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2,662,712 12/1953 Rose..... 287/58X
 2,748,901 6/1956 Brooks..... 287/58X
 3,455,400 7/1969 Hanser et al..... 172/793

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[54] **MOTOR GRADER ADJUSTMENT LINK**
1 Claim, 7 Drawing Figs.

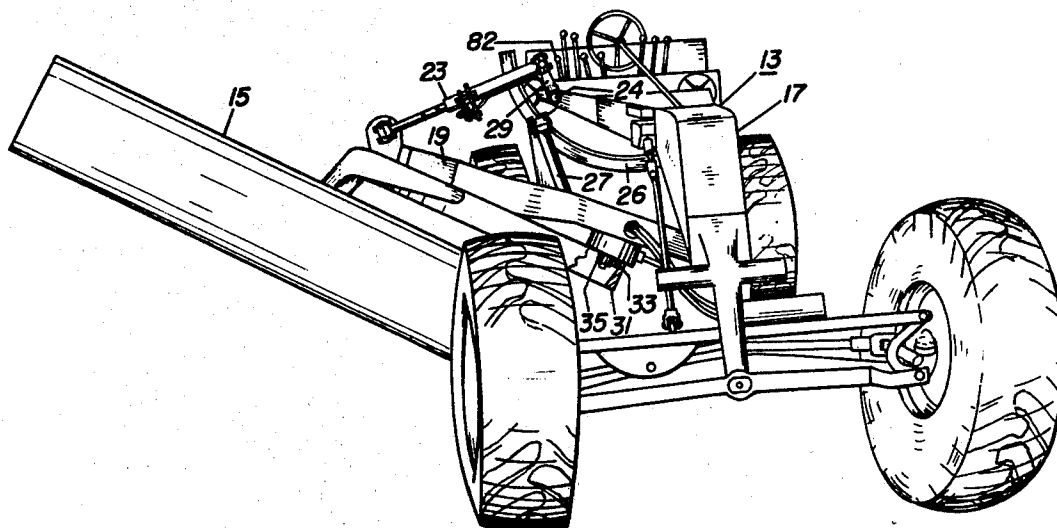
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 287/58
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 781, 484; 287/58CT; 285/302, 307; 92/18

[56] **References Cited**

UNITED STATES PATENTS

2,512,150 6/1950 Geren..... 92/18

ABSTRACT: An improved grader adjustment linkage in which first and second telescoping linkages are mounted between first and second links attached on one end to the main frame of a grader and on the opposite end to the sub-frame of the grader; the telescoping linkages consisting of first and second elongated hollow members with first and second telescoping rods therein; the hollow members having a plurality of apertures in cooperating relationship with a plurality of recesses in the rods and a plurality of hydraulically actuated locking pins for locking the rods with respect to the hollow members in any desired position and a third telescoping linkage mounted between said first and second linkages, each of said linkages being separately adjustable by means of three hydraulic valves mounted in proximity with the operator.



