Oct. 14, 1941. C. A. GUSTAFSON 2,258,890

ROAD GRADER

Filed Oct. 7, 1940 3 Sheets-Sheet 1

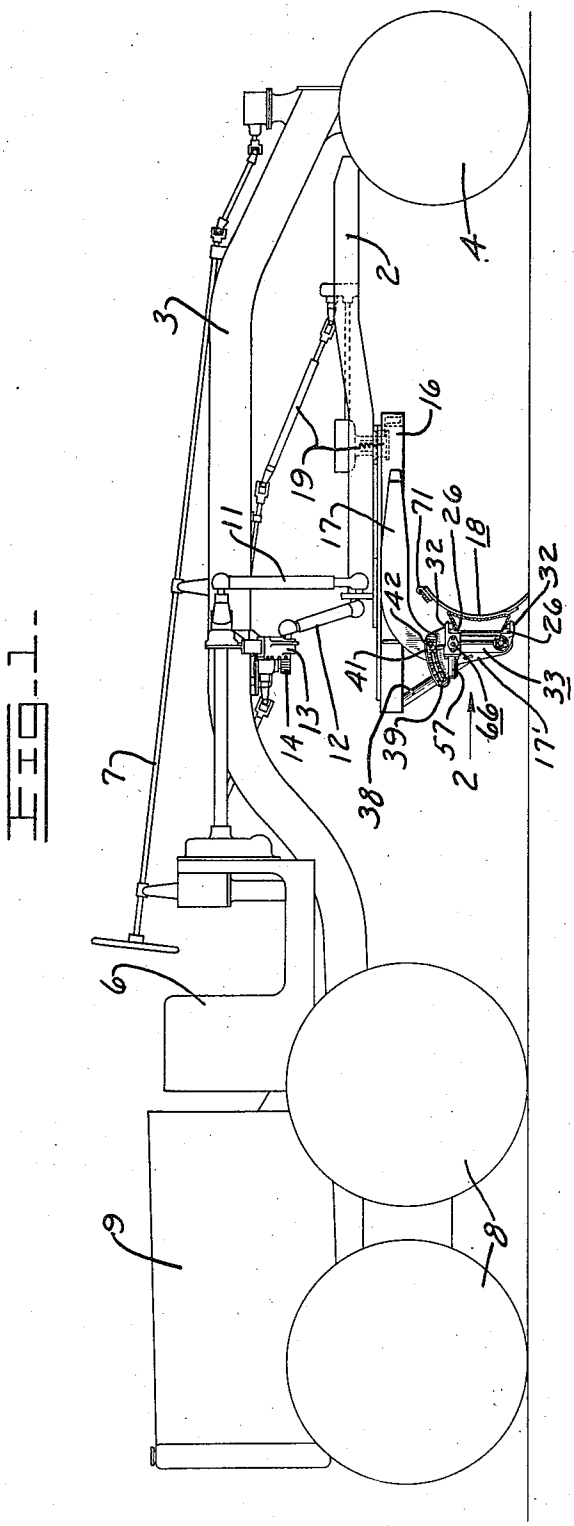

FIG. 1.

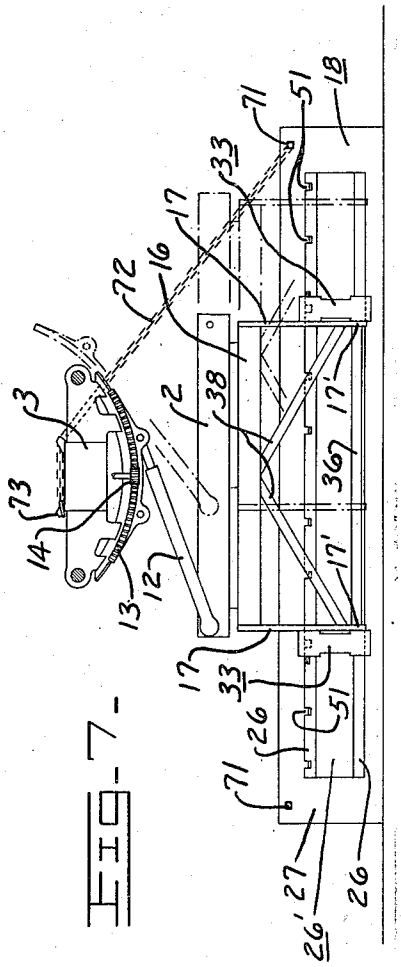

FIG. 7.

