March 8, 1960 A. B. SKROMME ET AL 2,927,388

BULLDOZER MOUNTING MEANS

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FIG. 1

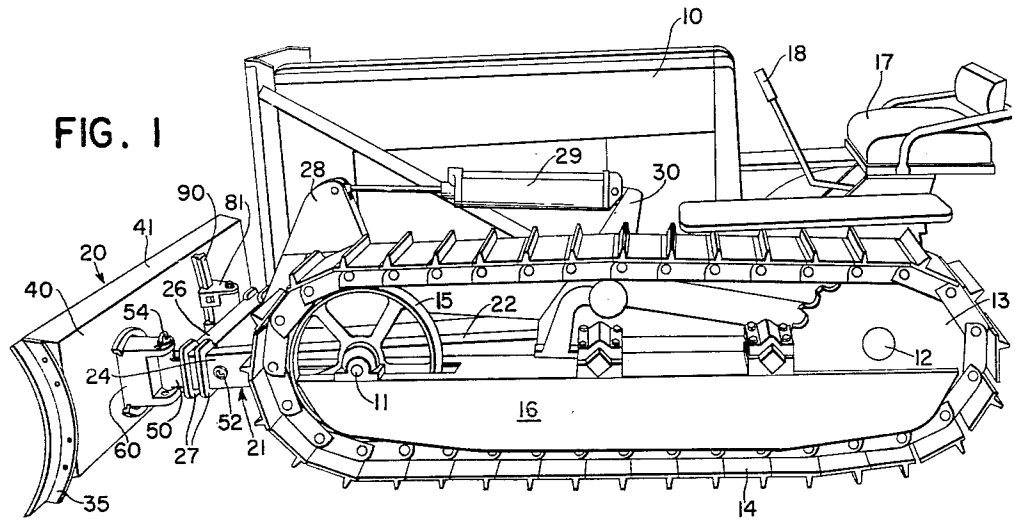
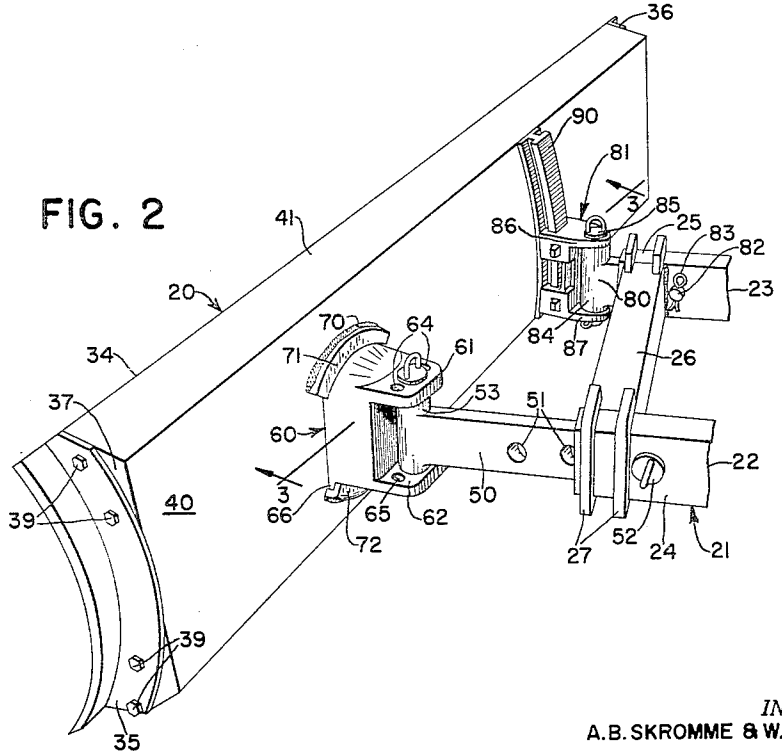


