Aug. 21, 1962 R. W. LICHTI 3,049,820

DIAGONAL BRACE MOUNTING FOR BULLDOZER BLADES

Filed April 11, 1960

3 Sheets-Sheet 1

Fig. 1.

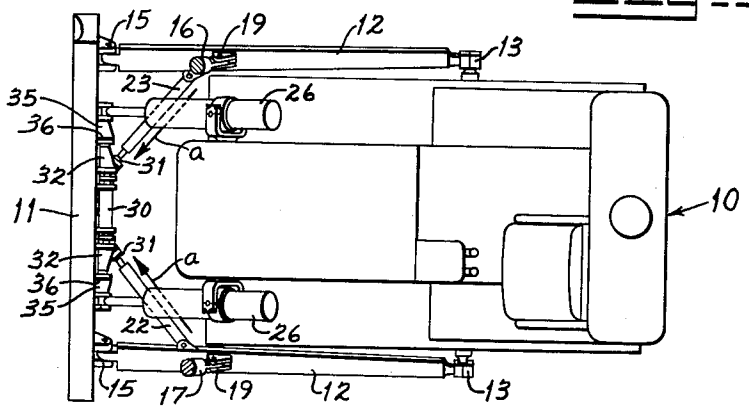


Fig. 2.

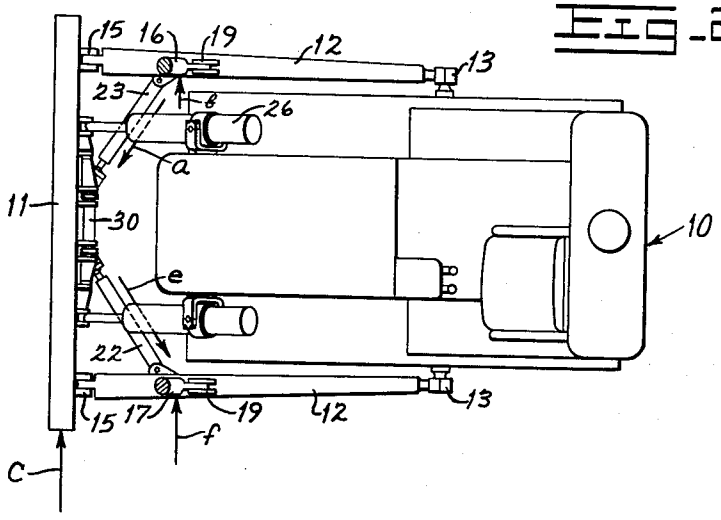
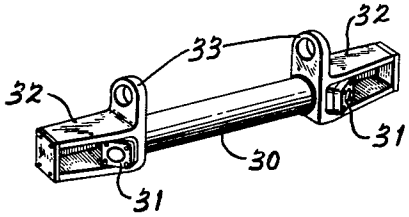


Fig. 4.



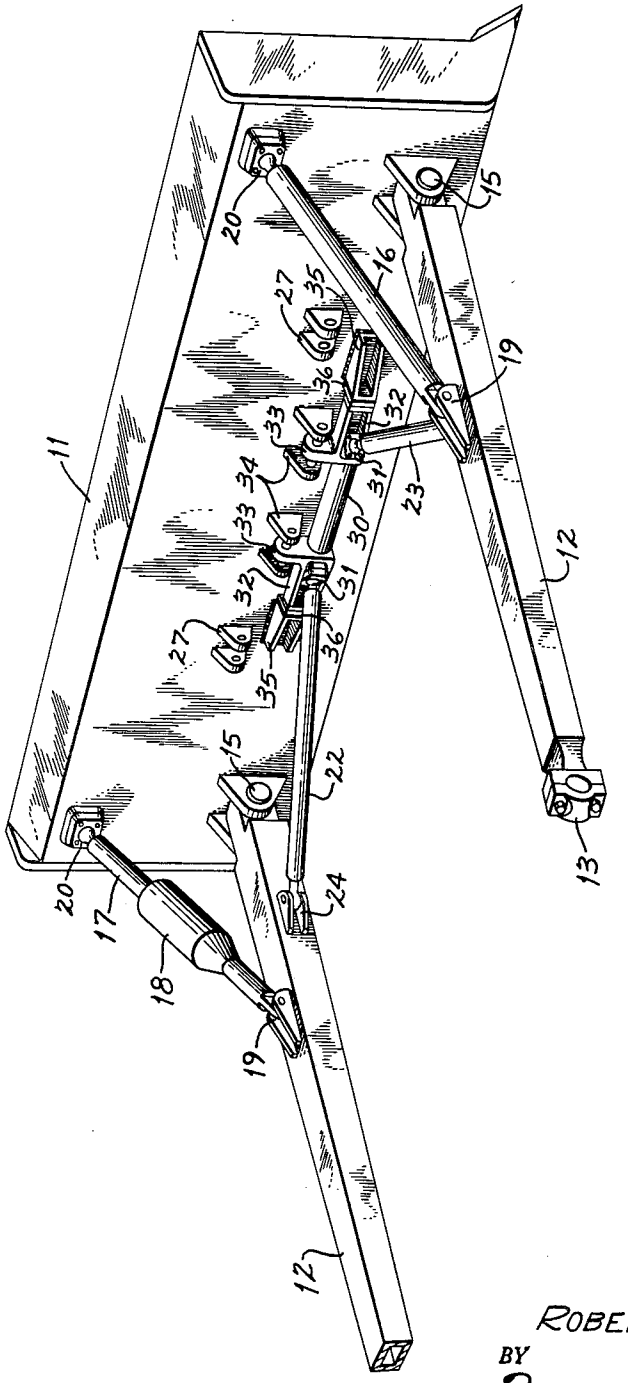
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FIG. 3