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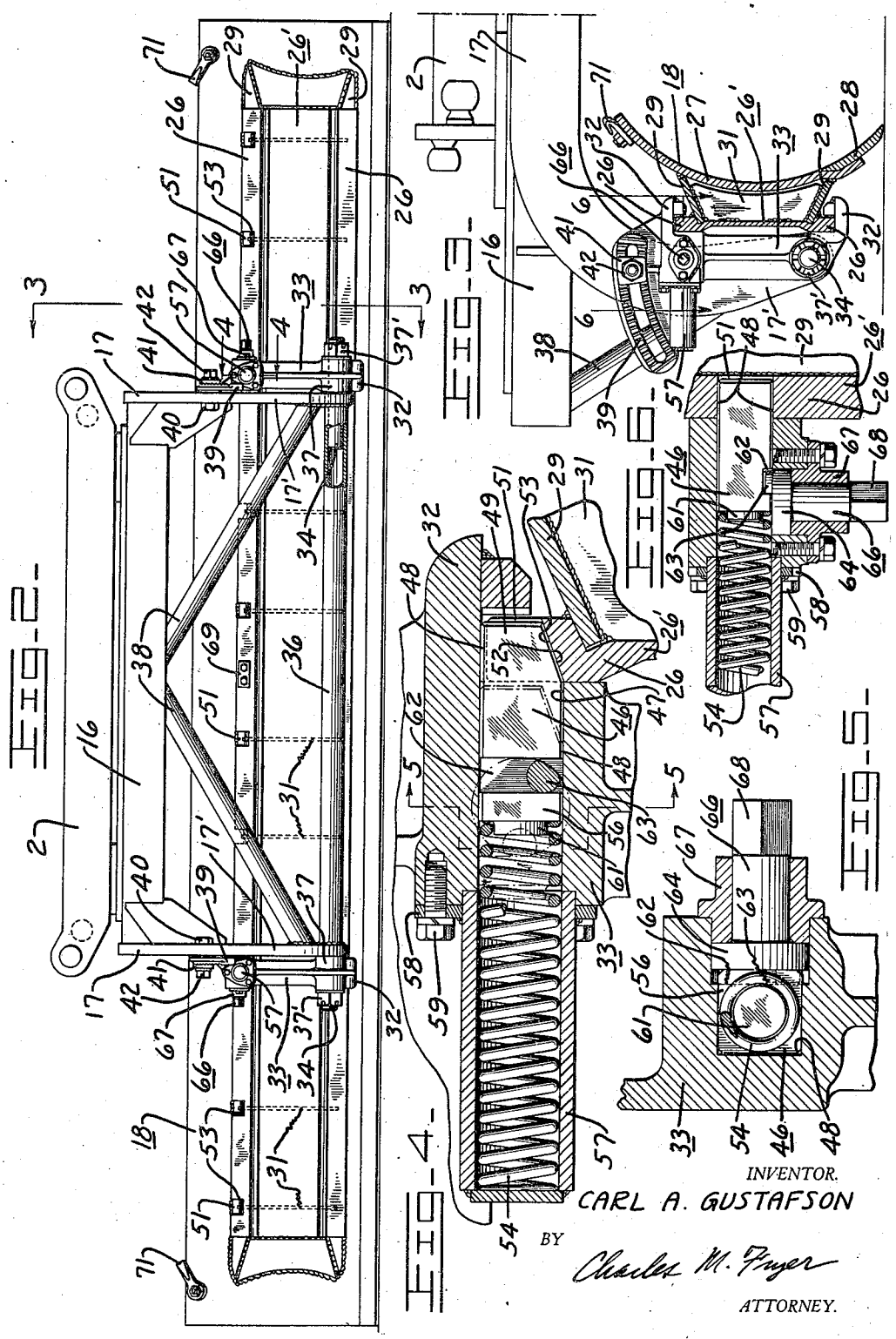