FIG. 2



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FIG. 3

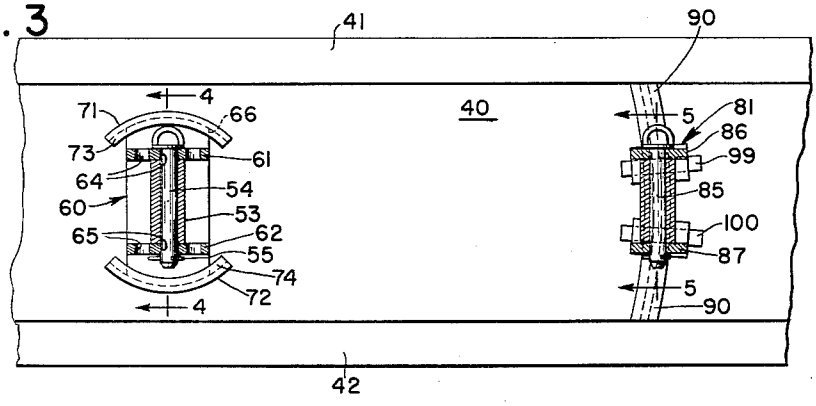


FIG. 4

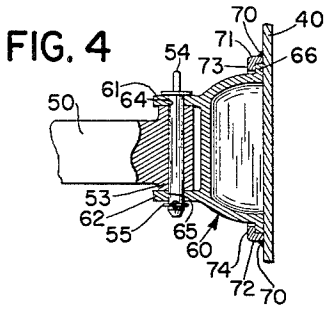


FIG. 5

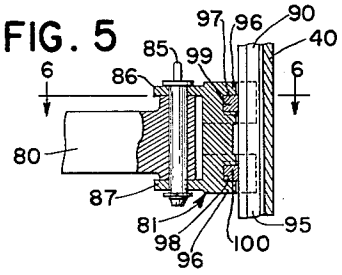


FIG. 6

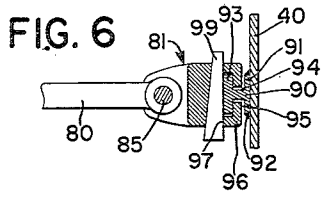


FIG. 7

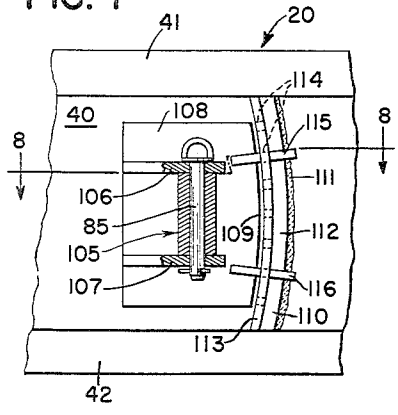
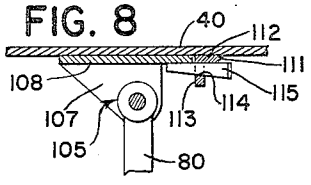


FIG. 8



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BULLDOZER MOUNTING MEANS

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Application May 14, 1956, Serial No. 584,491

8 Claims. (Cl. 37—144)

This invention relates to a bulldozer and tractor assembly, and more particularly to the method of mounting a bulldozer blade on its supporting structure on the tractor.

Normal operation of a bulldozer blade requires three adjustments for positioning the blade relative to the ground be incorporated in the bulldozer assembly. First, provision must be made for vertical positioning of the blade. Provision for this is normally afforded by the installation of hydraulic units mounted on the tractor which operate to raise or lower the supported framework of the bulldozer blade. Second, provision must be made to permit tilting of the blade relative to the ground which is basically the adjustment of dipping or lowering one end of the bulldozer blade so that the blade will create a surface inclined to the horizontal. Third, provision must be made for angling the blade so as to move one end of the blade forward of the opposite end so that the blade is angled relative to the direction of travel. It is with the latter two adjustments that this invention is primarily concerned.

