Nov. 6, 1962 F. I. BRADEN 3,061,956

HYDRAULICALLY CONTROLLED SLOPING ATTACHMENT FOR GRADERS

Filed Aug. 10, 1960 5 Sheets-Sheet 1

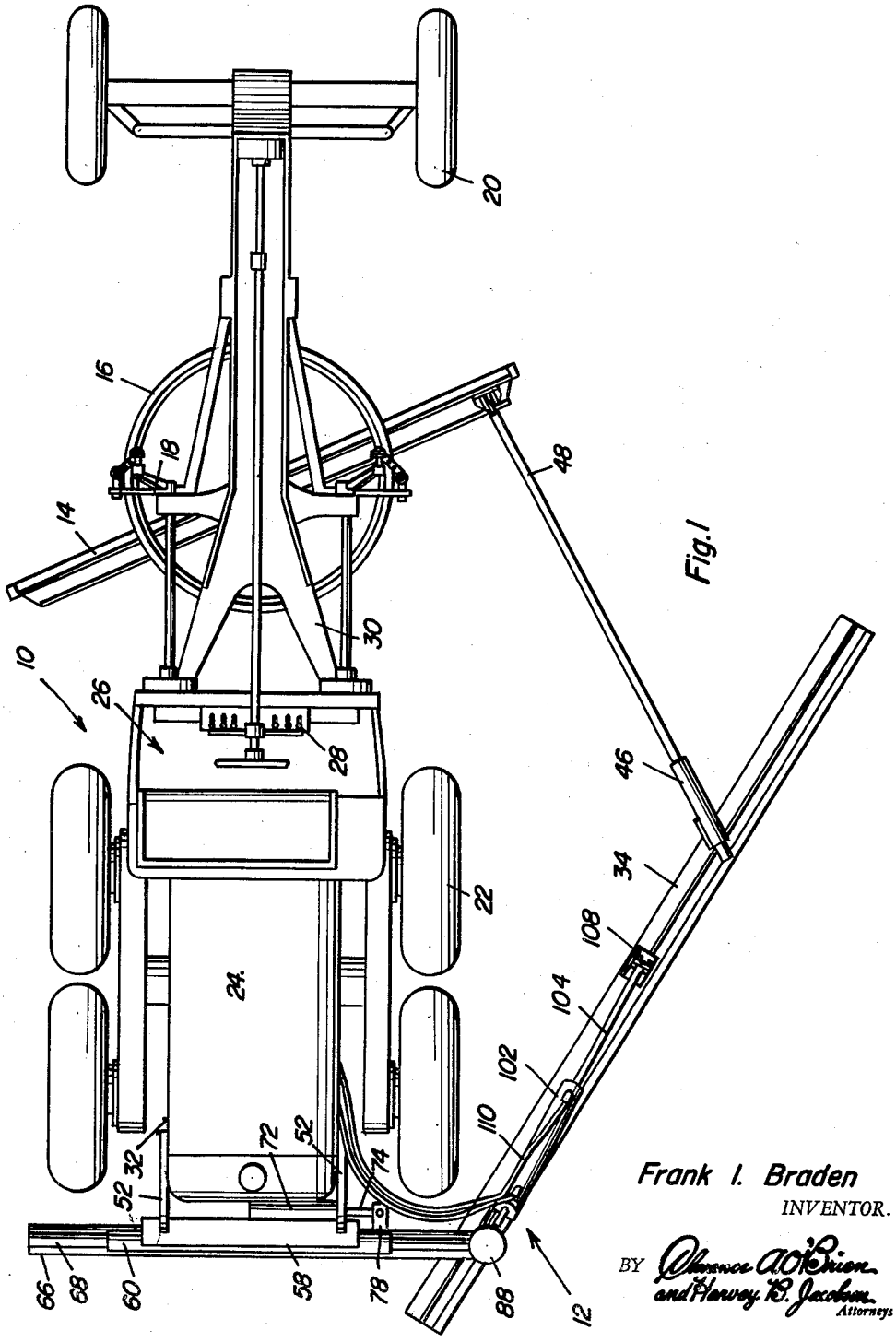


Fig. 1

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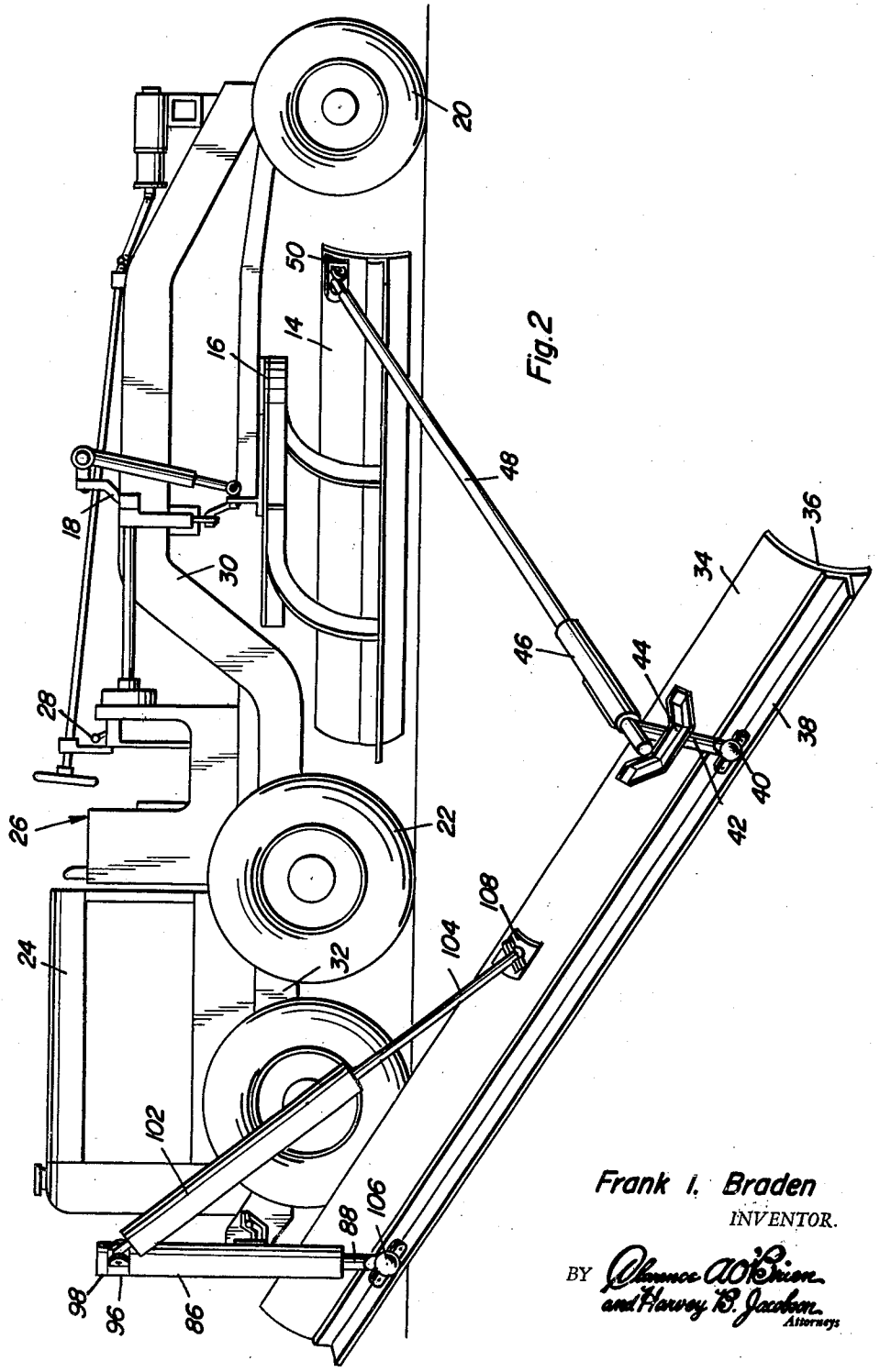