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Fig. 5.

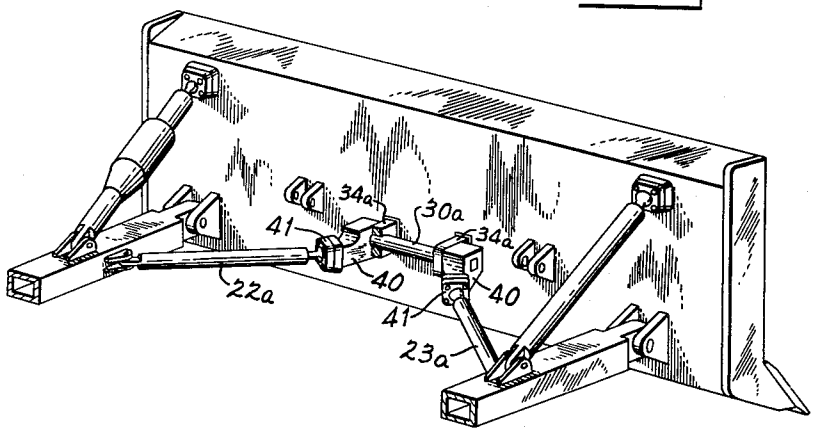
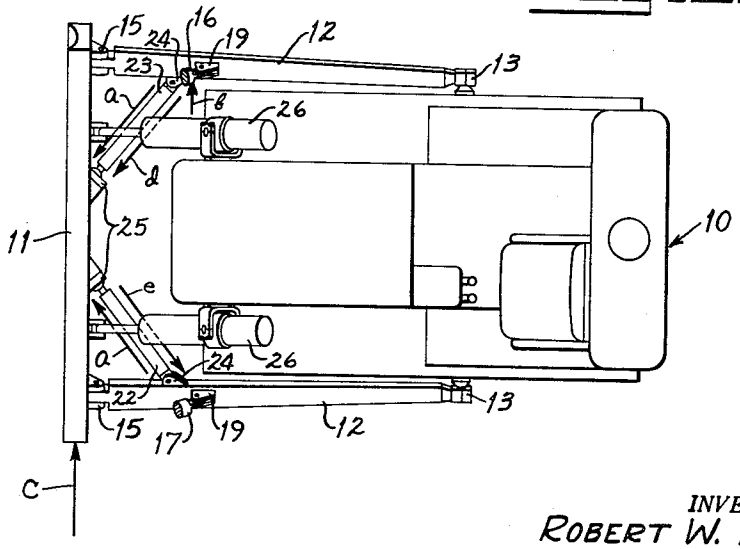


Fig. 6.



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DIAGONAL BRACE MOUNTING FOR BULLDOZER BLADES

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5 Claims. (Cl. 37—144)

This invention relates to bulldozers and particularly to means for bracing bulldozer blades to prevent damage resulting in part from stresses which are set up when a blade is adjusted to its tilt position.