In the usual commercial type of bulldozer assembly, in which the bulldozer blade is mounted forwardly of a tractor, supporting structure is provided for mounting the blade in the form of a pair of forwardly extending arms positioned on opposite sides of the tractor which are pivotally mounted at their rear to the tractor body to permit the forward end of the arms to be swung vertically. The arms are interconnected forwardly of the tractor by means of an integral or rigidly connected cross piece. The free ends of the arms extend forward of the cross piece and means are provided for connecting the free ends to the rear surface of the bulldozer blade. Tilting of the blade is normally afforded by providing a horizontal pivot at the center of the cross piece on which the blade may swivel and provision is made adjacent the free ends of the arm to adjust the tilting angle of the blade and also to lock the blade against tilting. The adjustment at the free ends of the arms usually comprises an arcuate shaped rail member having its center of curvature on the horizontal pivot at the center of the cross piece and which is fixed to the rear face of the bulldozer blade. Attaching elements are provided on the forward end of the arms to lock the blade at any of a plurality of angular or arcuate positions.

One of the difficulties encountered with this type of mounting arrangement is that the lateral spacing between the horizontal pivot and the arcuate rail is such that the radius of curvature of the rail is relatively small. The lateral distance between the horizontal pivot and the rail is small so as to require an arcuate adjustment to be provided on both of the free ends of the forwardly extending arms. In such a connecting arrangement it should be noted that there are three positions of attachment between the supporting arms and the bulldozer blade, the pivotal connection at the center of the cross piece and the connections at each of the free ends of the arms, all of which serves to create a high initial cost

of the assembly as well as requiring a large amount of operational time and expense necessary to detach and attach the bulldozer blade to its supporting framework.

It is, therefore, the primary object of this invention to provide a novel attachment arrangement between the bulldozer supporting structure which limits the number of positions of attachments between the structure and the blade to two, each of which are directly forwardly of the fore-and-aft extending supporting arms.

It is a further object of this invention to incorporate in the above type of connecting means a horizontal pivot at the forward end of one of the supporting arms and an attachment at the forward end of the opposite arm which permits arcuate or angular adjustment about the axis of the horizontal pivot of the first arm.

It is still a further object of this invention to provide a new and novel arrangement for providing arcuate adjustment between the forward end of the respective arm and the bulldozer blade.

Other objetcs and advantages will become apparent to one skilled in the art as the invention is set forth in detail in the following specification described in conjunction with the accompanying drawings.

Fig. 1 is a side perspective of the tractor and bulldozer assembly.

Fig. 2 is a perspective view of the rear of the bulldozer blade and a portion of the bulldozer supporting structure.

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2.

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 3.

Fig. 5 is a sectional view taken along the line 5—5 of Fig. 3.

Fig. 6 is a sectional view taken along the line 6—6 of Fig. 5.

Fig. 7 is a sectional view similar to Fig. 3 of a modification of the invention showing tilting adjustment on the bulldozer blade.

Fig. 8 is a sectional view taken along the line 8—8 of Fig. 7.

For purposes of illustration the present invention is shown in conjunction with a front mounted bulldozer and track-laying tractor assembly. The tractor is composed of a fore-and-aft extending elongated body 10 supported on front and rear axles 11 and 12 respectively. On the rear axle 12 is a track driving sprocket 13 over which is mounted a track 14. The forward end of the tracks extend over an idler sprocket 15 journaled to the front axle 11. Track rollers, not shown, are mounted on the tractor behind a roller shield 16 and operate to maintain the track 14 in engagement with the ground. An operator's station is characterized by a tractor seat 17 on which an operator may be stationed to manipulate levers, as at 18, provided to operate the tractor as well as the bulldozer structure. These as well as other characteristics of the tractor are standard with conventional track-laying tractors and further details are not necessary for a complete and full understanding of the present invention.