Fig.2

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HYDRAULICALLY CONTROLLED SLOPING ATTACHMENT FOR GRADERS

Filed Aug. 10, 1960 5 Sheets-Sheet 3

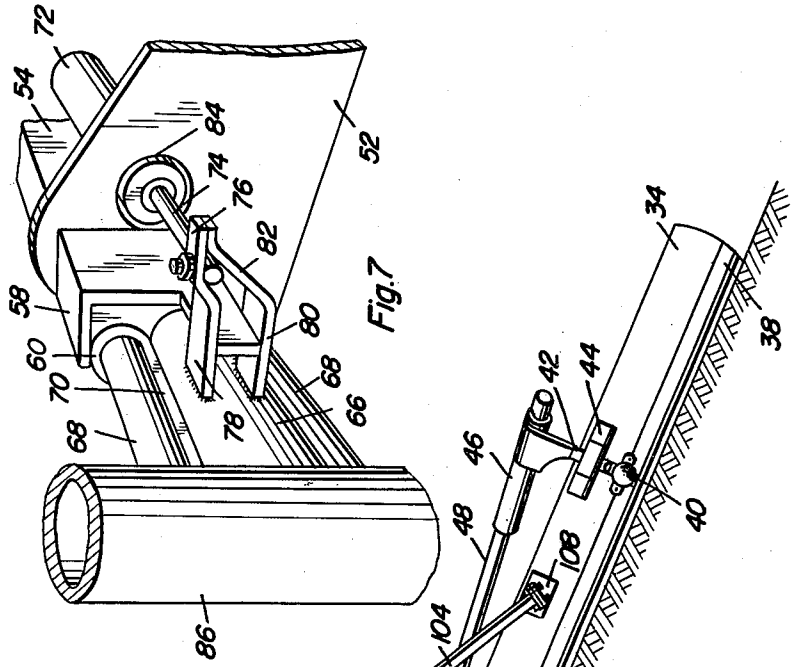


Fig.7

Fig.3

Fig.8

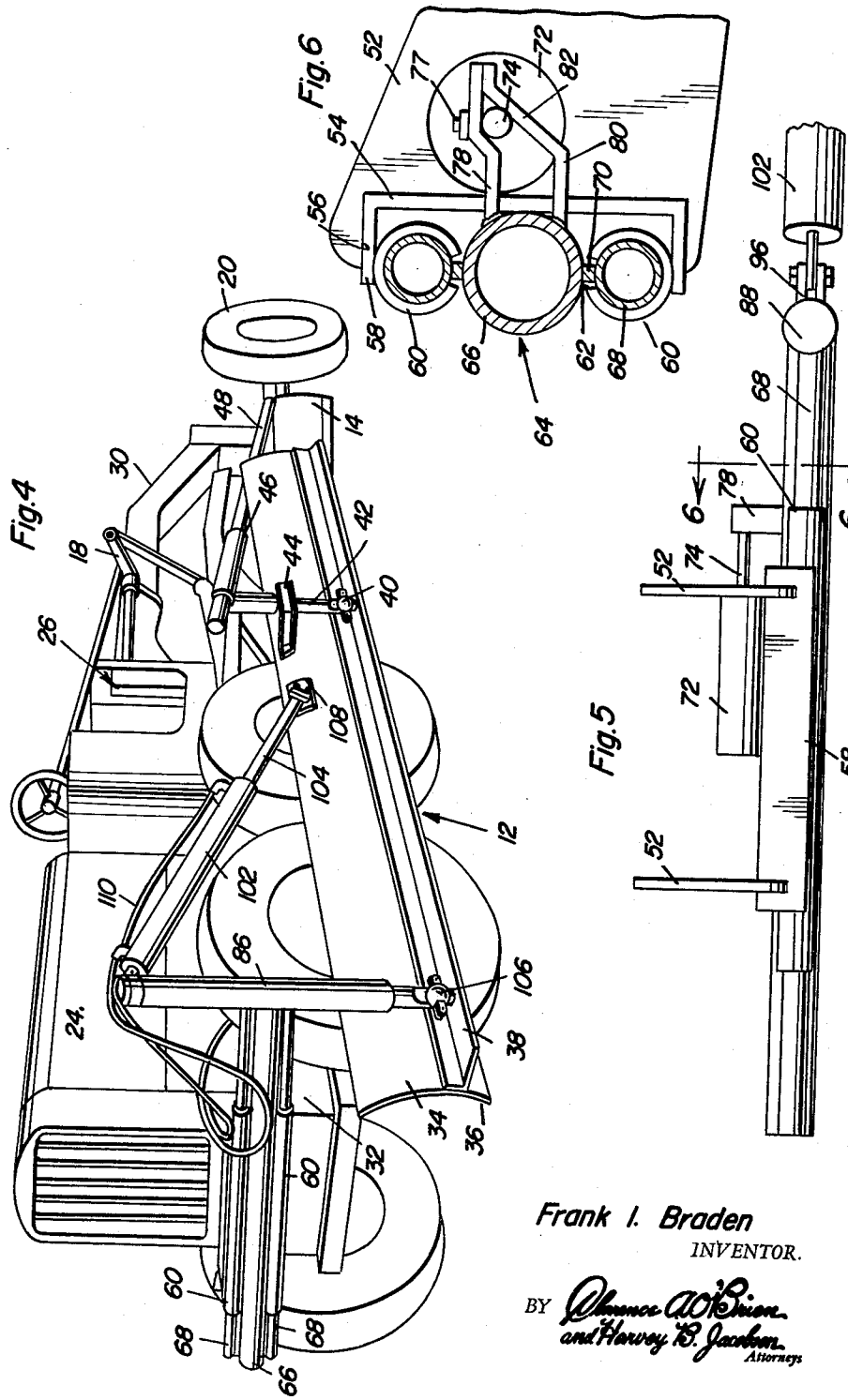
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HYDRAULICALLY CONTROLLED SLOPING ATTACHMENT FOR GRADERS