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ROAD GRADER

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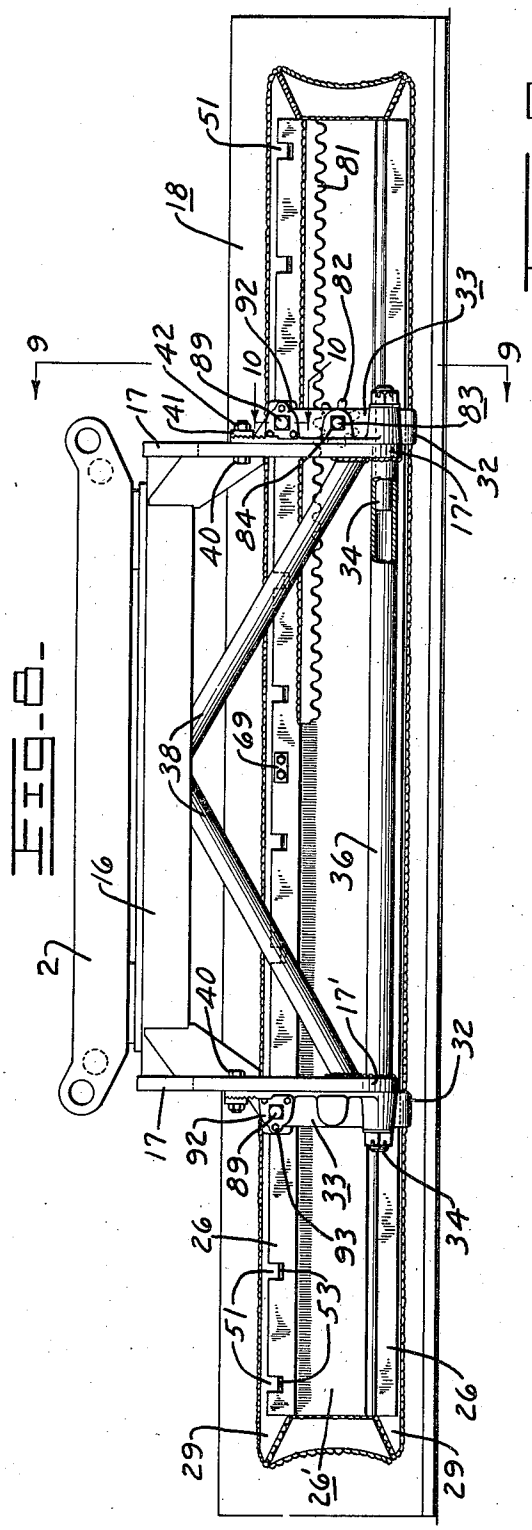

Fig. 8.

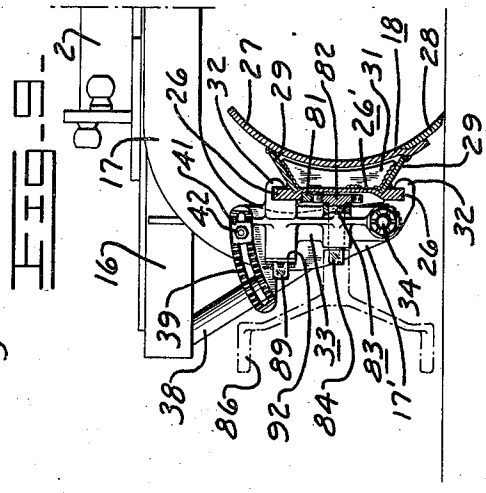

Fig. 9.

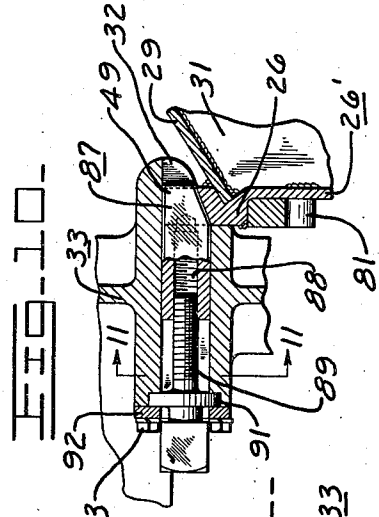

Fig. 10.

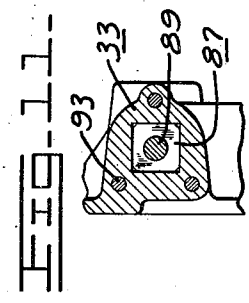

Fig. 11.