The bulldozer is composed of two main parts, a bulldozer or earth-moving blade 20, and the supporting structure which mounts the blade on the tractor and indicated in its entirety by the reference numeral 21. The supporting structure 21 comprises a pair of fore-and-aft extending pusher or lift arms 22, 23 mounted on opposite sides of the tractor body 10 and having their rear ends pivotally mounted for vertical swinging on the tractor frame and having free ends 24, 25 extending forwardly of and ending substantially at the forward end of the tractor body. The arms 22, 23 are cross connected at their forward or free ends 24, 25 by means of a cross member 26 which is fixed to the respective arms as by welding or other suit-

able means. Reenforcing ribs 27 extend around the respective arms 22, 23 and serve as additional support for maintaining a rigid supporting structure.

Upright structural members 28 are fixed to the upper surface of the pusher arms 22, 23. The upper end of the structural members 28 are connected to the piston end of a hydraulic unit 29 which is anchored to a portion of the tractor frame, as at 30. The purpose of the hydraulic unit 29 is obviously to raise or lower the pusher arms 22, 23, about their rear pivotal connections. Hydraulic systems, which are not shown, may be of any conventional type now commonly incorporated in most conventional type tractors. The lifting mechanism here mentioned is of no particular importance as concerning a full understanding of the present invention; consequently, details of the system have been omitted. It should also be noted that only the left side of the tractor and bulldozer has been shown and generally described, the general nature of the assembly on the right side of the tractor being substantially identical to that on the left.

The bulldozer or earth-moving blade 20 is composed of a front plate 34 which is curved to operate as a moldboard. The outer edges of the moldboard 34 are formed of a pair of angle iron members 35, each having a front leg portion contiguous with the front moldboard surface and the other leg portion lying adjacent to side plates, as at 37, which extend rearwardly from opposite edges of the moldboard 34, the angle iron members being fixed thereto by means of bolts 39. Besides the side plates 37, 38 the blade is further built up to include a back plate 40 which extends between the rear edges of the side plates 37 and upper and lower plates 41, 42, respectively, which extend from the upper and lower edges of the back plate 40 to the upper and lower edges of the moldboard plate 34. Therefore, the back surface of the back plate 40 serves as the back surface on the bulldozer blade 20.

The means connecting the bulldozer blade 20 to the pusher arms 22, 23 is comprised in the first instance of a first or left-hand mounting means which connects the left-hand portion of the bulldozer blade 20 to the left pusher arm 22. The first mounting means includes an arm extension 50 which telescopes into the hollow left-hand pusher arm 22 for fore-and-aft adjustment. The arm extension 50 is provided with a plurality of transverse holes 51 which are adapted to receive a pin 52 which extends through complementary registrable holes in the arm 22 so as to lock the arm extension at its desired extended position. The forward end of the arm extension 50 is formed into a hub 53 which has an internal bearing surface for receiving a vertical pin 54. The inner connection between the hub 53 and the pin 54 acts as a vertical pivot. A cotter pin 55 operates to lock the pin in the hub 53. A first or left-hand mounting element 60 is supported on the arm extension 50 by means of upper and lower lugs 61, 62, respectively which extend rearwardly and lie adjacent to the upper and lower surfaces of the hub 53. Suitable openings as at 64, 65 are provided in the upper and lower lugs 61, 62 to receive the vertical pins 54 so as to permit lateral swinging of the mounting element 60 about the vertical pivot. The openings 64, 65 are provided in series of three which are laterally spaced apart to permit a plurality of lateral positions of the pin 54 so as to compensate for various positions of extension of the arm extension 50 relative to the arm 22.

The mounting element 60 is substantially hollow (see Figure 4) and is flared at its forward end to provide flange 66 having a forward surface substantially parallel and lying adjacent to the back surface of the blade 20. As shown in Fig. 3 the flanges 66 are formed so that they form peripheral circular segments.

