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J. R. SMITH ET AL

3,503,457

BULLDOZER

Filed Dec. 14, 1967

2 Sheets-Sheet 1

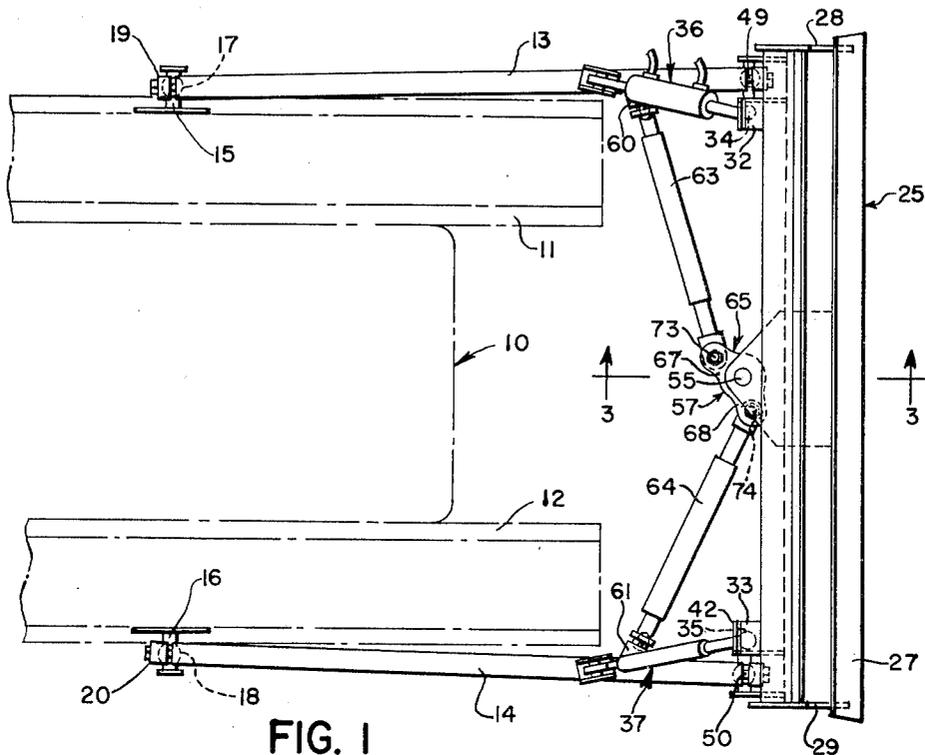


FIG. 1

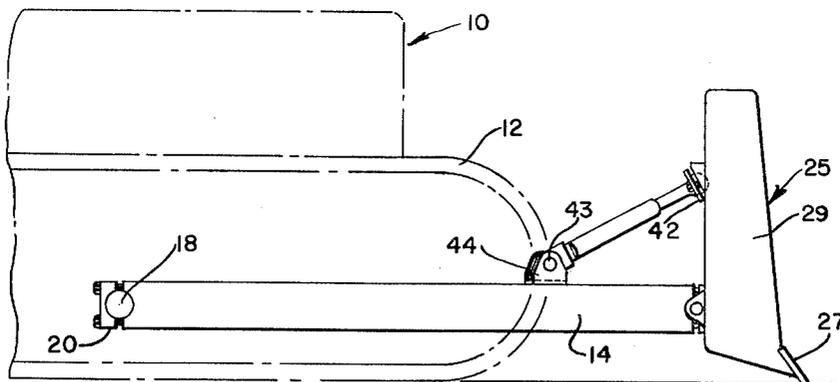


FIG. 2

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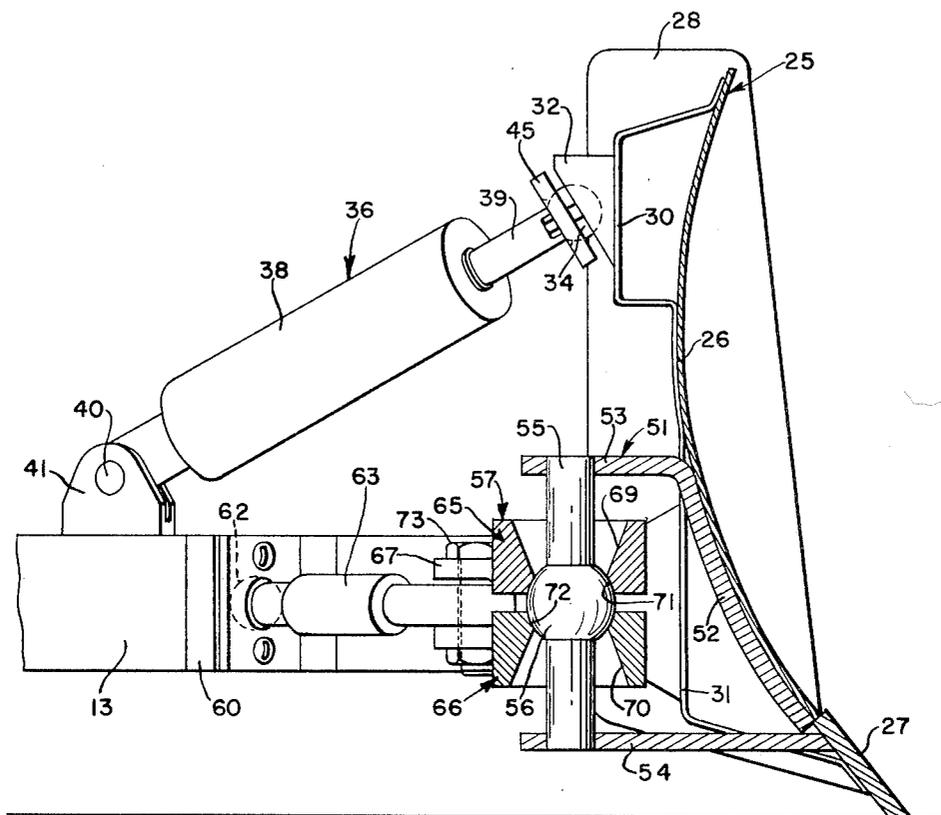


FIG. 3

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BULLDOZER

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7 Claims

ABSTRACT OF THE DISCLOSURE

A bulldozer including a blade, a pair of parallel push arms supported at their rear ends on a tractor and having their forward ends connected to the blade; a pair of struts supported on the respective arms and extending upwardly and forwardly from the arms to and for connection with the back of the blade, at least one of the struts being extensible and retractable for effecting tilting of the blade; a pair of elongated rigid brace elements having outer ends connected to the respective arms and extending inwardly and forwardly toward the center of the blade; a coupler device pivotally supported on the rear side of the blade and in a central location thereof; and a pair of connectors on the coupler spaced radially from the pivot on opposite sides of the pivot and adapted for connection to the inner ends of the braces whereby the forces exerted by one of the braces will be forwardly of the pivot and the lines of force exerted by the other of the braces will be rearwardly of the pivot.

BACKGROUND OF THE INVENTION

This invention relates to a bulldozer and more particularly to the strut and brace arrangement between the push arms of the bulldozer and the blade.

The conventional type of bulldozer utilizes a pair of push arms that are connected to opposite ends of a bulldozer blade. Extending upwardly from the upper side of each of the arms is a strut that braces the bulldozer blade and normally at least one of these struts is extensible and retractable for tilting the blade from one end to the other. Also provided are a pair of braces that extend inwardly from the inner sides of their respective arms and are connected to the center portion of the blade. Heretofore it has only been conventional to strengthen the struts and braces in accordance with the size of the blade and the size of the tractor that the bulldozer was to be mounted. In testing the bulldozer, should a failure occur in the arms, braces, or struts, the normal procedure was to enlarge or strengthen the part that failed.

The very nature of the construction of a bulldozer is such that when the extensible and retractable strut is moved, it places a very strong load on the push arms since there is a load applied on the arms due to the tilting of the blade which tends to distort or deform the arms. Also when a load is applied to only one end of the blade there is a further tendency to distort the arms, braces and struts. These are the forces that normally create breakage or warping of various of the parts of a bulldozer.