Many conventional bulldozers comprise a blade carried at the forward ends of push arms pivotally supported on a tractor to permit raising and lowering of the blade. Diagonal braces between the push arms and the back of the blade in a horizontal plane prevent sidewise movement of the blade. Tilt braces extend diagonally upwardly from the tops of the push arms to the back of the blade to hold it erect and by varying the length of one or both tilt braces, the blade is tilted to enable it to provide a sloping cut. Because of the system of bracing employed, this tilting of the blade sets up stresses and particularly compressive stresses in the diagonal braces which in turn impart bending forces to the push arms. Because of these forces, push arms are often broken when a blade in tilt position is subjected to side thrust in operation.

It is the object of the present invention to provide an improved mounting for bulldozer blades and particularly for the diagonal braces thereof whereby excessive compressive forces are relieved when the blade is tilted and whereby upon the imposition of side thrust, stresses which tend to damage the push arms are equally distributed between the diagonal braces to prevent their concentration at one point on one of the push arms.

Further objects and advantages of the invention and the manner in which it is carried into practice are made apparent in the following specification by reference to the accompanying drawings.

In the drawings:

FIG. 1 is a schematic view in plan of a tractor with a bulldozer embodying the present invention with the nature of forces imposed on the diagonal braces indicated by arrows;

FIG. 2 is a similar view indicating the distribution of forces which are destructive under certain operating conditions;

FIG. 3 is a perspective view of a bulldozer blade embodying the present invention;

FIG. 4 is a perspective view of a portion of the structure illustrated in FIG. 3;

FIG. 5 is a perspective view similar to FIG. 3 illustrating a modified form of the invention; and

FIG. 6 is a view like FIGS. 1 and 2 illustrating a conventional bulldozer and indicating the direction of destructive forces under different conditions.

In FIGS. 1 and 2 of the drawings, a tractor generally indicated at **10** is shown as provided with a bulldozer blade **11** which, as also illustrated in FIG. 3, is carried at the forward end of a pair of push arms **12**. At their rearward ends, the push arms are connected in a conventional manner to the truck frames of the tractor as by ball and socket type joints shown at **13**. The bulldozer blade is pivotally connected to the forward ends of the push arms as by hinge connections **15** and held in an erect position by braces which are called "tilt braces" shown at **16** and **17** and the latter of which includes adjustable means as, for example, a hydraulic cylinder shown at **18** in FIG. 3. The tilt braces are connected as by pivot pins and brackets **19** to the tops of the push arms and ball and socket joints **20** to the back of the blade adjacent its upper edge. A pair

of diagonal braces **22** and **23** extend between the inner sides of the push arms to which they are pivotally connected with brackets illustrated at **24** and these diagonal braces are, in conventional bulldozers, usually connected directly to the back of the blade by a ball and socket joint such as illustrated at **25** in FIG. 6 of the drawings which discloses a conventional bulldozer. Conventional lift jacks are shown at **26** as extending between the tractor and bulldozer blade to which they are connected as by pins in bracket **27** (see FIGS. 3 and 5) fixed to the back of the blade.

Tilting of the blade, as for example toward the right, is accomplished by lengthening the tilt brace **17** through the cylinder **18**, fluid to which is supplied in a conventional manner which, due to the bracing illustrated and described above, raises the left end of the blade as well as the forward end of the push arm. This imposes stresses on the diagonal braces and the push arms which are indicated by arrows in FIG. 6 of the drawings. Both diagonal braces are placed in compression as indicated by arrows *a* thus imposing a bending stress on each of the push arms indicated in FIG. 6 on the right hand push arm by an arrow *b* as exerted outwardly on the push arm just behind the connection of the diagonal brace therewith. When this condition exists and a side thrust indicated by an arrow *c* is applied to one end of the bulldozer blade, the structure tends to collapse adding compressive stresses indicated by an arrow *d* to the right hand diagonal brace thus increasing the bending stress represented by the arrow *b* and often resulting in breaking of the right hand push arm. Meanwhile the compression of the left hand diagonal brace represented by arrow *a* has been relieved by the side thrust which imparts tension to the diagonal brace as represented by the arrow *e*.