Fixed by welding 70 to the back surface of the back plate 40 are upper and lower segmental plates 71, 72, respectively, having vertical portions 73, 74, respectively, spaced from the rear surface of the back plate 40 which operate to embrace the flanges 66 so as to secure the flange against the back surface of the plate 40. Again viewing Figs. 3 and 4 it becomes apparent that the segmental plates 71, 72 are formed of circular segments having their center concentric with that of the flanges 66. The connection, therefore, between the mounting element 60 and the back plate 40 is such as to permit vertical swinging, unless otherwise restricted, between the bulldozer blade and the mounting element 60 and about a horizontal axis containing the center of the segments 71, 72 and flanges 66. Considering the element 60, the arm extension 50 and the pusher arm 22 as a first or left arm assembly it also becomes apparent that the bulldozer blade will swing about a horizontal pivot at the forward end of that assembly.

The right or second arm assembly is composed of a right arm extension 80 and a right or second mounting element 81. The right arm extension 80 is telescoped into the hollow center of the right pusher arm 23 and is provided with a plurality of holes, not shown, through which a pin 82 may be inserted. The holes in the arm extension 80 are spaced apart in a fore-and-aft direction along the extension and are registrable with a pair of openings in the pusher arm 23 which also receive the pin 82 for locking the extension 80 at its desired position. A cotter pin 83 operates to lock the pin against movement out of the holes. To this extent the extension 80 is identical to the extension 50 on the left arm assembly.

The forward end of the arm extension 80 is formed into a hub which has an internal bearing surface for receiving a vertical pin 85. The mounting element 81 is provided with a pair of rearwardly extending and vertically spaced apart lugs 86, 87 lying adjacent to the upper and lower surfaces of the hub 84 and have vertically aligned apertures for receiving the vertical pin 85. The mounting element 81, therefore, is permitted swinging about a vertical pivot at the forward end of the right or second arm means which includes the arm extension 80 and the pusher arm 23.

The means for connecting the mounting element 81 to the bulldozer blade 20 includes an arcuate shaped rail 90 having its center of curvature on the horizontal pivot as previously described on the forward end of the left or first arm assembly. As shown in Fig. 6 the rail 90 has an I-shaped cross section with one of the cross pieces 91 of the I welded, as at 92, to the back surface of the back plate 40. The second rigid cross piece or member 93 of the rail 90 is positioned rearwardly and spaced from the back plate 40. The rail 90 therefore affords a pair of arcuate slots 94, 95 for receiving the blade engaging portion of the right mounting element 81.

Upper and lower forward or blade engaging portions 96, part of and integral with the element 81, are formed to C-shaped cross sections which fit over the rigid portion or cross piece 93 of the rail 90 and unless otherwise restricted permits the element 81 to slide arcuately on the rail 90. Also provided in the element 81 is a pair of wedge receiving openings 97, 98 which are adapted to receive upper and lower wedges 99, 100. The wedges 99, 100 have their forward edges lying adjacent to the rear surface of the cross piece 93 of the rail 90 and operate when driven through the openings 97, 98 to drive the forward rigid portions of the C-shaped section 96 against the front surface of the cross piece or bar 93, thereby locking the element 81 against arcuate movement relative to the rail 90.

Positioning the bulldozer blade 20 relative to the pusher arms 22, 23 is done in the following manner. The blade 20 may be angled relative to the direction of travel by extending either or both the arm extensions 50, 80 relative to the pusher arms, 22, 23 and locking the arm extensions at the desired position by extending the pins 52, 82 in registered holes of the extensions and the arms. Angling of the blade 20 will necessitate a lateral adjustment of

the arm extension 50 relative to the mounting element 60 and such is provided for by moving the vertical pin 54 to the correct pair of aligned openings or holes 64, 65 in the mounting element 60. It should here be noted that provision is made for lateral adjustment in only the left arm assembly. While provision is not made for lateral adjustment in the right arm assembly, a similar arrangement could be provided if a higher degree of adjustability is desired. The vertical pivots at the forward end of the arm extension 50, 80 as created by the pins 54, 85 relative to their respective hubs 53, 84 permit the angling of the blade 20 relative to the arm assemblies by permitting the mounting elements 60, 81 to adjust themselves to any angle position of the bulldozer blade.

