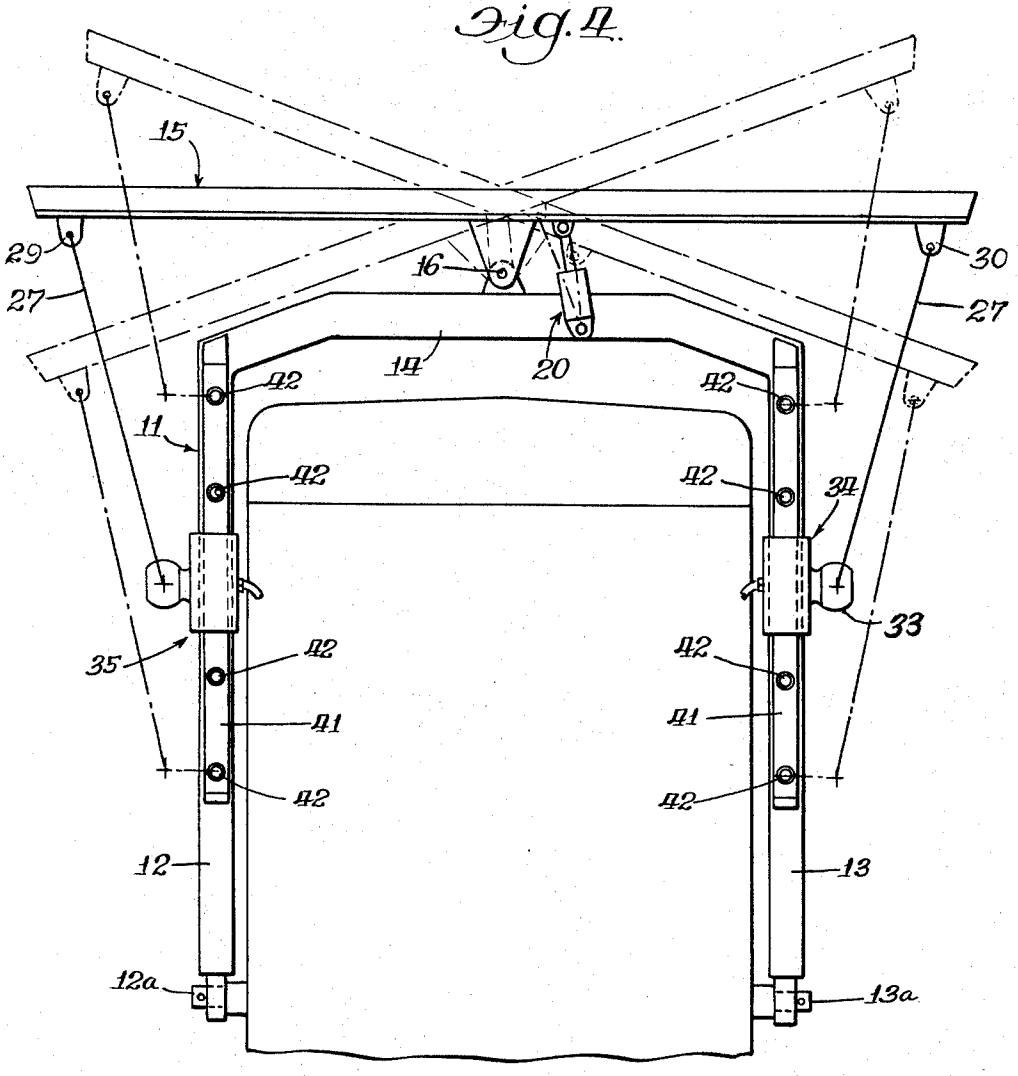
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POWER ANGLING BULLGRADER

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Fig. 4.