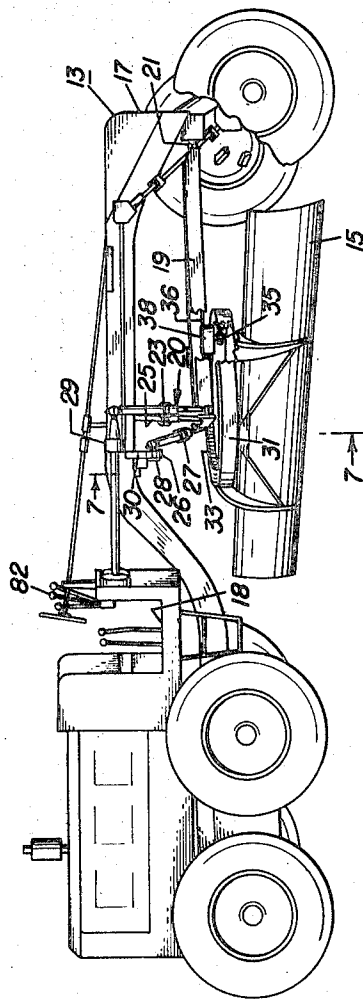


Fig. 1

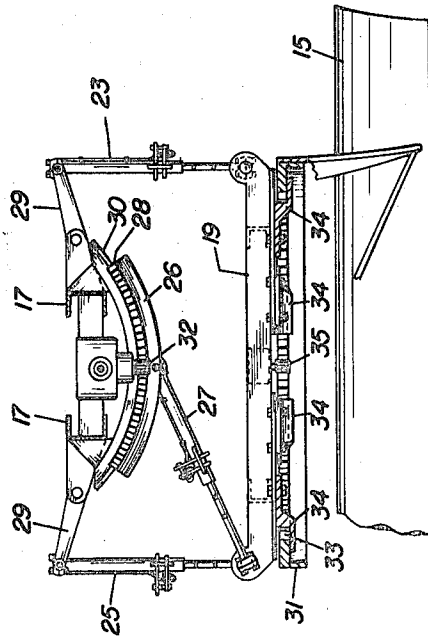
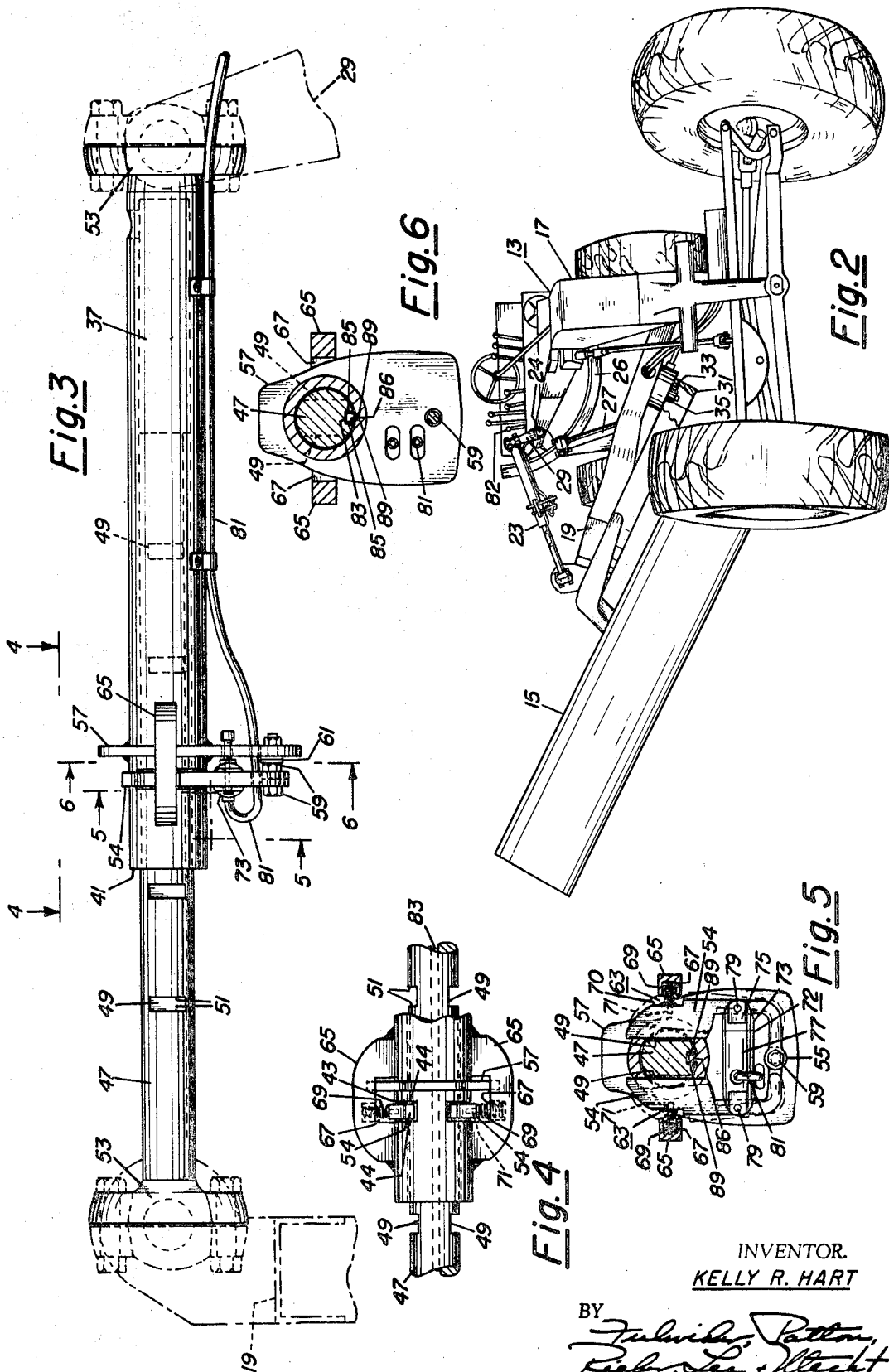