Tilting of the blade 20 so as to angle or incline it relative to the horizontal may be done by first loosening the wedges 99, 100 so as to permit arcuate adjustment of the element 81 on the rail 90. The rail 90 having its arc of curvature formed from a radius extending from the horizontal axis at the forward end of the left or first arm assembly, will permit arcuate or tilting adjustment of the blade about the horizontal axis, and the blade 20 may be locked at any desired tilting position by merely driving the wedges 99, 100 through the openings 97, 98 to reestablish locking contact between the rail 90 and the mounting element 81.

If it is desired to remove the blade 20 entirely from its supporting framework 21, such may be done by first releasing the wedges 99, 100 and swinging the blade vertically to a position in which the flanges 66 no longer engage or are under the plates 72. It then may be freely withdrawn from the structure 21.

Figs. 7 and 8 show a modification of the invention with particular emphasis on the arcuate adjustment on the second or right arm assembly. In this modification the mounting element at the forward end of the right arm means is mounted on the vertical pin 85 of the arm means in a manner already described relative to the previous form. Lugs 106, 107 of the mounting element 105 extend forwardly from the pin 85 and are integral with a vertical plate 108 which has its forward surface adjacent to the rear surface of the back plate 40. The right edge of the plate 108 is arcuate shaped as at 109 and is proximate to an arcuate shaped rail member 110. Again the center of curvature of the arcuate edge 109 and the arcuate rail 110 is on the horizontal pivot on the left or first arm assembly. The rail 110 is of angled cross section including therein a leg portion 112 adjacent to the back plate 40 and fixed as by welding 111 to the back plate and a rigid rearwardly extending leg portion 113. The rigid portion 113 is provided with a plurality of vertically spaced apart wedge receiving openings 114 for receiving wedges 115, 116. The wedges 115, 116 have their inner ends extending behind the plate 108 and engage the plate 108 to drive the plate into contact with the back plate 40 of the blade 20 so as to prevent it from sliding relative to the bulldozer blade 20.

The modification operates in the following manner. For tilting the bulldozer blade the wedges 115, 116 must first be driven outwardly so as to permit the blade 108 to be loosened from the back plate 40. The bulldozer blade may then be tilted to any desired position. The wedges 115, 116 are then placed in openings 114 and redriven against the rear surface of the plate 108 to lock the blade 20 at the selected tilted angle.

While only one modification of the invention has been shown it should be recognized that other forms and variations could exist without departing basically from the broad general principles herein claimed. It should, therefore, be understood that while the preferred embodiment of the invention has been described with the view of clearly and concisely illustrating the principles, it is desired not to so limit or narrow this invention beyond that which is claimed.

What is claimed is:

1. Attaching means for mounting an earth-moving blade on a mobile vehicle having an elongated body comprising: a blade supporting frame including a pair of fore-and-aft extending arms mounted on opposite sides of the elongated body respectively, each arm having a free end extending proximate one end of the body; first blade mounting means including an arm extension mounted on one of said pair of arms and adapted for adjustment fore-and-aft relative to the free end of the arm and extending beyond the arm to a blade-proximate position, said extension having thereon a vertical pivot, and a first mounting element mounted on the vertical pivot for lateral swinging thereon and having thereon a horizontal pivot; second blade mounting means including an arm extension mounted on the other of said pair of arms adapted for adjustment fore-and-aft relative to the end of the arm and extending beyond the arm to a blade proximate position, said extension having thereon a vertical pivot, and a second mounting element mounted on the latter vertical pivot for lateral swinging and having thereon a blade engaging portion; first mounting means on said blade for mounting said blade on the horizontal pivot to permit swinging of the blade vertically; and second mounting means on said blade for mounting said blade on the blade engaging portion of the second mounting element and including therein means for permitting angular adjustment of the blade about the axis of the horizontal pivot.