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Patented Oct. 14, 1941 2,258,890

# UNITED STATES PATENT OFFICE

2,258,890

## ROAD GRADER

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Application October 7, 1940, Serial No. 360,011

5 Claims. (Cl. 37—156)

My invention relates to road graders; and more particularly to mounting means for the grader blade of such machine to enable endwise adjustment thereof.

In road graders, the grader blade is customarily mounted on a blade supporting frame which is connected to the main frame of the machine by lift means providing for vertical adjustment of either end of the blade; and such blade supporting frame is also mounted for transverse movement to enable lateral shifting of the blade therewith. The blade itself is generally angularly adjustable on the blade supporting frame for adjustment of the angle of the blade with respect to the line of draft of the machine; and in addition, the blade is mounted for endwise adjustment with respect to the blade supporting frame. By these movements, the blade can be adjusted to any suitable position adapting it for the various types of work which a road grader is called upon to perform. With the exception of the endwise adjustment of the grader blade with respect to the blade supporting frame, all of the adjustments can be relatively easily obtained on present commercial machines, by control means accessible to the operator at the operator's station of the machine.

The endwise adjustment of the blade itself with respect to the blade supporting frame has heretofore been usually obtained by providing a plurality of sets of spaced brackets on the blade adapted to be detachably connected to brackets on the blade supporting frame. Such mounting means has heretofore necessitated disconnecting the entire blade, shifting it bodily, and reconnecting it when an adjustment was desired, which was very difficult to perform by one man. My invention is designed to obviate this difficulty, and has as its objects among others, the provision of improved mounting means enabling endwise or lateral adjustment of a grader blade with respect to its blade supporting frame, which mounting means is of simple and economical construction, and of such character as to permit the adjustment to be made by one man. Other objects of my invention will become apparent from a perusal of the following description thereof.

In general, the mounting means of my invention for obtaining endwise adjustment of a grader blade with respect to its blade supporting frame comprises rail and guide supporting means between the blade and its supporting frame, which permits endwise sliding movement of the blade with respect to such frame. Locking means in the form of an axially movable pin is provided to engage a selected one of a plurality of locking stations in the form of notches or recesses formed in the blade structure to hold such blade structure in adjusted position. Preferably, the locking pin and each recess are tapered to provide a wedging engagement therebetween, and hold the blade firmly in adjusted position.

Reference is now made to the drawings for a more detailed description of the invention, in which:

Fig. 1 is a more or less schematic side elevational view of a self-propelled road grader in which the blade mounting means of my invention is employed.

Fig. 2 is a rear elevational view of the mounting means of my invention, looking in the direction of arrow 2 in Fig. 1.

Fig. 3 is a section taken in the plane indicated by line 3—3 in Fig. 2.

Fig. 4 is a section taken in a plane indicated by line 4—4 in Fig. 2.

Fig. 5 is a section taken in planes indicated by line 5—5 in Fig. 4.

Fig. 6 is a section taken in a plane indicated by line 6—6 in Fig. 3.

Fig. 7 is a more or less schematic view illustrating one way in which the blade structure of Figs. 1 through 6 may be shifted with respect to its supporting frame.

Fig. 8 is a rear elevational view similar to that of Fig. 2, of a modified form of construction.

Fig. 9 is a section taken in a plane indicated by line 9—9 in Fig. 8.

Fig. 10 is a section taken in a plane indicated by line 10—10 in Fig. 8.

Fig. 11 is a section taken in a plane indicated by line 11—11 in Fig. 10.

The mounting means of my invention for endwise adjustment of a grader blade on its supporting frame, may be employed on any type of blade supporting frame. For purposes of illustration, I have disclosed such mounting means on a self-propelled motor grader having a blade supporting frame similar to that shown in my Patent No. 2,189,286, dated February 6, 1940, which enables the blade to be angularly adjusted with respect to the line of draft of the machine, vertically adjusted at either end, laterally adjusted together with the supporting frame, and also adjusted to bank sloping position at either side of the machine. With reference to Fig. 1, such blade supporting frame comprises auxiliary or drawbar frame 2 universally connected at its front end by any suitable means (not shown) to main frame 3 of the machine. Such main frame

is mounted on front steerable, and titlable or leaning wheels 4, steerable from operator's station 6 through steering shafting 7, and on rear propelling wheels 8 drivable from power plant 9 of the machine.

