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SWIVEL FOR BULLDOZER BLADES

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4 Sheets-Sheet 2
My invention relates to new and useful improvements in tractor-operated bulldozers, more particularly to an improved means for connecting the bulldozer blade to the blade-supporting U-frame and to the landsides, whereby the blade may be angled about a vertical axis, tilted about a fore-and-aft axis, tipped about a horizontal transverse axis, and secured in selected positions of angling, tilting, and tipping.

In bulldozers of the type to which the invention is adapted, namely bulldozers, a U-shaped frame, surrounds the front end of a tractor, the ends of the two branches of the U being pivoted to the sides of the tractor, usually on or adjacent the rear axle thereof. The apex of the U is attached to the center of the rear of the blade by means of a joint, which permits the blade to be tilted in a vertical plane and angled in the horizontal plane. An adjustable brace, called a landside, extends from the sides of the U to each end of the blade, where the landside is attachable at various elevations to an arcuate guide on the blade, thus effecting tilting of the blade in a vertical plane. Attaching the rear ends of the landsides at various selective positions on the U effects angling of the blade in the horizontal plane.

The principal object of my invention is to provide an improved connection between the blade and the U-frame, with the following ends in view, namely:

(1) To provide a simple compact connection between the blade and the U-frame which will permit the blade to be angled, tilted and tipped, and to be secured in selected angled, tilted and tipped positions.

(2) To provide a connection such that the tilting axis both angles and tips with the blade; and the tipping axis angles but does not tilt with the blade.

(3) To provide a connection such that the tilting axis is central and perpendicular to the blade, and the tipping axis is central and parallel to the blade.

(4) To provide a connection having a minimum number of parts, and assembly and disassembly of which is simple.

(5) To provide a connection having suitable bearing surfaces for transmitting thrust from the blade to the supporting U-frame.

(6) To provide a connection that will provide a firm and steady mounting for the blade and a snug fitting relationship between the blade, the supporting U-frame, and the connecting pin, in all positions of angling, tilting, and tipping.

In addition to the objects above stated, I have worked out a number of novel and useful details, which will be readily evident as the description progresses.

My invention consists in the novel parts, and in the combination and arrangement thereof, which are defined in the appended claims, and of which two embodiments are exemplified in the accompanying drawings, which are hereinafter particularly described and explained.

Throughout the description, the same reference number is applied to the same member or to similar members.

Referring now to the accompanying drawings, it will be seen that:

Figure 1 is a plan view of the blade and U-frame of a bulldozer, according to the present invention, the landside end connections being partly in section.

Figure 2 is a rear elevation of the blade, taken along the line 2—2 of Figure 1.

Figure 3 is an enlarged diagonal view, from one side rear, partly in section, showing the front central portion of the supporting U-frame, the central portion of the blade, and the connection between them.

Figure 4 is a transverse vertical section of said connection, taken along the line 4—4 of Figure 5.

Figure 5 is a longitudinal vertical section of said connection, taken along the line 5—5 of Figure 4.

Figure 6 is a horizontal section, taken along the line 6—6 of Figure 4, showing the connection in a horizontal plane through the upper square portion of the pin.

Figure 7 is a horizontal section, taken along the line 7—7 of Figure 4, showing the connection in a horizontal plane through the intermediate circular portion of the pin.

Figure 8 is a side elevation of the connection between one end of the blade and its adjacent landside, showing the blade secured in normal vertical position.

Figure 9 is a plan view, partly in section, taken along the line 9—9 of Figure 8.

Figure 10 is a side elevation, similar to Figure 8, but showing the blade tipped rearwardly of its normal position.

Figure 11 is a side elevation, similar to Figure 8, but showing a second embodiment of the connection between one end of the blade and its adjacent landside.

Figure 12 is a plan view, partly in section, taken along the line 12—12 of Figure 11.