2. The invention defined in claim 1, in which at least one of said mounting elements is mounted on its respective vertical pivot by means permitting a plurality of lateral positioning adjustments of the bracket relative to the arm extension.

3. The invention defined in claim 1, in which the first mounting element is characterized by having concentric and circular shaped flange portions fixed to said element disposed in a substantially vertical plane and lying adjacent to the back surface of the blade; and the first mounting means is in the form of rigid members which are fixed to the blade and overlie the flanged portions for creating a horizontal pivotal connection between the blade and the first mounting element.

4. The invention defined in claim 1, in which the second complementary mounting means includes as arcuate shaped track having its center of curvature on the axis of the horizontal pivot and fixed to the blade and including a rigid portion substantially parallel to and spaced from the blade with a surface thereof facing toward said vehicle; the blade engaging portion of the second element is characterized by having a rigid part thereof adapted to extend between the rigid portion of the arcuate track and the plate and is provided with a wedge receiving opening on the opposite side of said rigid portion than said part; and wedge means receivable in the opening and engageable with said surface for selectively locking the blade against vertical swinging about the horizontal pivot.

5. The invention defined in claim 1, in which the second complementary mounting means includes an arcuate shaped track fixed to the blade and having its center of curvature on the axis of the horizontal pivot, said track having a rigid portion projecting in a vehicle extending direction and having therein a wedge receiving opening; and the blade engaging portion of the second element includes a plate portion having one surface thereof adjacent to the blade and the opposite surface thereof facing said vehicle, said second complementary mounting means also having wedge members adopted for extension through said wedge receiving opening and engageable with said opposite surface.

6. Attaching means for mounting a bulldozer blade on a mobile vehicle having an elongated body comprising: a blade supporting frame including a pair of fore-and-aft extending arm means mounted on opposite sides of the elongated body respectively, each of said arm means

having a free end extending beyond the body and having thereon a vertical pivot; a first mounting element mounted on the vertical pivot of one of the free ends for lateral swinging thereon and having thereon a horizontal pivot; a second mounting element mounted to the vertical pivot of the free end of the other arm means for lateral swinging and having thereon a blade engaging portion; first complementary mounting means on said blade for mounting said blade on the horizontal pivot to permit swinging of the blade vertically; and second complementary mounting means on said blade for mounting said blade on the blade engaging portion of the second mounting bracket including therein an arcuate track and guide for permitting angular adjustment about the axis of the horizontal pivot.

7. Attaching means for mounting a bulldozer blade on a mobile vehicle having an elongated body comprising: a blade supporting structure mounted on the elongated body and extending forwardly beyond the body, said structure having thereon a horizontal pivot and a plate member spaced from the pivot with a front surface thereof adapted to lie adjacent the blade; mounting means on the blade for mounting the blade on the horizontal pivot to permit swinging of the blade vertically; a vertically disposed track fixed to the back surface of the blade and including a rigid rearwardly extending portion, said portion having therein a wedge receiving opening; and wedge means extending through the opening and adapted to engage the back surface of the plate member for locking the blade in any of a plurality of angular positions relative to the horizontal pivot.

8. Attaching means for mounting a bulldozer blade on a vehicle having an elongated body with front and rear ends comprising: a blade supporting frame including a pair of fore-and-aft extending arms mounted on opposite sides of the elongated body respectively, each of the arms having a free end ending substantially at the front end of the body; a pair of fore-and-aft extending arm extensions extending forwardly from the free ends respectively of the arms; means forming vertical pivots at the forward end of the arm extensions; mounting elements on each of the vertical pivots; means mounting said arm extensions on their respective arms, said latter means being adjustable to move the vertical pivots between a position adjacent the free ends of the arms and a position spaced forwardly of the free end; means on one of the elements mounting the blade on the element for movement about a horizontal pivot; and track and guide means between the other of the elements and blade for mounting the blade on the element for angular adjustment relative to the horizontal pivot.

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