HYDRAULICALLY ADJUSTABLE DOZER BLADE

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3 Claims. (Cl. 37—144)

This invention relates generally to dozer equipment and is specifically concerned with a hydraulically operated means of blade control.

This application is a continuation-in-part of my co-pending application Serial No. 72,226, filed November 28, 1960, for Hydraulically Adjustable Dozer Blade.

In the conventional bulldozer construction, the scraper blade is usually mounted on a U-shaped frame which has its legs pivotally connected to the dozer so that the blade can be raised and lowered. It is also conventional in some arrangements to provide hydraulic cylinders along the sides of the frame for angling the blade. In other known arrangements, provision has been made for tilting the blade, and in still different constructions for changing the pitch of the blade.

The prior art has not, however, provided for an automatic means of blade control which is operative to change the angle of the blade and, at the same time, to adjust the angle of the cutting edge relative to the horizontal when the blade is raised and lowered. The need for such automatic, universal control exists in many operations. For example, when an angled dozer blade is vertically raised by pivoting the U-shaped frame, the end of the blade nearest the dozer will be lower than the other end. This vertical angling of the blade often is disadvantageous, as in scalping operations where it is desired to have the cutting edge of the blade horizontal.

Hence, in order to change the vertical angle of the cutting edge of the blade which has been raised and angled, it has been necessary for the operator manually to adjust turnbuckles or the like. Such a manual operation is known to be extremely difficult and is also time-consuming, since the operator is required to get off of the dozer when making the adjustment.

An object of the present invention is to provide a novel and improved dozer blade assembly which permits the blade angle and the angular disposition of the blade cutting edge relative to the horizontal to be adjusted conveniently when the blade is raised and lowered.

Another object of the invention is to provide an automatic control for an adjustable blade assembly as described above.

A further object of the invention is to provide a blade assembly and automatic control as previously described wherein the adjustment can be made while the dozer is in motion.

Still another object of the invention is to provide a novel and improved dozer blade assembly and automatic control which is adaptable to existing equipment.

The above objections of the invention are achieved by providing a dozer with the usual U-shaped blade mounting frame which includes side frame portions connected forwardly of the dozer by a horizontal cross frame. An elongated dozer blade is universally mounted at its center to the center of the cross frame, and triangular frames are universally connected at vertically spaced points to each end of the blade. The rearwardly extending portions of the triangular frames are connected to hydraulic cylinder mechanisms secured to the fixed side frames, whereby the angle of the blade can be adjusted.

The upper spaced connecting point of each triangular frame to the blade is formed by a hydraulic cylinder carried by the frame and having its piston rod attached to the blade. According to the novel concepts of the invention, these hydraulic cylinder mechanisms are actuated in opposite directions so as to longitudinally twist the dozer blade. More particularly, when the blade is angled and raised, the hydraulic cylinder mechanism connected to the blade end nearest the dozer is retracted, while the mechanism connected to the opposite blade end is extended. The resulting twisting of the blade effectively adjusts the cutting edge of the blade so that it is disposed in a horizontal plane.

As will hereinafter be made apparent, the blade adjustment is advantageously carried out automatically without requiring the operator to get out of the dozer. Further, the blade assembly and control can be incorporated into existing equipment with a minimum amount of alteration and expense.

Other objects and advantages of the invention will become apparent from the following detailed description and the accompanying drawings.

In the drawings:

FIGURE 1 is a plan view of the novel and improved dozer blade assembly and automatic control mechanism of the invention; and,

FIGURE 2 is a side elevational view of the invention shown mounted on the forward end of a tractor indicated by broken lines.

Referring now to the drawings, reference numeral 5 designates the forward end of a tractor having an endless track drive 6 and a blade mounting side frame structure 7.

The side frames 7 extend forwardly of the tractor and are connected by a cross beam 8 which has a forwardly extending stepped portion 9 forming an outwardly located central apex 10. The opposite ends of the side frames are pivotally connected to the tractor 5 in the conventional manner so the cross beam 8 can be raised and lowered by suitable actuating mechanisms (not shown) acting between the tractor and the side frame structure.

A rectangular opening 11 is cut at the apex 10 and is adapted to mount horizontal bearing lugs 12. The lugs 12 form part of a universal joint 13. The joint 13 thereby consists of a large adjustment central portion with protruding bearing lugs 12 extending from each end. The lugs 12 are bearing in the apex 10 of the cross beam 8.

Pivotal movement in a horizontal plane is provided by a vertically extending bolt 14 which extends through the joint 13 and two opposed blade mounting brackets 15. The brackets are secured centrally of the length of an elongated blade 16. The blade has a flat back face 17 and a forward concave surface 18 and lower terminating cutting edge 19.

Mounted on the back face 17 adjacent the upper end portions thereof are ball socket mountings 20 into which are inserted for universal pivotal movement the ends of rearwardly extending piston rods 21. As described above, the piston rods are selectively operable in opposite directions by two-way cylinders 22 having suitable hydraulic leads 23. Each cylinder is mounted on one arm of a triangular frame 24 which is located in a vertical plane and extends forwardly of the tractor side frame in a spaced relationship therewith.