Through the present invention, the compressive stress in the diagonal braces and the bending stress on the push arms is reduced and also the greater compressive stress received by one diagonal brace is distributed to and therefore partially borne by the other diagonal brace. This is accomplished as most clearly illustrated in FIG. 3 by connecting the forward ends of the diagonal braces **22** and **23** to opposite ends of a torsion bar **30**, also shown in FIG. 4, through the medium of ball and socket joints **31** in abutment members **32** rigidly secured as by welding or the like to opposite ends of the torsion bar. This assembly is pivotally connected with the back of the bulldozer blade by pins which extend through upstanding ears **33** on the members **32** and brackets **34** secured to the back of the bulldozer blade. This permits slight swinging movement of the torsion bar. Endwise movement thereof, that is movement in the direction of its own axis is prevented by abutment blocks **35** secured to the back of the blade and shims as indicated at **36** may be employed if desired for replacement on the occasion of wear at the abutting surfaces and to effect centering of the blade with respect to the tractor.

With the construction above described, when the blade is tilted by actuation of the tilt cylinder **18**, both diagonal braces tend to be compressed as represented by the arrows *a* in FIG. 1 but due to the pivotal support of the torsion bar assembly, it is permitted to rotate or swing slightly toward the blade, thus relieving the compressive stress and eliminating the application of excessive forces which tend to bend the push arms outwardly. When a side thrust is imparted to the blade, as represented by the arrow *c* in FIG. 2, whether or not the blade is tilted the compressive stress of arrow *a* in FIG. 2 and the tensile stress of arrow *e* therein in the two diagonal braces are equalized because the stress of each diagonal brace is transmitted to the other through twisting action of the torsion bar **30** and the forces represented by the arrows *b* and *f* in FIG. 2

are also equalized to insure that each of the push arms supports one-half of the load imposed by the side thrust.

A modified form of the invention is illustrated in FIG. 5 wherein a torsion bar shown at 30*a* is directly pivoted in brackets 34*a* secured to the back of the bulldozer blade and lever arms 40 are fixed against rotation at opposite ends of the torsion bar and carry sockets 41 to receive the balls on the ends of the diagonal braces 22*a* and 23*a*. In this modification contact between the levers 40 and the brackets 34*a* prevents longitudinal movement of the torsion bar though it is capable of the rotational and twisting action referred to above.

I claim:

1. In a bulldozer blade mounting which comprises push arms secured to the blade, tilt braces extending upwardly between the tops of the push arms and the blade, and diagonal braces extending inwardly from the inner sides of the push arms to the blade and means to adjust the length of at least one of said tilt braces to effect tilting of the blade, means to reduce stresses set up in the mounting upon such tilting including, a member pivotally supported from the blade adjacent the end of each diagonal brace and having a part adapted to swing to and away from the blade and connections between the end of each brace and one of said parts, and torsion means connecting said pivotally supported members.

2. In a bulldozer blade mounting which comprises push arms secured to the blade, tilt braces extending upwardly between the tops of the push arms and the blade, and diagonal braces extending inwardly from the inner sides of the push arms to the blade and means to adjust the length of at least one of said tilt braces to effect tilting of the blade, means to reduce stresses set up in the mounting upon such tilting including, a member pivotally supported from the blade adjacent the forward end of each diagonal brace and a ball and socket joint between the end of each brace and one of said members, and torsion means connecting said pivotally supported members.

3. In a bulldozer blade mounting which comprises push arms secured to the blade, tilt braces extending upwardly between the tops of the push arms and the blade, and diagonal braces extending inwardly from the inner sides of the push arms to the blade and means to adjust the length of at least one of said tilt braces to effect tilting of the blade, means to reduce stresses set up in the mounting upon such tilting including, a member pivotally supported from the blade adjacent the forward end of each diagonal brace and a ball and socket joint between the end of each brace and one of said members and a torsion bar connecting said members.

4. In combination with a bulldozer having the usual blade supported forwardly of spaced push arms, tilt braces extending upwardly from the push arms to the blade, and diagonal braces extending inwardly from the push arms to the blade, means to reduce stresses set up in diagonal braces and push arms upon tilting of the blade by varying the length of a tilt brace comprising a torsion bar supported for swinging movement about an axis parallel to the blade between the forward ends of the diagonal braces and a swivel connection between the forward ends of each brace and opposite ends of the torsion bar.

5. In combination with a bulldozer having the usual blade supported forwardly of spaced push arms, tilt braces extending upwardly from the push arms to the blade, and diagonal braces extending inwardly from the push arms to the blade, means to reduce stresses set up in diagonal braces and push arms upon tilting of the blade by varying the length of a tilt brace comprising a torsion bar supported for swinging movement about an axis parallel to the blade between the forward ends of the diagonal braces, a swivel connection between the forward ends of each brace and opposite ends of the torsion bar, and means to prevent movement of the torsion bar longitudinally of itself with respect to the blade.

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