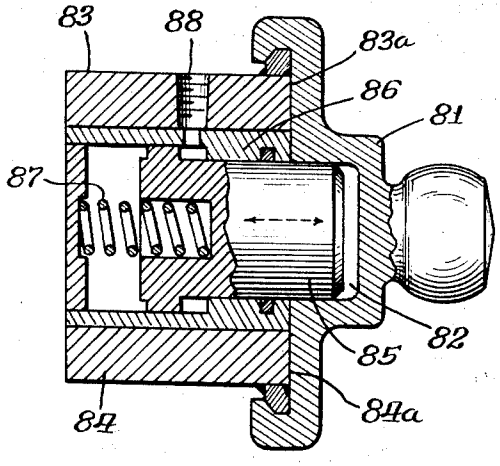


Fig. 5.

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POWER ANGLING BULLGRADER

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7 Claims. (Cl. 172—805)

ABSTRACT OF THE DISCLOSURE

Power angling bullgrader having a supporting frame with longitudinal side arms, a blade angulatingly supported on the front of the frame, longitudinal struts trailing from pivots on the blade ends, a cooperating slide and slider interconnecting the trailing end of the strut at each side of the bullgrader and the side arm at that side, a lock on each slide and slider, including a power cylinder and a pin operated thereby to lock the slider in selected longitudinal positions on the slide, and a power cylinder to pivot the blade, when the lock pins unlock same, into a selected position of angularity.

This invention relates to bullgraders and more particularly to a type known as power angling bullgrader in which the blade is shiftable angularly of the longitudinal axis of the implement; i.e., so as to shunt the load to one side or another of the path of the implement.

It is an object of the invention to provide in such an implement power actuated means for shifting the blade including releasing the blade from one position of angular adjustment, moving it to another position of adjustment, and securing it in the latter position.

A second object of the invention is the provision of means for distributing the load heretofore borne to a great extent by the power means for shifting the blade, thus lessening wear and tear thereon and increasing the stability and efficiency of the implement.

Another object of the invention is to utilize the basic hydraulic system of such an implement in the actuation of such means, thereby saving time, labor and expense.

Other objects and uses of the invention will appear from the description which follows.

In the drawings:

FIG. 1 is a schematic view in perspective of a tractor equipped with an embodiment of the invention;

FIG. 2 is a vertical section along the line 2—2 of FIG. 1;

FIG. 3 is a sectional view in the direction indicated by line 3—3 of FIG. 1, illustrating a different position of adjustment;

FIG. 4 is a fragmentary schematic plan view of an embodiment of the invention with the blade of the implement indicated (broken lines) in selected positions of adjustment;

FIG. 5 is a sectional view of a modified form of the invention.

Referring to FIGS. 1 and 4, the invention comprises a C-frame **11** having rearwardly extending, generally parallel sidearms **12, 13** whose end portions **12***a*, **13***a* are adapted to be received in conventional sockets (not shown) supported on the frame of a tractor for pivotal movement about a common horizontal axis. Transverse portion **14** of C-frame **11** is conventionally arranged to support a blade unit **15** for pivotal movement about a vertical axis through pin **16**. Conventional linkage **17** is provided for maintaining the C-frame in selected positions of adjustment in relation to said horizontal axis.

Actuating means in the form of a conventional hydraulic cylinder **20** is operatively arranged between C-frame **11** and blade unit **15** in selected spaced relation

with pin **16** to shift blade unit **15** angularly to positions of adjustment as indicated in broken lines—to the right and to the left.

Upper and lower strut assemblies **25, 26** have a forward end portion **27** connected at **29, 30**, respectively, to blade unit **15** for universal movement in relation thereto, and a rearward end portion **31** supported for universal movement in relation to ball joint members **33** of slide assemblies **34, 35** carried by sidearms **12, 13**. The slide assemblies are operatively connected with a conventional hydraulic system of the implement and arranged to operate selectively to adjust the position of blade unit **15** in angular relation to the longitudinal axis of the implement. This is accomplished through coordinated operation of the hydraulic cylinder **20** to shift blade unit **15** and slide assemblies **34, 35**.