Filed Aug. 10, 1960 5 Sheets-Sheet 4



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HYDRAULICALLY CONTROLLED SLOPING ATTACHMENT FOR GRADERS

Filed Aug. 10, 1960 5 Sheets-Sheet 5

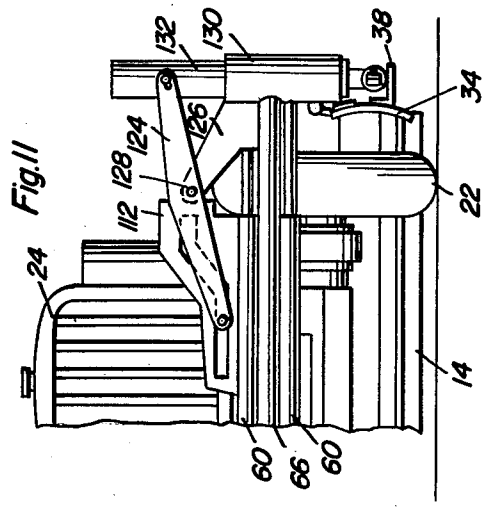


Fig.11

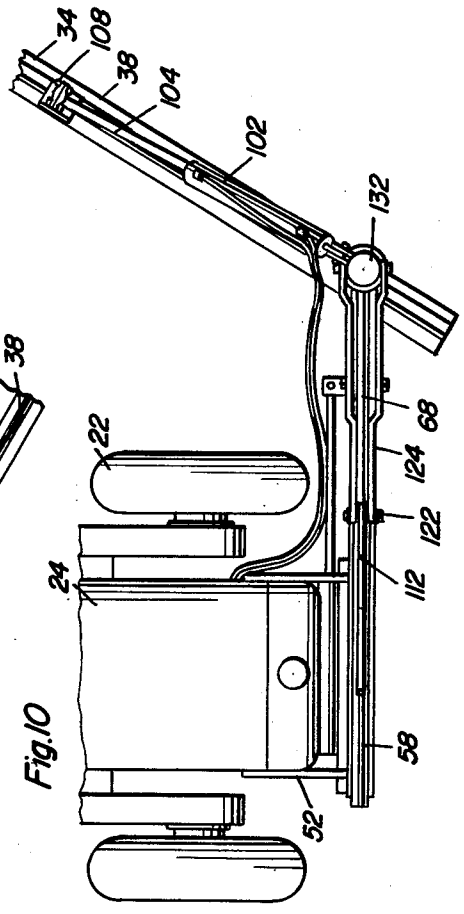


Fig.10

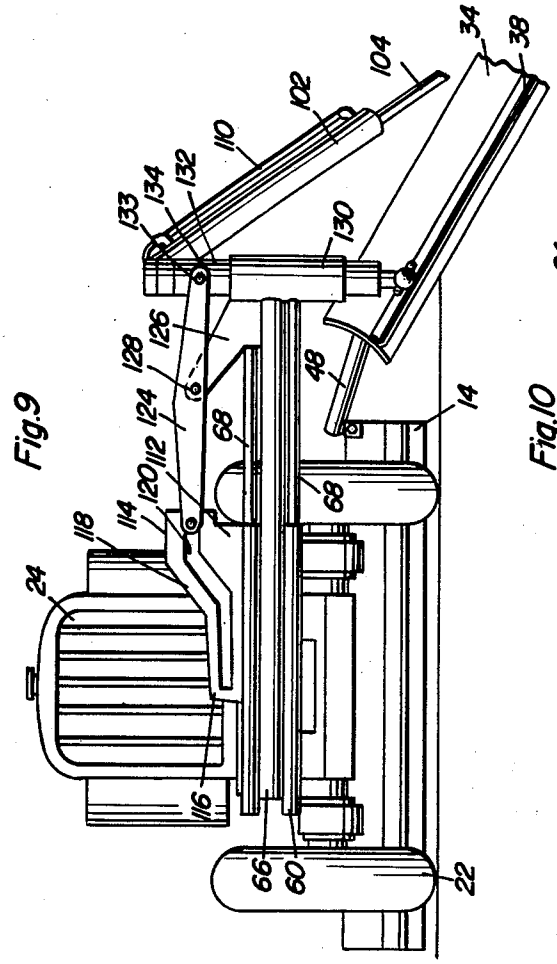


Fig.9

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United States Patent Office

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Patented Nov. 6, 1962

3,061,956

HYDRAULICALLY CONTROLLED SLOPING ATTACHMENT FOR GRADERS

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Filed Aug. 10, 1960, Ser. No. 48,727
7 Claims. (Cl. 37—155)

The present invention generally relates to attachment for road graders and more particularly to sloping attachments including novel mechanism for hydraulically controlling the position of the sloping blade and especially the heel or inner end of the blade. The present invention represents an improvement on that type of structure disclosed in prior Patent No. 2,659,988, issued November 24, 1953.

The primary object of the present invention is to provide a hydraulically controlled sloping attachment for road graders including novel means for controlling the position of the heel or inner end of the sloping attachment. The purpose of the sloping attachment is to grade the slope of a bank, ditch, or the like.

Another object of the present invention is to provide a sloping attachment for graders of the character described including a rear drawbar mounted on the grader and adjustably supporting the inner end or heel of the sloper blade thereby enabling the operator of the grader to align himself or at least the sloper blade with the shoulder of the roadway. The drawbar includes a slide horizontally movably mounted together with hydraulic means controlled from the operator's seat of the grader for moving the inner end of the sloper blade adjustably in a lateral direction in relation to the path of movement of the grader thereby enabling the sloper blade to be properly orientated in relation to the side edge of the roadway or with the surface to be sloped.

Still another important object of the present invention is to provide a sloper blade attachment for graders in which the sloper blade is vertically controlled by a hydraulic cylinder and piston assembly that also is controlled from the operator's station on the grader thus enabling complete and full control of the sloper blade by the operator.

Still another feature of the present invention is to provide a sloper blade attachment having the front or outer end of the sloper blade adjustably connected to the moldboard or grader blade normally provided on the road grader.