Figure 13 is a side elevation, similar to Figure
Referring now to Figures 1 and 2, we see that 11 represents a conventional bulldozer supporting U-frame which serves to mount the bulldozer blade 12 forwardly of a tractor (not shown). The rear end 13 of the side arms 14 of the U-frame are usually pivotally connected to the sides of the tractor (not shown) so that the U-frame may be raised and lowered about the horizontal transverse axis of the tractor (not shown). The bulldozer blade is disposed transversely of U-frame 11 in advance of its front portion 15. At its center it is mounted on the apex of the U-frame so that it can be angled about a normally vertical axis, tilted in a normally vertical plane about its central fore-and-aft axis, and tipped about a horizontal transverse axis, as will be described hereafter.

In order to retain the bulldozer blade in a given angled position in the horizontal plane, channel braces 19, known to the trade as "land-sides," are provided between the side arms 14 and the ends of the bulldozer blade 12. The rear end of each landside 16 carries a pin 17 which is receivable in one of holes 18 longitudinally spaced along each side arm 14. The method of attaching the forward ends of the landsides to the arcuate tracks 19 on the blade 12, so as to retain the blade in any given tilted position or tipped position will be described hereafter.

Some conventional means (not shown) must be provided for raising and lowering the blade, about the pivotal connection of the frame to the tractor.

Turning now more particularly to Figures 3 to 5, let us consider the means for securing the blade 12 to the apex of U-frame 11.

The front portion 15 of U-frame 11 has a cylindrical abutment 20 with spherical ends 21 and 22 and a vertical cylindrical hole 23 therethrough. On and integrally secured to, the rear face of the blade 12, is attaching member 24 which has two rearwardly projecting top and bottom lugs 25 and 26. These lugs are adapted to overlap the spherical ends 21 and 22 of abutment 20, and have vertical holes 27 and 28 respectively which are keyed by pin 29 and rectangular keeper 40 to hole 23 in abutment 20.

Pin 29 has a cylindrical portion 30 to fit in hole 23 of abutment 20, and preferably a square head 31, with sides slightly wider than the diameter of cylindrical portion 30, to fit in hole 41 of keeper 40.

Hole 21 in upper lug 25 is rectangular in cross section. Its sides 32, transverse to the tractor, are approximately the same length as the corresponding outer sides 42 of keeper 40, in order to give a snug fit between the ends of the keeper and sides 33 of lug 25 and to effect the keying above mentioned. Sides 33 longitudinal to the tractor, are substantially longer than the corresponding outer sides 43 of keeper 45, in order to permit the blade to tip about an axis transverse to the tractor.

Similarly hole 41 of keeper 40 is rectangular in cross section, its transverse inner sides 44 being somewhat longer than the corresponding sides of head 31 of pin 29, to permit tilting of the blade about its perpendicular axis, and its longitudinal inner sides 45 having the same length as the sides of head 31 to give a snug fit between the pin and keeper to key the pin 29 to lug 25.

Hole 28 of lower lug 26 is also large enough to permit tilting and tipping movement of the lug relative to the pin which need not, however, be keyed to the lug.

The top surface of lugs 25 is spherical, pin 29 having a cap 34 which overlaps and contacts snugly the top surface of the lug in all tilting or tipping positions and thereby prevents dirt from collecting between pin head 31 and the sides of keeper 40 and lug 25.

The forward half of the inner surface of lugs 25 and 26 is spherical to register on the spherical ends of abutment 20, but the rear half is cylindrical about the tilting axis of the blade to permit the lugs to be withdrawn from the abutment when the blade is dismantled.

In order to retain the blade in a given tipped position, an adjustable lock, preferably the one not necessarily in the form of screws 46 turned by crank 47 through worm gear 48 and worm pinions 49, is provided between upper lug 25 and keeper 40. Turning the crank in one direction tips the top of the blade rearwardly, turning it in the other direction tips the top of the blade forwardly.