Fig. 7

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MOTOR GRADER ADJUSTMENT LINK

RELATED APPLICATIONS

This application is a substitution of an application for U.S. Letters Pat. filed by Kelly R. Hart On Feb. 2, 1966, Ser. No. 524,563 now abandoned, for MOTOR GRADER ADJUSTMENT LINK.

DESCRIPTION OF THE INVENTION

The present invention relates generally to an improved grader adjustable linkage and mechanism for actuating same and more specifically to an adjustable link that is adapted to be used with a grader that includes a main frame, an operator's support, an elongated subframe pivotally attached on one end to the main frame, a movable blade attached to the extending end of the subframe and an adjustable linkage adapted to support the subframe from the main frame.

The adjustable linkage includes two elongated lifting links that are spaced from each other and are disposed on a line extending laterally with respect to the subframe. These lifting links are pivotally attached on one end to the main frame and on the opposite end to the subframe. The linkage also includes means for maintaining the blade positioned laterally with respect to the main frame, the means including a longitudinally adjustable link that is pivotally attached on one end to the main frame and on the opposite end to the subframe. The adjustable link includes an elongated hollow member that is open on one end, the wall of which member forms a transverse abutment. An elongated rod extends telescopically into the hollow member. The periphery of the rod forms a plurality of transverse abutments spaced along the length of the rod which latter abutments are adapted to be located consecutively in the same transverse plane as the abutment included in the hollow member.

A movable stop is adapted to be moved into abutting relationship with the abutment included in the hollow member and consecutively into abutting relationship with the abutments included in the rod. Means is provided accessible to the operator from the operator's support, for moving the stop into the former abutting relationship and from said latter abutting relationship.

Other features and the advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the invention is illustrated.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a grader that includes the adjustable linkage of the present invention for the grader blade;

FIG. 2 is a perspective view of the grader shown in FIG. 1 depicting the grader blade in position for grading sloping banks, but on a larger scale;

FIG. 3 is a detailed view of the adjustable link, but on a larger scale;

FIG. 4 is a fragmentary view of a portion of the link shown in FIG. 3 depicting the means for urging the stop into abutting relationship with the abutments included in the hollow member and rod, the view being taken looking in the direction of arrows 4-4 of FIG. 3;

FIG. 5 is a view, partly in section, of a portion of the adjustable link shown in FIG. 3 depicting the means for moving the stop from abutting relationship with the abutments included in the rod, the section being taken along line 5-5 of FIG. 3;

FIG. 6 is a view, partly in section, of the adjustable link shown in FIG. 2, the section being taken along line 6-6 of FIG. 3; and

FIG. 7 is a sectional view of the grader shown in FIG. 1 depicting the adjustable linkage of the present invention, the view being taken along the line 7-7 of FIG. 1.

Referring more in detail to the drawings, a motor driven tractor is shown at 13, which tractor is propelled along the ground and is adapted to push a grader grading blade 15. The grading blade 15 can be adjusted to various positions depending upon the terrain which is to be graded.

The tractor includes a longitudinal main frame 17 that is elevated from the ground. An operator's support 18 is supported on the main frame 17. An elongated subframe 19 is disposed below the main frame 17 and the forward end of said subframe is pivotally supported on the main frame 17 by a conventional ball and socket joint 21.

The extending portion of the subframe 19 is supported by a linkage group 20, which linkage group comprises three independently supported, adjustable links 23, 25 and 27. Links 23 and 25 are spaced from each other and are located on a line extending laterally of the subframe 19 and furnish vertical support for the subframe 19 and blade 15. The links 23 and 25 are pivotally supported individually on the upper ends by lifting arms 29 (one of which is shown in FIGS. 1 and 2). The lower ends of the links are pivotally attached to the subframe 19.