Still another feature of the present invention of utmost importance is a construction supporting the heel of the sloper blade from the rear drawbar so that as the drawbar is extended and retracted laterally, the heel or inner end of the sloper blade will be raised and lowered automatically. Thus, as the hydraulic cylinder arrangement connected with the drawbar is extended to put the sloper blade in operating position, the heel of the sloper blade is automatically lowered to the proper operating height. As the rear drawbar is retracted, the cantilever action lifts the heel of the sloper blade to the proper elevated position for travel over the road.

A still further object of the present invention is to provide a sloper attachment for road graders or the like which not only cooperates with the conventional grader blade but also is hydraulically controlled for orientating the sloper blade in the desired optimum position regardless of the slope or regardless of the orientation of the ditch, the inclined bank or the like being sloped.

Still other objects will reside in its simplicity and ruggedness of construction, ease of mounting on existing road graders, ease of control, efficiency and accuracy in operation and its relatively inexpensive operating and maintenance costs.

These together with other objects and advantages which

will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a plan view of a road grader with the sloping attachment of the present invention mounted thereon;

FIGURE 2 is a side elevational view of the road grader with the sloping attachment mounted thereon illustrating the sloping blade in position for use;

FIGURE 3 is a rear elevational view of the construction of the road grader, the rear drawbar and the orientation of the sloping blade;

FIGURE 4 is a rear perspective view of the sloping blade attachment in collapsed or retracted position for over the road movement of the road grader;

FIGURE 5 is a detailed plan view of the rear drawbar illustrating the structural details thereof;

FIGURE 6 is a transverse, plan sectional view taken substantially upon a plane passing along section line 6—6 of FIGURE 5 illustrating the details of construction of the mounting mechanism forming the guides together with the slide received in the guides;

FIGURE 7 is a detailed perspective view illustrating the manner of mounting the rear drawbar onto the grader;

FIGURE 8 is a detailed sectional view taken substantially upon a plane passing along section line 8—8 of FIGURE 3 illustrating the construction of the support member for the heel or inner end of the sloping blade;

FIGURE 9 is a rear elevational view of another form of the invention incorporating an automatic mechanism for raising and lowering the heel of the sloping blade during inward and outward lateral movement of the drawbar illustrating the sloping blade in operative position;

FIGURE 10 is a plan view of the construction of FIGURE 9; and

FIGURE 11 is a rear elevational view of the construction of FIGURE 9 illustrating the orientation of the structure when in retracted or over the road condition.

Referring now specifically to the drawings, the numeral 10 generally designates a conventional road grader and the numeral 12 generally designates the sloping attachment of the present invention.

The road grader 10 may be of any suitable construction and includes the usual grader blade 14 mounted on a turning circle 16 supported by lift arms 16 for controlling the angular position of the blade 14 in both a vertical and horizontal plane in a well known manner. The grader 10 is provided with steerable forward wheels 20, rear driving wheels 22, the usual prime mover 24 and an operator's station generally designated by the numeral 26 which has a plurality of control valve handles 28 mounted thereon for controlling the various movements of the road grader. The road grader also includes a frame structure 30 which includes two rearwardly extending frame rails or the like 32 to which the attachment 12 is connected.

The attachment 12 includes an elongated sloping blade 34 having an arcuate forward surface 36 and a longitudinal reinforcement L-shaped member 38 rigid with the rear surface thereof. The blade 36 may be provided with a removable blade with the remainder thereof being in the form of a moldboard or the entire blade 36 may be of one piece with the reinforcement 38 welded thereto.

Adjacent the outer end of the reinforcement 38, there is provided a socket member 40 mounted thereon receiving the lower ball end of a vertical shaft 42 which extends upwardly and is retained in position adjacent the rear surface of the sloper blade 34 by virtue of a retain-

ing bracket 44 of angle iron construction suitably welded to the blade 34. The upper end of the member 42 is rigid with a tubular sleeve 46 slidably and adjustably mounted on an elongated rod or tubular shaft 48 having the forward end thereof universally connected to a bracket 50 attached to the upper adjacent corner of the grader blade 14 for universal adjustment in relation thereto.

The construction of the elongated arm 48 is such that the orientation of the arm 48 may be adjusted as to its longitudinal length thereby enabling variation in the relation between the sloping blade 34 and the grader blade 14. By moving the adjacent end of the grader blade 14 forwardly and rearwardly of the road grader, the angular disposition of the sloping blade 34 may be varied by virtue of swinging the sloping blade about generally a vertical axis disposed at the rear of the road grader. Also, by moving the grader 14 completely forwardly, the sloping blade 34 may be drawn completely inwardly to an over the road or retracted position, this condition being illustrated in FIGURE 4.

At the rear of the road grader and supported by the longitudinal frame rails 32 is a pair of brackets 52 rigidly attached to the frame rails 32 in any suitable manner. The brackets 32 which are in the form of vertical plates support substantially a channel shaped member 54 which faces rearwardly and is received in recesses 56 in the mounting bracket or plate 52. The channel shaped member 54 may be rigidly affixed to the plate 52 as by welding or the like.