The connection is assembled by simply inserting abutment 20 between the lugs 25 and 26 of member 24 on the back of the blade and then inserting pin 29 through the three holes already described. The pin may be held in place by a cotter-pin (not shown) or other suitable fastening means.

It will be noted that pin 29 is the only part to be inserted in assembly, inasmuch as the invention has eliminated the second pin, pivot plate, or bayonet joint as the case may be commonly used in present machines between the blade and the separate attaching member. Furthermore it will readily be seen that the blade can be assembled and disassembled in normal horizontal position, without it being necessary to turn either it or any other part. Another advantage of this connection is that it is more compact, it being possible to place the blade closer to the supporting frame because of the elimination of any intermediate attaching member with its additional pin or other swivel joint between the blade and the supporting frame. Another advantage is that the thrust and weight of the blade is carried directly by the spherical bearing surfaces 21 and 22 of abutment 20, instead of on pin 29 as in earlier machines.

Turning now to Figures 8 to 10, we see that the means connecting each landside 16 with the corresponding end of the blade to permit angling, tilting and tipping and to secure the blade in various tilted and/or tipped positions comprises a T-shaped adjusting block 51 which is pivotally mounted on landside end casting 52 by pin 53 (or other suitable means) to permit swinging about a vertical axis, and dovetails with and slides vertically in a C-shaped arcuate track 19 (with center of curvature on the tilting axis) secured to the back of the bulldozer blade. By sliding the T-block along the C-effect axis tilting a blade. The blade is secured against tilting at any selected point by inserting wedges 55a and 55b through holes 56a and 60 respectively in the web 58 of the T-block, between the shoulders 57a and 57b of the T-block and the back surfaces 56 of the C-track.

The head 59 of the T-block engages the interior of the C-track at surface 61 of the T-block, this surface being convex in a vertical plane to permit the blade to tip about horizontal tipping axis 63 transverse to the tractor that passes through the center of curvature of spherical surfaces 21 and 22.
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The blade is secured in normal vertical position (Figure 8) by inserting one wedge in each of holes 58a and 58b in T-block 51. The blade is secured in rearwardly tipped position (Figure 10) by inserting both wedges 58a and 58b in lower hole 60b between lower shoulder 57b and the lower portion of surfaces 55 of C-track 19, so that the upper portion of back surface 56 of C-track 19 bears against the rearwardly inclined upper shoulder 57a of T-block 51. The blade is secured in forwardly tipped position by inserting both wedges 58a and 58b in upper hole 60a between upper shoulder 57a and surfaces 58, so that the lower back surfaces 58 of C-track 19 bear against the forwardly inclined lower shoulder 57b of T-block 51.

Turning now to Figures 11 to 13 inclusive, we see a second embodiment of the means for connecting the end of the landside to the blade to permit angling, tilting and tipping. This embodiment is similar to the first embodiment (Figures 8 to 10), except that the T-block now consists of two interlock members, i.e.: bearing block 71 and tipping block 72. Bearing block 71 is pivotally mounted on landside end casting 52 by pin 53 to permit swinging about a vertical axis, and has arcuate surfaces 73a and 73b to permit the blade to tip about horizontal tipping axis 69 and bearings surfaces 74a and 74b on the bearing block 71 to engage the back of C-track 19, when the blade is tipped rearwardly and forwardly respectively. Tipping block 72 has a shoe 15 that slides inside arcuate C-track 19 (to permit tilting), and has arcuate arms 75a and 75b that slidably engage convex surfaces 76a and 76b respectively of bearing block 71 to permit tipping of the blade. Wedges 17a and 17b are inserted between one or both of bearing surfaces 74a and 74b and the back of the C-track depending on the tipping position of the blade, in a manner similar to that employed in the first embodiment.

Having now described and illustrated two forms of my invention, I wish it to be understood that my invention is not to be limited to the specific form or arrangement of parts herein described and shown.