Slide assemblies **34, 35**, which comprise a housing **36**, are arranged for sliding movement along the sidearms **12, 13**, to and from selected positions of adjustment, in the following manner.

Sidearms **12, 13** comprise channel members **40** on which are mounted rails **41** provided with spaced holes or pin sockets **42** and flaring side portions **43** disposed and arranged to provide slideways **44** for the slide assemblies.

Slide assemblies **34, 35** are correspondingly arranged. Housing **36** thereof comprises opposed side wall members **45, 46** to the upper portions of which top plate **47** is removably secured by bolts **48**. The lower portions of members **45, 46** are arranged conformably with rail portions **43** for sliding relation therewith in mortise and tenon fashion.

The underside of plate **47** has a central cutaway portion **49** which serves as a seat for the upper end of a coil spring **50** which is disposed centrally of housing **36** for actuation along a vertical axis.

Interiorly of the housing **36** a sleeve bearing **51** is arranged for receiving a loading pin **52** coaxial with spring **50**, in up and down slidable relation between predetermined limits, the lower end of spring **50** being seated in a cutaway portion **50***a* of pin **52**. For this purpose pin **52** has an enlarged circumferentially extending portion **52***a* providing shoulders **52***b*, **52***c*. Sleeve **51** has an enlarged portion **51***a* to accommodate vertical movement of pin **52** in the desired path. Upward vertical movement of pin **52** is limited in relation to sleeve **51** by spring **50**; downward movement, by shoulder **51***b*.

Spring **50** is arranged normally to bias pin **52** in its lowermost position.

Oil seals **51***d* are arranged adjacent opposing faces of shoulders **51***b*, **52***b* to provide an intermediate oil-tight compartment **70** into which hydraulic fluid may be introduced in a conventional manner to move pin **52** upwardly against the bias of spring **50**. To this end fluid inlet **71** is provided in sidewall **13**, a suitable connection **72** being provided between inlet **71** and the conventional hydraulic system with which cylinder **20** is associated.

Sockets **42** of rails **41** and side arms **12, 13** are provided with sleeves **60** for receiving a closing pin **62** of diameter corresponding with that of pin **52** in slide bearing relation.

Sleeves **62** are closed at their lower end by a bottom plate **63** which has a central bore **63***a* for receiving a bolt **64** in vertical slidable relation, the upper end of bolt **64** being threaded in pin **62**. Plate **63** has a central cutaway portion **65** which provides a seat for one end of a coil spring **66**—relatively weaker than spring **50**—the other end being similarly seated in the lower end of pin **62**.

Spring **66** and the associated parts described are so arranged to operate that pin **62** is normally biased in uppermost position (FIG. 3) when its upper end or nose **62***a* protrudes from socket **42** slightly upward of the

upper surface of rail 41; upperward movement of pin 62 in relation to the outer surface of plate 63 being limited by bolt head 64*a*. A scraper ring 62*b* carried by pin 62 is arranged to provide a close, flexibly slidable relation between pin 62 and sleeve 60.

Slide assemblies 34, 35, rails 41, pin sockets 42, and their associated parts are so conformed and arranged to operate in relation to one another and to the aforesaid hydraulic system, including cylinder 20, that when a slide assembly is in operative position on a rail 41 intermediately of sockets 42, but stationary—no hydraulic pressure being applied—the lower extremity of pin 52 under pressure of spring 50 will bear upon the upper surface 44 of rail 41, and the noses 62*a* of pins 62 under pressure of spring 66 will protrude slightly from sockets 42.

When it is desired to angle or shift blade unit 15 to a selected angular working position hydraulic fluid under pressure is applied to cylinder 20 accordingly. Fluid under pressure is then introduced into the fluid compartments 70 of slide assemblies 34, 35 to overcome the bias of spring 50 and release the slide assemblies for movement along rails 41. Force applied through strut assemblies 25, 26 and 27, 28 and ball joint members 33 then causes corresponding movement of the slide assemblies along rails 41.