SUMMARY OF THE INVENTION

With the above in mind, it is the purpose of the present invention to provide a bulldozer utilizing a coupler device on the rear center portion of the blade that interconnects the inner ends of the braces to utilize the force created in each of the braces, as created due to the aforementioned loads, to counteract identical forces in each of the opposite braces. Specifically it is proposed to provide a coupler that is carried on the rear portion of the blade so as to swivel about a vertical axis and to provide connectors radially spaced from the vertical axis that connect

to the inner ends of the braces and maintain the lines of force of one of the braces forwardly of the axis and the lines of force exerted by the other of the braces rearwardly of the pivot.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the bulldozer structure with a tractor in dotted representation for purposes of orientation.

FIG. 2 is a side view of the bulldozer shown in FIG. 1 and also showing the tractor in dotted representation.

FIG. 3 is an enlarged sectional view taken substantially along the line 3—3 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The bulldozer is adapted to be supported on a tractor, shown in dotted representation at 10, and preferably of the type of tractor having a pair of tracks also shown in dotted representation at 11 and 12. The bulldozer is composed of a pair of push beams 13, 14 adapted to be disposed on the outer sides of the tracks 11, 12 and supported thereon by transverse horizontal shafts 15, 16, the latter having at their outer ends the ball portions 17, 18 of conventional ball and socket joints. The rear ends of the beams 13, 14 are carried on the ball portions 17, 18 by detachable sockets 19, 20.

The bulldozer blade 25 is provided at the forward ends of the push beams 13, 14. The bulldozer blade includes a forwardly disposed arcuate blade portion 26 with a lower cutting blade 27 continuing downwardly from the lower edge of the blade portion 26. A pair of upright structural plates 28, 29 are fixed to opposite ends of the blade portion 26. Welded to the inner faces of the plates 28, 29 and to the rear face of the blade portion 26 are a pair of vertically spaced horizontal channels 30, 31 that serve to brace and reinforce the entire blade. The upper channel 30 has at its opposite ends rearwardly extending bracket structure.

Extending rearwardly and fixed to the upper channel are a pair of blocks 32, 33, both of which have cavities for receiving a ball portion 34, 35 of a pair of end struts 36, 37. The lefthand strut 36 is composed of a hydraulic cylinder 38 and a rod 39, the latter having the ball 34 at its end. The cylinder is pivotally mounted at 40 to upright brackets 41 projecting from the upper surface of the push arm 13. The right strut 37 is of a turnscrew type that has its forward end 35 fixed in the block 33 by a suitable clamp 42 and its rear end pivotally mounted at 43 to upright brackets 44 welded to the upper surface of the right push beam 14. The piston rod 39 and the ball 34 thereon are held in the block 32 by a connecting plate 45 bolted into the block 32.

The forward ends of the push beams are connected to the lower outer ends of the blade structure 25 by means of ball and socket joints 49, 50 respectively.

Fixed to the rear surface of the main blade portion 26 and centrally in respect to the fore-and-aft center line of the tractor and bulldozer blade is a rearwardly projecting bracket structure 51 that includes a forward arcuate shaped section 52 welded to the rear surface of the blade portion 26 and an integral upper horizontal plate portion 53 that projects rearwardly. The bracket structure 51 also includes a lower horizontal plate 54 positioned beneath the upper plate 53. Extending between the two plates 53, 54 and fixed thereto is an upright pin member 55 with a centrally located ball portion 56 that serves as a pivotal joint for a coupling device indicated in its entirety by the reference numeral 57.

Welded to the inner sides of the push beams 13, 14 are a pair of blocks 60, 61 having hollow recesses serving as sockets for receiving the ball-shaped ends, such as is

shown in dotted representation at 62 in FIG. 3, of a pair of converging braces 63, 64. The braces 63, 64 have their adjacent inner ends connected to the coupling device 57.

The coupling device 57 is a three-point lever structure composed of upper and lower bell crank levers 65, 66, each having one arm 67 extending rearwardly of the pin 55 and an arm 68 extending slightly forwardly of the pin 55. As shown in FIGURE 1, the arms are substantially 120 degrees apart. The levers 65, 66 have enlarged central portions with hollowed cone-shaped sections 69, 70 respectively and adjacent socket or partial spherical sections 71, 72 that engage the surface of the ball portion 56. The two levers 65, 66 are held together by a pair of bolts 73, 74 that extend through the outer ends of the respective arms 67, 68 and operate as connecting elements for the inner ends of the braces 63, 64. The nuts on the bolts 73, 74 are equally tightened and rigidly hold the two plates 65, 66 in a relatively tight pivotal connection on the ball 56.