At its rear end, auxiliary or drawbar frame 2 is suspended from main frame 3 by means including a pair of independently adjustable lift links 11 each of which is connected to a side of frame 2; thus, either side of frame 2 may be adjusted vertically. Lateral shift mechanism including lateral shift strut 12 connected to slidably mounted arcuate rack 13 adjustable through shafting connected to driving pinion 14, is provided for lateral adjustment of frame 2. A circle frame 16 forming part of the blade supporting frame, is rotatably mounted on frame 2 and has secured thereto rearwardly extending beams 17 having downwardly extending rear projections 17' upon which blade structure 18 is mountable. By rotation of circle frame 16, through suitable actuating means 19, the blade may be angularly adjusted with respect to the line of draft of the machine. All of the adjustments thus far described can be very readily made by suitable controls at operator's station 6, as is disclosed in my previously mentioned patent.

For some purposes, for example, where it is desired to shift the blade to reach way out to either side of the machine in the dressing of road shoulders or gathering in of material from the outside slope on a grade, or for adjusting the blade to bank sloping position so as to enable its heel to clear the ground more readily, it is desirable that the blade be shiftable endwise on its supporting frame. The mounting means of my invention is designed to accomplish this with ease. With particular reference to Figs. 2 through 6, the mounting means of my invention comprises a pair of spaced parallel rails 26 which extend longitudinally or endwise in the direction of the blade which includes moldboard 27 having lower cutting edge 28 secured thereto. Rails 26 are formed on the opposite edges of a plate 26' secured to the rear of moldboard 27 by means of spaced plates 29 between which are secured a plurality of laterally spaced reenforcing plates 31 also secured to plate 26'. Welding is preferably employed for rigidly securing these parts together, to thus provide a rigid box-like reenforcing structure for moldboard 27.

Rails 26 are slidably mounted on the blade supporting frame to permit endwise adjustment of the blade structure 18 with respect to the frame. Such mounting comprises upper and lower guideways 32 in which rails 26 engage for relative sliding movement with respect thereto; the guideways being formed in pairs on each of a pair of brackets 33 each of which is pivotally mounted at the lower end of a circle beam extension 17'. As can be observed more clearly from Fig. 2, the pivotal mounting of each bracket 33 comprises a stationary pin 34 secured in hollow reenforcing strut 36 connected between the lower ends of beam extensions 17', and a bearing 37 journalled on pin 34 and held in position by nut 37'. Additional upwardly and diagonally extending struts 38 are connected between the lower ends of beam extensions 17' and the circle 16 to reenforce the structure. Because of the pivotal mounting of brackets 33, the grader blade mounted on such brackets can be adjusted as to pitch. For securing brackets 33 in adjusted position, each of them is provided at its upper end with an arcuately shaped, slotted and serrated guide 39. A pin 40 secured to the associated circle beam 17 projects through the slot of each bracket to provide for clamping thereof by means of serrated clamping member 41 engageable with the serrations of guide 39 and securable by nut 42.

Means is provided for locking the blade structure in endwise adjusted position, comprising a flat sided locking pin 46 mounted for axially slidable but non-rotatable movement in similarly shaped flat sided aperture 47 formed near the top of each of brackets 33; the longitudinal edges of pin 46 being chamfered slightly at 48 to permit freedom of movement. The front end portion 49 of each pin 46 is adapted to project into a selected one of a plurality of properly spaced locking stations in the form of notches or recesses 51 formed in top rail 26, to hold the blade structure locked against endwise movement. For holding the blade structure firmly without chattering, the lower side of the front end 49 of each pin 46 is formed with an upward taper 52; and the edge 53 forming the lower boundary of each recess 51 is similarly tapered to provide for wedging engagement between the recess and the pin. Such firm wedging engagement is maintained when the blade structure is locked against endwise movement by a coiled spring 54 abutting the rear end 56 of each pin 46.

Each spring 54 is contained within a cylindrically shaped housing 57 having welded thereto a flange 58 secured to the rear end of each bracket 33 by cap screws 59; the rear end 56 of each pin 46 being formed with a projection 61 about which spring 54 is centered. Thus, each spring 54 always urges the associated pin 46 into locking position; and in cooperation with the wedge shape of the forward end of each pin 46 and the recesses 51, tight locking engagement is maintained at all times when the locking pins are engaged.