Rigidly affixed to the rearwardly extending flanges 58 of the channel shaped member 54 is a pair of cylindrical guides 60 which are disposed in vertically spaced parallel relation. Each guide 60 is provided with a slot 62 in the inner edge portion thereof. The slots 62 are in vertical alignment and are vertically spaced from each other as are the guides 60.

Slidably received in the guides 60 is a slide generally designated by the numeral 64 which includes a central enlarged tubular or cylindrical member 66 having two smaller cylindrical members or tubes 68 rigidly connected thereto by virtue of a connecting web or rib 70. The tubes 68 are slidably received in the guides 60 and the webs 70 extend through the slots 62 whereby the guides 60 will guide the slide 64 during lateral sliding movement of the slide 64. As illustrated in FIGURE 3, the slide 64 is considerably longer than the guides 60 thus enabling lateral inward and outward movement of the slide 64 in relation to the guides 60.

For moving the slide 64 in relation to the guides 60, there is provided a hydraulic cylinder 72 having a piston movable therein together with a piston rod 74 extending through one end of the cylinder 72 and connected with a forwardly extending bracket assembly 76 rigid with the enlarged central tubular member 66. The bracket assembly 76 includes two plates 78 and 80 extending in parallel relation to each other and including upwardly offset forward end portions 82 which receive the piston rod 74 therebetween and which is rigidly secured to the piston rod as by a fastener 77. The ends of the plates 78 and 80 are joined together by any suitable means whereby expansion and retraction of the piston rod 74 will cause lateral sliding movement of the slide 64. One of the plates 52 is provided with an opening 84 receiving the end of the cylinder 72 from which the piston rod 74 projects. The cylinder 72 may be supported from the plate 52 where it passes through the opening 84 and may also be further rigidly supported wherever desired and by any suitable manner. FIGURE 7 illustrates the orientation of the plate 52, channel shaped member 54, guide 60, slide 64 and the piston and cylinder arrangement for extending and retracting the slide 64.

One end of the slide 64 terminates laterally of the road grader and the ends of the tubes 66 and 68 are rigidly interconnected by a tubular sleeve 86. The tubular sleeve 86 is vertically disposed and is rigid with the slide 64 for movement therewith.

Rotatably and adjustably disposed in the sleeve 86 is a vertically elongated supporting post or rod 88 adjustably secured to the sleeve 86 by a bolt type fastener 90 extending through one of a plurality of longitudinally spaced apertures 92 appearing in the rod or shaft 88 and also through openings 94 formed in the sleeve 86.

As illustrated in FIGURE 8, the sleeve 86 terminates below the top of the rod 88 and a rotatable collar 96 is disposed around the rod 88 above the sleeve 86. A retaining collar 98 is disposed above the collar 96 and secured in position as by welding 100 or the like. The collar 96 is rotatably mounted on the rod 88 for rotational movement and for universal pivotal movement to one end of a cylinder 102 of a piston and cylinder assembly having a piston rod 104 extending longitudinally outwardly therefrom.

The lower end of the supporting rod or shaft 88 is universally swivelly connected to a socket 106 mounted on the inner end of the reinforcing member 38 for universally connecting the inner end or heel of the sloper blade 34 to the lower end of the supporting rod 88. The outer end of the piston rod 104 is universally pivotally connected to a bracket 108 rigidly affixed to the sloping blade 34 thus enabling pivotal swinging movement of the sloping blade 34 in a universal manner in relation to the pivotal connection between the sloping blade 34 and the supporting rod 88 which is supported by the slide 64 thus enabling lateral sliding movement of the slide and the vertical supporting post 88 thus enabling variation in the position of the sloping blade.

The piston and cylinder arrangement including the cylinder 102 is of the double acting type and is provided with flexible hoses 110 connected to each end thereof with the hoses extending to the operator's station and operatively associated with one of the control valve handles 28 so that the piston rod 104 may be extended and retracted. Also, the piston and cylindrical assembly including the cylinder 72 is double acting and the hoses engaging the ends of the cylinder 72 also extend to the control valve handles 28 for inward and outward movement of the slide 64.

The details of the rear drawbar including the slide 64 and the guides therefor enable the operator, by adjusting or operating a control valve handle, to adjust the inner end of the sloper blade whereby the operator may align the inner end of the sloper blade properly in relation to the shoulder of the roadway thus enabling a proper taper to be formed on the slope of the bank of the roadway. The various components of the rear drawbar may be of tubular construction or of solid construction with the entire drawbar being quite rigid in construction and various lubrication fittings may be provided for facilitating the lateral sliding movement of the slide in relation to the guides. The orientation of the hydraulic cylinder 72 between the plates 52 enable the compact structural arrangement requiring very short length of hydraulic hose which will not be in an area exposed thus protecting such hoses. The vertical control of the sloper blade 34 is by virtue of the hydraulic cylinder 102 and the piston rod 104 which is attached to the collar on the supporting post on the rear drawbar and is also attached to the sloper blade 34 at a point spaced outwardly from the point of attachment between the sloper blade and the drawbar for raising and lowering the sloper blade.