Referring to FIG. 1, it will be noted that the braces 63, 64 diverge from the coupling 57. Also, the brace 63 will exert a force lying in a line whose extension would be rearwardly of the pivot pin 55 and the brace 64 will exert forces lying in a line whose extension is forwardly of the pivot pin 55. This feature becomes important for it tends to balance forces which would normally tend to rack the bulldozer structure. For example, if a force were to be applied to one end of the bulldozer and in a direction transverse relative to the tractor, it would tend to create a tensile force in the brace 63 and a compression force in the brace 64. The tensile force in the brace 63 would tend to drive the lever 65 in a counterclockwise direction and the compression force in the brace 64 would tend to drive the lever 65 in a clockwise direction. Consequently the two forces in the braces 63, 64 would tend to counteract one another. Consequently the resultant loads or forces on the respective beams 13, 14 are equalized. Further, upon extension of the hydraulic cylinder or strut 36, there will be created compression forces in both braces 63, 64. Due to the rocking of the lever 67 on the ball 56, the entire coupling device 57 will be permitted to rotate slightly to eliminate the resultant forces on the push arms 13, 14. This will, of course, minimize the tendency of the braces 63, 64 to distort or bend the arms 13, 14.

What is claimed is:

1. A bulldozer having a blade, a pair of parallel push arms adapted for support at one of their ends on a tractor and at their opposite ends for connection to the blade; a pair of struts supported on the respective arms and extending in a forward vertical angular relation therefrom to and for connection with the back of the blade, at least one of the struts being extensible and retractable for effecting tilting of the blade; a coupler including a vertical pivot portion supported on the back of the central portion of the blade; a pair of elongated rigid brace elements having outer ends connected to the respective arms and extending forwardly and inwardly to inner ends adjacent the coupler, with one brace extending forwardly and inwardly along a line extending forwardly of the pivot portion and the other brace extending forwardly and inwardly along a line extending rearwardly of the pivot portion; and a pair of connectors offset radially and on opposite

sides of the pivot portion and adapted for connection to the respective inner ends of the brace elements whereby the line of force exerted by one brace will be forwardly of the pivot portion and the line of force exerted by the other brace will be rearwardly of the pivot portion.

2. The structure as set forth in claim 1 in which the pivot portion of the coupler is a member mounted on the back of the blade with a ball portion of a ball and socket joint being rigid therewith and the connectors are supported on the ball portion by a centrally located socket that swivels on the ball portion.

3. The structure as set forth in claim 2 in which the socket is formed by a pair of parallel upper and lower bell crank shaped plates with the center portions thereof having upper and lower socket portions respectively and the connectors are threaded adjustable pins extending through the opposite ends of the plates and the respective inner ends of the braces.

4. The structure as set forth in claim 1 in which the connectors are substantially 120° apart.

5. In a bulldozer having a blade and a pair of push arms, the improvement residing in a three-point lever supported adjacent the center portion of the blade to swing laterally on a substantially vertical pivot means and including a pair of arms extending from opposite sides of the pivot means; a pair of elongated rigid braces having outer ends connected to the respective arms and extending forwardly and inwardly to inner ends adjacent the respective arms, with one brace extending forwardly and inwardly along a line extending forwardly of the pivot means and the other brace extending forwardly and inwardly along a line extending rearwardly of the pivot means; and connecting means between the respective arms and the inner ends of the braces whereby the line of force exerted by one brace will be forwardly of the pivot means and the line of force exerted by the other brace will be rearwardly of the pivot means.

6. The structure as set forth in claim 5 in which the pivot means is formed by a ball and socket joint between the lever and blade, and the connecting means includes pivot pins extending between the arms and inner ends of the braces.

7. The structure as set forth in claim 5 in which the lever is a bell crank and is carried on the pivot means to articulate laterally and the arms are horizontally disposed so that the respective connecting means are forwardly and rearwardly respectively of the pivot means.

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