In the preferred embodiment, the lifting arms 29 each extend from a rotatable shaft 24 (one of which is shown in FIGS. 1 and 2) and said shaft is usually actuated by a hydraulic mechanism. The controls (not shown) of said mechanism are accessible by the operator while on the operator's support 18. The shafts 24 are operable independently of each other, thus providing means whereby the angle the blade 15 makes with the horizontal may be adjusted.

Since the subframe is pivotally supported on one end by a ball and socket joint 21 and on the extending end by pivotally connected links 23 and 25, the extending end is free to shift laterally with respect to the main frame 17. Link 27 is pivotally attached on its upper end to a semicircular geared slide 26 and on its lower end to the subframe 19. The link 27 is provided to control the lateral position of the extending end of the subframe 19 and the supported blade 15. The slide 26 includes confronting runners 28 that are adapted to loosely embrace a semicircular stationary track 30 mounted on the main frame. Movement of said slide along the track 30 is induced by a pinion 32 adapted to cooperate with said geared slide. The pinion 32 is actuated in a conventional manner by the tractor motor through a drive shaft and appropriate gear box mechanism.

A circular gear ring 31 includes inwardly facing gear teeth 33. The ring is slidably supported on the subframe 19 by a plurality of upper and lower outwardly extending guides 34. A pinion 35 is adapted to mesh with the gear teeth 33 in the gear ring 31 and the pinion 35 is rotated by a motor driven drive shaft 36 that acts through a conventional gear box mechanism 38. The blade 15 depends from the circular ring 31 and consequently can be oscillated to a desired position by the ring. From the foregoing, it will be clear that the blade 15 may be moved laterally with respect to the main frame by rotating pinion 32 to cause the geared slide 26 to move along the track 30 to the desired side. Since the links 25 and 27 are pivoted on both ends, the movement of the slide will move the link 27 thereby urging the extending end of the subframe and supported blade 15 to the desired side.

It is frequently desirable to grade high on steep slopes and, in that event, it is desirable to have the capability of moving the blade 15 some distance to the side of the main frame 17, thus enabling the tractor 13 to travel on a plane different than the plane of the steep bank. This feature is accomplished by providing for adjusting the lengths of the adjustable links 23, 25 and 27. Each of said links includes an elongated tube 37 that is open on one end 41, the wall of which tube has openings 43 through opposite sides of the tube, and the walls about the openings form transverse abutments 45. The tubes 37 included in links 23 and 25 are pivotally connected in a conventional manner to arm 29 and the tube 37, included in link 27, is pivotally connected to the geared slide 26.

Each of the links 23, 25 and 27 also includes an elongated rod 47 that slides telescopically into the tube 37. The periphery of said rod forms a plurality of depressions 49 spaced along the length of the rod. Transverse abutments 51 are formed on opposing sides of the depressions 49 and said abutments are disposed consecutively in the same transverse plane as the abutments 44, formed by the tube 37, as the rod

47 is telescoped into and out of said tube. Each of the rods is pivotally attached to the subframe 19 by means of a conventional ball and socket joint 53.

The stops 54 are preferably elongated and pivotally supported at 55 to a frame 57 that is welded to the tube 37, the pivotal support comprising a bolt and nut combination 59 and a spacer 61. These stops 54 are adapted to extend through the openings 43 formed by the tube 37 wall and into depressions 49 thereby abutting the abutments 44 and 51.

Means 63 for urging the stops 54 into abutting relationship with the abutments 44 and 51 includes two frames 65, each of which is spaced laterally from the openings 43 and welded to the tube 37. Each frame includes a socket 67 adapted to retain a coil compression spring 69, which spring fits freely around a guide pin 71 that extends from the stops 54. Each spring 69 makes contact with the respective stops 54 thereby urging the stop into the selected depression 49.

The means 72 for moving the stops 54 from the depressions 49 includes a motor 73 that may be of any type, but in the preferred embodiment, is shown as hydraulic motor. The hydraulic motor comprises two slidably, interfitting hollow cylinders 75 and 77 opening into one another on one end and closed on the opposite end.