The rear end of the arm 48 is received in the sleeve 46 and is held in position by a safety shear pin and this arm is manually adjustable. All attachments to the sloper blade are with ball and socket connections thus providing for long wearing and low repair costs of the present construction even after extended use.

Referring now specifically to the form of the invention illustrated in FIGURES 9–11, the structure of the sloping blade 34 is the same and identical reference numerals

are employed for identifying identical parts to those employed in that form of the invention illustrated in FIGURES 1–8.

In this form of the invention, the channel shaped member 54 and especially the top flange 58 thereof is provided with a vertically disposed plate 112 having a left portion of less height than the right portion. The highest or right hand portion is designated by the numeral 114. The left hand portion of the plate 112 is designated by the numeral 116 and the inclined or offset portion of the plate 112 is designated by the numeral 118. The plate 112 is provided with a longitudinally extending slot 120 conforming to the curvature of the upper edge of the plate 112 thus forming a cam slot receiving a roller therein with the roller being mounted on a pin or shaft 122. The roller 122 is supported by the inner end of a pair of cantilever members 124 which extend on opposite sides of an upwardly extending mounting bracket 126 carried by the outer end of the tubular member 66. The bracket 126 is hingedly attached to the cantilever members 124 by a hinge pin 128 whereby the cantilever members 124 will be cause to oscillate about the hinge pin 128 as the horizontally movable slide 64 is moved laterally in relation to the road grader.

Rigidly mounted on the outer end of the slide 64 is a tubular sleeve guide 130 for vertically slidably receiving a tubular member which may be considered a rear vertical drawbar and which generally is equivalent to the tubular member 86 in that it is provided with the internal post and is connected with the collar, piston and cylinder assembly 104 and the like in the same manner. The vertical rear drawbar 132 is pivotally connected to the outer end of the cantilever members 124 by pins 132 which are received in slots 134 in the ends of the cantilever members 124.

The flat steel plate 112 is approximately 36 inches long and is cut so that the right side 114 is approximately 14 inches high. This plate is cut approximately one third of the distance to the left and then tapers down diagonally at the offset portion 118 to a point a little over one half way and then is straight to the extreme left end designated at 116. The left end portion is approximately 5 inches high and the slot 120 is approximately 30 inches long and is approximately two inches in width. This allows the cylinder 72 to operate for its full 30 inch stroke during lateral movement of the slide 64. The plate 112 is preferably welded to the top of the rear drawbar bracket. The sleeve 130 is preferably of five and one half inch tubing and extends about four inches above the top of the horizontal rear drawbar or slide 64 to a considerable distance below the horizontal rear drawbar for allowing the four and one half inch rear drawbar 132 to slide vertically within the sleeve.

The cantilever arm 124 is fabricated from two steel plates held together by a bolt in the center as shown and includes a roller mounted on the extreme left end of the cantilever arm which fits in the two inch slot in the plate 112. The roller is preferably made of bronze with a one inch hole in the center and this roller rotates on the bolt or pin which holds the two pieces of the cantilever arm together on the left end. The slot in the right hand end of the cantilever arm is approximately two inches long for compensating for the arcuate movement of the right hand end of the cantilever arm when the arm is raised or lowered.

As the hydraulic cylinder 72 is extended to put the blade 34 in operating position, the heel or inner end of the sloping blade 34 is automatically lowered to the proper operating height. As the horizontal rear drawbar is retracted, the cantilever action lifts the heel of the sloper blade 34 to the proper position for travel over the road.

The operation of the present invention will readily be understood from a perusal of the drawings and briefly, the sloper blade 34 will be automatically orientated at the inner end thereof when the outer end is controlled by

the operator by maneuvering the existing grader blade 14 and by extending and retracting the hydraulic piston and cylinder arrangement including the cylinder 102. With this construction, the sloping blade 34 may be properly aligned in relation to the desired slope to be formed on a bank, ditch or the like thus enabling proper orientation of the sloping blade 34 so that the slope may be more accurately formed.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A sloping attachment for road graders comprising a blade having inner and outer ends, drawbar means universally swivelly connected to the inner end of said blade and adapted to be attached to a road grader, an elongated arm univerally pivotally attached to the outer end of said blade and extending forwardly and adapted for attachment to a grader blade for movement therewith, and extensible means interconnecting the drawbar means and the blade adjacent the center thereof for raising and lowering the outer end of the blade relative to the inner end of said blade, said drawbar means including guide means adapted to be rigidly attached to a road grader and disposed in horizontal position, a slide slidably received in said guide means, means interconnecting the slide and said guide for moving the slide laterally of a road grader thereby controlling the lateral position of the inner end of the sloping blade.

2. The attachment as defined in claim 1 wherein said slide includes a vertical sleeve at one end thereof, a vertical drawbar mounted in the sleeve and having the lower end thereof universally pivotally connected with the inner end of the blade for providing universal adjustment of the inner end of the sloping blade, said means for raising and lowering the outer end of the blade being connected to the upper end of the vertical drawbar for elevational change of the entire blade in response to vertical movement of the vertical drawbar.