In adjusting the blade structure endwise from any previously adjusted position, it is necessary to retract each of pins 46 from engagement with the associated recess 51, and hold it in retracted position against the action of the associated spring 54. For this purpose, I provide in the side of each pin 46 a transversely extending notch 62 in which is engaged a pin 63 eccentrically mounted on a disk 64 integral with a shaft 66 journalled in a cap 67 secured to the side of each bracket 33; the outer end 68 of each shaft 66 being flat sided to facilitate engagement with a suitable tool, such as a wrench, to enable turning of shaft 66 in either one of opposite directions. Turning of shaft 66 in the proper direction results in movement of pin 63 engaging notch 62, which causes retraction of locking pin 46 when so desired. When retracted and with pin 63 at dead center position, illustrated by the phantom lines in Fig. 4, each locking pin will remain retracted against the action of the associated spring 54 because of the abutment which pin 63 forms at such dead center position. After the blade structure is adjusted endwise to the desired extent, re-engagement of the locking pins 46 in the associated recesses 51 can be positively effected by turning of shafts 66 to move pins 63 from dead center position, whereupon springs 54 will thrust locking pins 46 into engagement with the associated recesses 51. A stop 69 is provided at the center of the rear face of upper rail 26, to engage the inner side of each of upper guideways 32, and thus preclude the blade structure from running off of the guides when being adjusted.

In making such endwise adjustment of the grader blade, it is unnecessary for the operator to attempt to shift manually the blade in the blade supporting frame, because such adjustment can be positively effected by turning circle 16 so that the blade extends diagonally with respect to the line of draft of the machine, with one end thereof engaging the ground. In such position and with the locking means released, the machine when driven the proper distance toward the ground engaged end of the blade, will cause shifting of the blade with respect to its blade supporting frame. When shifted to the desired extent, the locking means may be reengaged in the manner described. Generally, it is desirable to have the blade diagonally arranged with respect to the line of draft of the machine rather than substantially longitudinally thereof, when it is to be shifted with respect to the blade supporting frame, so as to avoid possible interference underneath the machine. To facilitate the described adjustment with the blade diagonally positioned, it is desirable to lean the front wheels and also steer the machine in the direction of inclination of the blade.

Another way in which relative endwise shifting between the blade and its supporting frame may be obtained positively, is illustrated diagrammatically in Fig. 7. Each end of the blade structure is provided with a hook 71 adapted to engage one end of a chain 72 which is adapted to be connected adjacent its opposite end to a pin 73 on main frame 3 of the machine. When the chain is so connected and the blade locking means is released, relative shifting may be obtained between the blade and its supporting frame, by shifting auxiliary or drawbar frame 2 laterally in the direction of the end of the blade to which the chain 72 is connected, while the blade remains relatively fixed with respect to the main frame. Such shifting may be accomplished through the previously described lateral shift mechanism. Fig. 7 illustrates in phantom lines a laterally shifted position of the blade supporting frame toward an end of the blade to which chain 72 is connected.

Figs. 8 through 11 illustrate a modified form of construction in which a different form of means is provided to effect positively endwise shifting of the blade; and a somewhat different form of locking means is provided. Many parts are essentially the same as those in the previously described modification; and to facilitate the description, such parts are designated by the same reference characters and the description is confined essentially to those parts which differ. For effecting endwise adjustment of the blade, a rack bar 81 is welded against plate 26' underneath the lower edge of top rail 26, and engages a pinion 82, secured to shaft 83 which projects through one of brackets 33 and is formed with a flat sided outer end 84 adapted to be engaged by a removable crank 86 by which pinion 82 may be turned in either one of opposite directions. Each locking pin 87 is essentially the same as locking pin 46 being provided with front tapered end 47 adapted to engage a selected one of tapered recesses 51, but it is not spring pressed. However, it is formed with a threaded aperture 88 having threaded engagement with a pin 89 integral with a disk 91, journalled in bracket 33 and clamped in position by a cap 92 secured to bracket 33 by cap screws 93. The outer projecting end of pin 89 is flat sided to enable engagement by a suitable tool such as a wrench for turning of the pin. When pin 89 is turned in either one of opposite directions, locking pin 87 may be axially moved in either one of opposite directions to effect engagement or disengagement thereof, depending upon the direction of rotation of pin 89.