In operation, the piston rods 21 work through a relatively small distance, usually six inches or less. Thus, by using conventional ball and socket mountings 20 which provide relatively loose connections, there will be no binding of the piston-cylinder mechanisms 21, 22. However, if desired, the cylinders 22 may be pivotally connected to the frame 24 in a conventional manner so that the cylinders can tilt about a horizontal axis.

One side 25 of each frame 24 extends downwardly in a substantially vertical manner to terminate with a socket-type bearing 26. The bearing 26 mounts the outer end of a rearwardly projecting lug 27 located on the back face 17 vertically beneath the mountings 20. A third arm 28 of the frame completes the triangular framework.
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A piston rod 30 having a normally extending bearing end 31 is adapted to locate in each socket 29. The rods are received in double-acting hydraulic cylinders 32 having suitable hydraulic leads 33 and mounted along the tops 34 of the side frames 7.

The novel operation of the blade will be apparent from the above description. The blade may be selectively angled to either side, as indicated by the broken lines 16', by actuation of the piston-cylinder mechanisms 30, 32 in opposite directions. Also, the blade 16 can be bodily raised and lowered by actuation of the side frame structure 7.

In order to adjust the cutting edge 19 of the blade 16 after it has been angled and elevated, the piston rod 21 which is connected to the end of the blade nearest to the tractor 5 is retracted. Simultaneously the piston rod 21 which is connected to the end of the blade farthest from the tractor is extended. This opposite actuation of the piston-cylinder mechanisms 21, 22 results in an actual twisting of the dozer blade 16, as generally indicated by the broken lines 16', so that the elevated portion of the cutting edge is pivoted toward the ground while the lower portion of the cutting edge is swung away from the ground. As a result, the entire cutting edge 19 may be disposed in substantial horizontal alignment. It is to be understood that the actual longitudinal twisting which is imparted to a dozer blade in accordance with the invention has been exaggerated in FIGURE 1 for the purpose of clearly illustrating the novel manner of operating the piston-cylinder mechanisms 21, 22.

Thus, it will be seen that the invention provides an effective and robust means of universally adjusting a dozer blade in the minimum of time. The construction enables efficient operation of the dozer within confined areas and assists in making more effective cuts under all conditions.

Many modifications and variations of the invention will be apparent to those skilled in the art in view of the foregoing detailed description. Therefore, it is to be understood that, within the scope of the appended claims, the invention can be practiced otherwise than as specifically shown and described.

What is claimed is:

1. An adjustable blade structure for a dozer comprising a side frame extending along each side of the dozer, a cross beam rigidly connected between the forwardly extending ends of said side frames, a dozer blade, means universally connecting said blade intermediate its ends to the center of said cross beam, fluid operated means carried by each of said side frames, a frame structure pivotally connected to each of said fluid operated means for linear movement relative to said side frames, means connecting said frame structures to said blade at corresponding locations near its ends, said frame structure connecting means being disposed in alignment with said universal connecting means and including means for permitting said blade to be universally moved, and a piston-cylinder mechanism carried by each of said frame structures, said piston-cylinder mechanism including piston rods connected by universal pivot means to the back of said blade near the upper end corners thereof and above the frame structure connecting means, whereby the blade can be angled by said fluid operated means and simultaneously twisted by opposite actuation of said piston-cylinder mechanisms to thereby dispose the bottom edge of said blade in substantial horizontal alignment.

2. An adjustable blade structure for a dozer comprising a side frame extending along each side of the dozer, a cross beam rigidly connected between the forwardly extending ends of said side frames, an elongated dozer blade, means connecting said blade to said center of said cross beam for universal movement, said blade connecting means being disposed intermediate the ends of said blade and below the horizontal centerline thereof, a pair of substantially vertically extending frame structures, universal pivot means connecting each frame structure to the back face of said blade near its ends, said universal pivot means and said blade connecting means being disposed in horizontal alignment, a fluid actuated piston-cylinder mechanism carried by each of said frame structures, universal pivot means connecting said piston-cylinder mechanisms to the back face of said blade near its upper end corners, and fluid operated means carried by each of said side frames, each of said fluid operated means being pivotally connected to one of said frame structures for producing linear movement thereof relative to said side frames, whereby the blade can be angled by said fluid operated means and simultaneously twisted by opposite actuation of said piston-cylinder mechanisms to thereby dispose the bottom edge of said blade in substantial horizontal alignment.

3. An adjustable blade structure as claimed in claim 2 wherein each of said frame structures comprises a triangular framework including a vertical leg adjacent the back face of said blade, a horizontal top leg, and an upwardly and rearwardly extending bottom leg, said piston-cylinder mechanisms being carried on said horizontal top legs, said universal pivot means being disposed at the bottom ends of said vertical legs, and said fluid operated means being pivotally connected to said triangular frameworks at the junctures of said horizontal top legs and said bottom legs.

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