3. A road grader having a frame and supporting wheels therefor, a grader blade supported from the frame for adjustable movement intermediate the ends of the frame, a rear drawbar assembly mounted on the frame, a sloping blade extending laterally of the frame, adjustable means interconnecting the outer end of the sloper blade and the adjacent end of the grader blade for enabling limited universal adjustment of the outer end of the sloper blade in relation to the outer end of the grader blade, said drawbar assembly including a vertical sleeve, an upstanding support member vertically adjustably and rotatably disposed in the sleeve, means adjustably interconnecting the upper end of the support member with the sloper blade adjacent the center thereof, means adjustably interconnecting the lower end of the support member with the sloping blade adjacent the inner end thereof whereby vertical movement of the supporting member will effect vertical elevational changes of the sloping blade, and means interconnecting the sleeve and the support member for raising and lowering the support member thereby changing the elevational position of the sloping blade, said drawbar assembly also including a guide rigid with the frame, a slide mounted in said guide for horizontal movement laterally of the frame, said slide being connected with said vertical sleeve whereby the sleeve may be moved laterally in relation to the frame, and means connected with the slide for moving the slide laterally of the frame.

4. The structure as defined in claim 3 wherein said sleeve is provided with an arm, a fulcrum lever mounted on said arm adjacent the center thereof and having one

end attached to the vertical support member, the other end of said fulcrum lever being engaged with stationary cam means for changing the elevational position of the vertical support member and the entire sloping blade in response in inward and outward movement of the slide in relation to the guide.

5. A sloping attachment for road graders comprising a blade having inner and outer ends, drawbar means universally swivelly connected to the inner end of said blade and adapted to be attached to a road grader, an elongated arm universally pivotally attached to the outer end of said blade and extending forwardly and adapted for attachment to a grader blade for movement therewith, and means interconnecting the drawbar means and the blade for raising and lowering the outer end of the blade, said drawbar means including guide means adapted to be rigidly attached to a road grader and disposed in horizontal position, a slide slidably received in said guide means, means interconnecting the slide and said guide for moving the slide laterally of a road grader thereby controlling the lateral position of the inner end of the sloping blade, said slide including a vertical sleeve at one end thereof, a vertical drawbar mounted in the sleeve and having the lower end thereof universally pivotally connected with the inner end of the blade for providing universal adjustment of the inner end of the sloping blade, said means for raising and lowering the outer end of the blade being connected to the upper end of the vertical drawbar for elevational change of the entire blade in response to vertical movement of the vertical drawbar, said vertical drawbar including a cantilever arm connected thereto, means on said slide supporting the cantilever arm intermediate its ends, and cam means engaging the inner end of the cantilever arm for causing pivotal movement of the cantilever arm and vertical movement of the vertical drawbar in response to lateral movement of the slide thus automatically lowering the inner end of the sloper blade to an operative position when the sloper blade is moved laterally outwardly of the road grader and automatically elevating the inner end of the sloper blade when retracting the sloper blade to an over-the-road position.

6. A road grader including forward and rear end portions, an earth moving blade mounted beneath the forward end portion, a sloping attachment comprising a sloping blade having inner and outer ends, an attaching arm mounted on the outer end of the sloping blade and connected universally to the grader blade, a rear horizontal drawbar mounted on the rear end portion of the road grader, and a vertical rear drawbar mounted on the horizontal rear drawbar, means universally adjustably connecting the lower end of the vertical rear drawbar to the inner end of the sloper blade, means interconnecting

the vertical rear drawbar and the sloper blade in spaced relation to the vertical rear drawbar for swinging the sloper blade in a vertical plane, and means interconnecting the horizontal rear drawbar and the road grader for moving the horizontal rear drawbar inwardly and outwardly laterally in relation to the road grader, said vertical rear drawbar being vertically slidably and adjustably mounted on the outer end of the horizontal rear drawbar, said horizontal rear drawbar being provided with a pair of upper and lower slide rails, and bracket means attached to the rear portion of the road grader with the bracket means including guides slidably receiving said slide rails, and means interconnecting the vertical rear drawbar and the bracket means for automatically lowering the sloper blade during outward movement of the horizontal rear drawbar and elevating the sloper blade during inward movement thereof.

7. An attachment for road graders comprising a rear drawbar assembly, a sloping blade extending laterally and having inner and outer ends, adjustable means connected to the outer end of the sloping blade and adapted to interconnect said outer end to a road grader, said drawbar assembly including a vertical sleeve, an upstanding support member vertically and adjustably disposed in the sleeve, said drawbar assembly also including a guide adapted to be rigidly connected with a road grader, a slide mounted in said guide for horizontal movement, such slide being connected with said vertical sleeve whereby the sleeve may be moved laterally, and means connected with the slide for moving the slide laterally, means adjustably interconnecting the upper end of the support member with the sloper blade adjacent the center thereof, means adjustably interconnecting the lower end of the support member with the sloping blade adjacent the inner end thereof whereby vertical movement of the supporting member will effect vertical elevational changes of the sloping blade, and means interconnecting the sleeve, the guide and the support member for raising and lowering the support member thereby changing the elevational position of the sloping blade.

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