When a desired position of adjustment is substantially reached—this will normally coincide with approximate registry of pin 52 with a socket 42 and pin 62—hydraulic pressure on pin 52 is withdrawn. Pin 52, under pressure of spring 50, will ride upon and overcome the bias of pin 62, and upon registry therewith enter socket 42, thereupon to hold the slide assembly with which it is associated in the selected position of adjustment.

To provide resilience and smoothness of operation when the slide assemblies are shifted along rails 41, the nose portions of pins 52 and 62 are bevelled as at 52*e*, 62*e*, so that as a pin 52 approaches a socket 42 and a pin 62, the heavier loaded pin 52 will ride upon the pin 62 to depress it without substantial shock or jolt, entry of pin 52 into a socket 42 being withheld until withdrawal of fluid pressure as above indicated. Upon such withdrawal pin 52 will enter the next socket 42 reached in its movement, it being noted that movement of the slide assemblies through operation of cylinder 20 will continue notwithstanding the withdrawal of fluid pressure upon pin 52.

As is of course apparent, slide assemblies 34, 35 and their associated parts, in a sense, complement one another. When blade unit 15 is angled in one direction or another both slide assemblies are shifted correspondingly but in opposite directions, one forwardly, the other reversely, of the rail with which it is associated.

The application of fluid pressures to cylinder 20, compartments 70 and pins 52—and withdrawal therefrom—may be accomplished in a conventional manner through the utilization of well-known hydraulic means.

It will be readily understood that the invention not only eliminates much time and labor in the manual adjustment of pins in prior art structures but enables the use of larger blades and quicker angling of them. Additionally, it has the advantage of transferring much of the load in the various operations of the implement from the hydraulic cylinder to the load pins. Thus the invention greatly augments the efficiency and productiveness of the implement.

The modification of FIG. 5 represents generally a reversal of the slide assembly arrangement of FIGS. 1, 2, 3 and 4, in which a sliding element 81 is adapted to slide along the top or the side of a C-frame 82. In this arrangement there is no closing pin such as pin 62. But the C-frame 82 is provided with a housing 82*a* having wall members 83, 84 whose end portions 83*a*, 84*a* provide a slideway for slide member 81 which carries a balljoint 33 as in the case of slide assemblies 34, 35 and has a recess 82 providing a socket for locking pin 85. Pin 85 is arranged for sliding movement in sleeve 86 supported in housing 82*a*. Spring 87 biases pin 85 to locking position as shown in FIG. 5 when in registry.

The configuration of pin 85 and sleeve 86 and the arrangement of housing 82*a* generally are similar to that of FIGS. 2 and 3. Inlet 88 provides for the introduction of fluid under pressure to overcome the bias of spring 87 and retract pin 85 in like manner as in the case of pin 52.

As in the case of the first described form of the invention the modification of FIG. 5 provides a simple and effective means for accomplishing the stated objects of the invention including the provision of efficient readily operable power means for angling the blade unit of a bull-grader to and from selected positions of adjustment and for securing the blade unit in such positions and releasing it therefrom, in a manner which shifts the work load of the blade unit in substantially a direct tension and compression path from the pivot means employed in the angling operation to the securing means.

The foregoing description is to be taken as illustrative merely of the invention, and not as limiting, it being clear that there may be a variety of forms within the scope of the claims which follow.

I claim:

1. Power angling vehicle for grading or dozing work comprising:

a tractor having a supporting framework carried thereby;

a C-frame having side arm members pivoted to reaction points on the supporting framework at the sides of the tractor, said members having generally fore and aft extending parallel axes;

a lockable blade connected to angularly swing in a horizontal plane relative to the C-frame, and having blade portions integrally extending from a frame connected intermediate blade section to opposite sides of the tractor;

fore and aft extending strut members disposed at the respective sides of the tractor, in substantial longitudinal alignment with the respective side arm members and each pivotally connected to the adjacent blade portion at that side, to collectively constitute a substantially direct tension and compression path between said blade portion at each side of the tractor and the framework reaction point at that side;

lockable means disposed one on each side of the tractor for locking the blade, and each comprising a cooperating slider element and slideway element therefor, connected to the strut and side arm members and slidably related for movement of adjustment axially on the side arm member to accommodate to swinging motion of the blade, each of said connections between a slider element and strut member comprising a pivotal connection;

lock devices individual to the lockable means comprising a pin movable transversely to the axis of the adjacent side arm member into interengaging relation between registering means in the slider and slideway elements, at least one element having an individually selectable plurality of such registering means, and a remotely controlled power cylinder for interengagingly and disengagingly moving the pin between interengaged and disengaged positions relative to the selected registering means, for adjustably locking the lock device to hold the lockable means and lock the blade at a desired angle of adjustment; and

a power cylinder for pivoting the blade in a horizontal plane when unlocked.

2. The invention of claim 1, characterized by a power cylinder on the vehicle to pivot the C-frame up and down.

3. The invention of claim 1, the strut members characterized by strut assemblies each connected at the front

end to the adjacent blade portion and extending convergently rearwardly therefrom.

4. The invention of claim 1, the slider and slideway elements characterized by:

a housing having opposed sidewall members arranged for sliding movement along the slideway;

a generally tubular sleeve extending vertically of said housing centrally thereof;

said pin carried by said housing within said sleeve, for limited up and down sliding movement coaxially within said sleeve;

means on said sleeve, said sidewall members, and said pin in cooperative relation with one another for limiting up and down movement of said pin; and

spring means in said housing normally biasing said pin in lowermost position;

said power cylinder comprising means hydraulically operable upon said pin to overcome said bias and retract said pin to uppermost position.

5. The invention according to claim 4, characterized by:

the sleeve having a portion of enlarged diameter for receiving a correspondingly enlarged portion of the pin for limited up and down movement in piston-like relation, said pin being spring biased in lowermost position and retractable therefrom under hydraulic pressure;

said enlarged sleeve portion forming an oil tight compartment in the power cylinder, and said compartment being in operative communication with the hydraulic system of the tractor for receiving fluid under pressure to overcome the spring bias upon said pin and for withdrawal of said fluid to restore said bias.

6. The invention of claim 1, characterized by:

each pin arranged for limited up and down movement along its longitudinal axis and having spring biasing means;

said pin having a circumferentially enlarged portion defined by upper and lower opposed shoulders in predetermined spaced relation with one another, said spring biased pin being spring biased to lowermost position;

sockets in said slideway elements arranged in predetermined spaced relation with one another and each having a closing pin arranged therein for limited up and down movement along its longitudinal axis;

each closing pin being spring actuated in uppermost position;

each closing pin in its uppermost position having an

end portion protruding upwardly slightly beyond the upper slideway surface;

each spring biased pin having an end position receivable in said sockets in releasable interlocking relation;

said spring biased pin and said closed pin being so conformed and arranged to operate that upon coming into contact with one another as the blade is angled, the lower end portion of the spring biased pin will override the opposing closing pin.

7. The invention of claim 1, the slider and slideway elements characterized by:

a housing;

a generally tubular bearing sleeve arranged in said housing;

said pin arranged in said sleeve for limited sliding movement coaxially therewith;

spring means in said housing biasing said pin to a projected position;

said power cylinder comprising hydraulically operable means in said housing in operative communication with the hydraulic system of the tractor for overcoming the bias of said spring means and retracting said pin, and comprising means on said sleeve and said pin in cooperative relation with one another and arranged to operate in response to fluid pressure to overcome said spring means and upon withdrawal of such pressure to yield to said spring means;

said pin under said spring bias being engageable with corresponding means on said slideway element releasably to secure said slider element and said blade in selected positions of adjustment; and

said pivotal connection between the strut and slider comprising a ball joint member providing for relative angular movement therebetween.

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