The closed ends of the hollow cylinders 75 and 77 are pivotally affixed as at 79, respectively, to the two stops 54. A hydraulic supply line 81 is connected to the motor 73 and is adapted to feed hydraulic fluid therein when it is desirable to move the stops 54 from engagement with the abutments 51. Flow of the hydraulic fluid through the line 81 and into the motor 73 is controlled in a conventional manner by a control lever 82, which lever is located so as to be accessible to the operator while on the operator's support 18. There are three such levers 82, one associated with each of the links 23, 25 and 27. Each of said levers is spring loaded in a rearward position and when in that position, removes the fluid pressure from the line 81 and motor 73 thereby allowing the springs 69 to urge the stops 54 into the depressions 49. When the respective lever 82 is moved to its forward position, fluid pressure is introduced through the line 81 and into the motor 73 thereby moving the interfitting cylinders 75 and 77 outwardly with respect to one another. The force of the respective springs 69 is overcome and the respective stop 54 is moved from the depression 49, thus enabling the rod 47 to be telescoped longitudinally with the tube 37.

The rod 47 includes a longitudinally extending groove 83 forming confronting and longitudinally extending abutments 85. The tube 37 includes an inwardly extending tongue 86 that is adapted to interfit said groove and forms abutments 89. Abutments 89 cooperate with abutments 85 to prevent relative rotation between the tube 37 and the telescoping rod 47, thus assuring that the depressions 49 will be maintained in locked cooperating relationship with the respective openings 43 and stops 54.

From the foregoing, it will be apparent that the linkage 20 of the invention provides means whereby the blade 15 can be adjusted readily so as to be disposed laterally from the main frame 17 by the operator without leaving the operator's support 18.

It will be clear that adjustment of the links 23, 25 and 27 may be made either while the blade 15 is in position under the main frame 17 or after it has been positioned to the side of the main frame 17 as shown in FIG. 2. Said adjustment may be accomplished in many ways and one method is described below.

Both arms 29 may be lowered to permit the blade to come to rest on the ground. The desired link 23, 25 and or 27 may

then be adjusted as desired. As for example, the lever 82 associated with link 23 may be pushed forward thereby moving the stops 54 included in link 23 from the abutments 51 and if the link is being lengthened, the respective arm 29 will be raised thus pulling the respective tube 37 telescopically the desired length along the the respective rod 47. When the desired amount of lengthening is approached, the lever 82 is urged to return to its rearward position thereby reducing the fluid pressure in the respective motor 73 and allowing the respective springs 69 to move said stops 54 against the periphery of the rod 47 and into the proper depressions 49. It will be noted that adjustment of link 25 is accomplished in a similar manner and so is adjustment of link 27, except that slide 26 will be moved to accomplish the appropriate telescoping of the respective tube 37 with respect to the rod 47 while the respective stops 54 are out of engagement with the abutments 51.

If the above lengthening of the links is accomplished while the blade 15 is in position under the main frame 17, a pinion 32 will then be actuated to move the slide 26 to the appropriate side thereby moving the blade 15 into the desired position to the side of the main frame 17, as shown in FIG. 2.

While the form of embodiment herein shown and described constitutes preferred form, it is to be understood that other forms may be adopted falling within the scope of the claims that follow.

I claim:

1. In an improved grader adjustment link and mechanism for actuating the same to be used with a grader that includes:

- a main frame;
- an operator's support;
- an elongated subframe pivotally attached at one end to the main frame;
- a movable blade attached to the subframe and spaced from the said end of the subframe;
- adjustable linkage including:
 - an elongated link pivotally attached on one end to the main frame and on the opposite end to the subframe;
 - a second elongated link spaced laterally of a line from the point where the subframe pivotally attaches to the main frame to the point where the first mentioned link attaches to the main frame, which link is pivotally attached on one end to the main frame and on the opposite end to the subframe;
- means for maintaining the blade positioned laterally with respect to the main frame, said means including:
 - at least one longitudinally adjustable link pivotally attached on one end to the main frame and on the opposite end to the subframe, which at least one link includes:
 - an elongated, hollow member that is open on one end;
 - an elongated rod in telescopic relationship with the hollow member;

the improvement comprising in combination:

adjustment means movable from a position in which said adjustment means fastens the rod with the hollow member to a position in which the rod and hollow member are free to move relative to one another and vice versa, said adjustment means comprising a pair of spring-loaded jaws mounted on said hollow member positioned at right angles to said rod and hollow member in cooperating proximity to a plurality of cooperating apertures and recesses in said hollow member and said rod, respectively; and hydraulic control means for opening and closing said jaws to selectively fasten and unfasten the rod and hollow member.