I claim:

1. In a road grading machine, a main frame, a grader blade supporting frame mounted underneath said main frame, said grader blade supporting frame being connected at its front to said main frame and being suspended at its rear from said main frame by spaced lift links, a grader blade structure including a grader blade and spaced rails rigidly secured at the back of said blade and extending longitudinally thereof, bracket means having guideways in which said rails are relatively slidable to enable endwise adjustment of said blade structure with respect to said grader blade supporting frame, means pivotally connecting said bracket means to said grader blade supporting frame to enable adjustment of the pitch of said blade, one of said rails having a plurality of spaced recesses, and a locking pin mounted for axial movement in said bracket means to engage selected of said recesses to lock said blade structure in endwise adjusted position.

2. In a road grading machine, a main frame, a grader blade supporting frame mounted underneath said main frame, said grader blade supporting frame being connected at its front to said main frame and being suspended at its rear from said main frame by spaced lift links, a grader blade structure including a grader blade and spaced rails rigidly secured at the back of said blade and extending longitudinally thereof, bracket means having guideways in which said rails are relatively slidable to enable endwise adjustment of said blade structure with respect to said grader blade supporting frame, means pivotally connecting said bracket means to said grader blade supporting frame to enable adjustment of the pitch of said blade, one of said rails having a plurality of spaced recesses, and a locking pin mounted for axial movement in said bracket means to engage selected of said recesses to lock said blade structure in endwise adjusted position, each of said recesses and said locking pin being tapered to provide wedging engagement therebetween.

3. In a road grading machine, a main frame, a grader blade supporting frame mounted underneath said main frame, said grader blade supporting frame being connected at its front to said main frame and being suspended at its rear from said main frame by spaced lift links, means also connecting said grader blade supporting frame to said main frame for lateral shifting with respect thereto, a grader blade structure, rail and guide means supporting said blade structure on said grader blade supporting frame for relative endwise sliding movement to enable endwise adjustment of said blade structure with respect to said grader blade supporting frame, and means for effecting said endwise adjustment including a member independent of said lift links adapted for connection between said blade structure and said main frame to hold said blade structure relatively fixed with respect to said main frame while said grader blade supporting frame is laterally shifted.

4. In a road grading machine, a main frame, a grader blade supporting frame mounted underneath said main frame comprising a drawbar frame and a circle frame rotatably mounted on said drawbar frame, said drawbar frame being

movably connected at its front to said main frame and being suspended at its rear from said main frame by spaced lift links, said circle frame including a pair of downwardly extending members, a grader blade structure including a grader blade and spaced rails rigidly secured at the back of said blade and extending longitudinally thereof, a pair of brackets having guideways in which said rails are relatively slidably to enable endwise adjustment of said blade structure with respect to said grader blade supporting frame, means pivotally connecting each of said brackets to an associated one of said downwardly extending members to enable adjustment of the pitch of said blade, one of said rails having a plurality of spaced recesses, and a locking pin mounted for axial reciprocation in each of said brackets to engage selected of said recesses to lock said blade structure in endwise adjusted position.

5. In a road grading machine, a main frame, a grader blade supporting frame mounted underneath said main frame, said grader blade supporting frame being movably connected at its front to said main frame and being suspended at its rear from said main frame by spaced lift links, a grader blade structure including a grader blade and spaced rails rigidly secured at the back of said blade and extending longitudinally thereof, a pair of brackets on said grader blade supporting frame having guideways in which said rails are relatively slidable to enable endwise adjustment of said blade structure with respect to grader blade supporting frame, one of said rails having a plurality of spaced recesses, a flat sided locking pin mounted for axially slidable but non-rotatable movement in a similarly shaped flat sided opening in each of said brackets to engage selected of said recesses for locking said blade structure in endwise adjusted position, each of said locking pins and said recesses being tapered to provide wedging engagement therebetween, resilient means housed within each of said brackets and bearing against each of said pins in a direction to maintain tight locking engagement when such pin is engaged in a recess, and means providing for retraction of each of said pins against said resilient means.

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