I claim:

1. In bulldozer, the combination of: a supporting frame; a blade; means swivelly mounting said blade on said frame to tilt about an axis substantially perpendicular to the blade and to tip in a fore-and-aft direction about a horizontal axis; a landside adapted to be adjustably connected at its rear end to one side of the supporting frame to retain the blade in a plurality of selected positions in the horizontal plane; means slidably connecting the forward portion of the landside to the blade to permit the blade to tilt and to tip; said means comprising a plurality of interlocked members; one such member being an arcuate block having a concave surface, said surface having its center of curvature substantially on the tipping axis; another such member being a connecting block mounted on the landside, and having a convex surface, said surface having its center of curvature substantially on the tipping axis; and said connecting block comprising means for surface engagement with bearing means on the blade when the blade is in a predetermined tipped position.

2. A bulldozer according to claim 1, further characterized by having a connecting member interlocked with said arcuate track and with said connecting block and having sliding engagement with said arcuate track about the tilting axis of the blade and sliding engagement with the convex surface of said connecting block about the tipping axis of the blade.

3. A bulldozer according to claim 1, further characterized by having common locking means associated with said interlocked members to secure the blade against tilting and against tipping at a plurality of selected tilted and tipped positions of the blade.

4. A bulldozer, the combination of: a supporting frame; a blade; means swivelly mounting said blade on said frame to tilt about an axis substantially perpendicular to the blade and to tip in a fore-and-aft direction about a horizontal axis; a landside adapted to be adjustably connected at its rear end to one side of the supporting frame to retain the blade in a plurality of selected positions in the horizontal plane; means slidably connecting the forward portion of the landside to the blade to permit the blade to tilt and to tip; said means comprising a plurality of interlocked members; two of said interlocked members having sliding engagement along an arc about the tilting axis of the blade, and two of said interlocked members having sliding engagement along an arc about the tipping axis of the blade.

5. A bulldozer according to claim 5, further characterized by the fact that two of said interlocked members have plane bearing surfaces that register in bearing contact when the blade is tipped in a predetermined position.

6. A bulldozer according to claim 5, further characterized by having wedge means between two of said interlocked members to lock the blade against tilting and tipping at a plurality of selected tilted and tipped positions of the blade.

7. A bulldozer according to claim 5, further characterized by having guide means for its adjacent cooperating interlocked member, said guide means being rigidly mounted on the blade and having its center of curvature on the tilting axis; that another of said interlocked members includes arcuate guide means for its adjacent cooperating interlocked member, said last-mentioned guide means being mounted on the forward end of the landside and having its center of curvature on the tipping axis; each guide means being adapted to lock its adjacent cooperating member against relative movement in the direction of the tilting and tipping axes.

8. A bulldozer according to claim 5, further characterized by the fact that said frame is U-shaped, having a vertical hole in the center of the U, and has adjacent its vertical hole a spherical bearing surface having its center of curvature on the tilting and tipping axis; that the blade has at least one rearwardly projecting lug with a vertical hole therein to register with the vertical hole in the U; and that said blade has a concave surface adapted to register with said spherical bearing surface in all tilted and tipped positions of the blade.

9. In a bulldozer, the combination of: a blade; a supporting frame; a pin; a supporting member integral with the back of the blade; a connecting block; a blade-supporting convex bearing surface on the supporting frame adjacent the second hole; said bearing surfaces having sliding contact and reg-
istering with each other in all angling, tilting, and tipping positions of the blade; and adjustable locking means associated with the supporting member and engaging said pin to secure the blade in any of a predetermined range of tipped positions while permitting the blade to assume any of its angled or tilted positions.

11. A bulldozer according to claim 10, further characterized by the fact that said adjustable locking means includes a rectangular keeper, said keeper being disposed inside said supporting member and having sliding engagement with the inner walls of said supporting member in a normally-vertical plane approximately perpendicular to the blade, and being disposed around said pin and having sliding engagement with said pin in a plane approximately parallel with the blade.

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