March 7, 1961 F. R. ABEL 2,973,592

BULLDOZER

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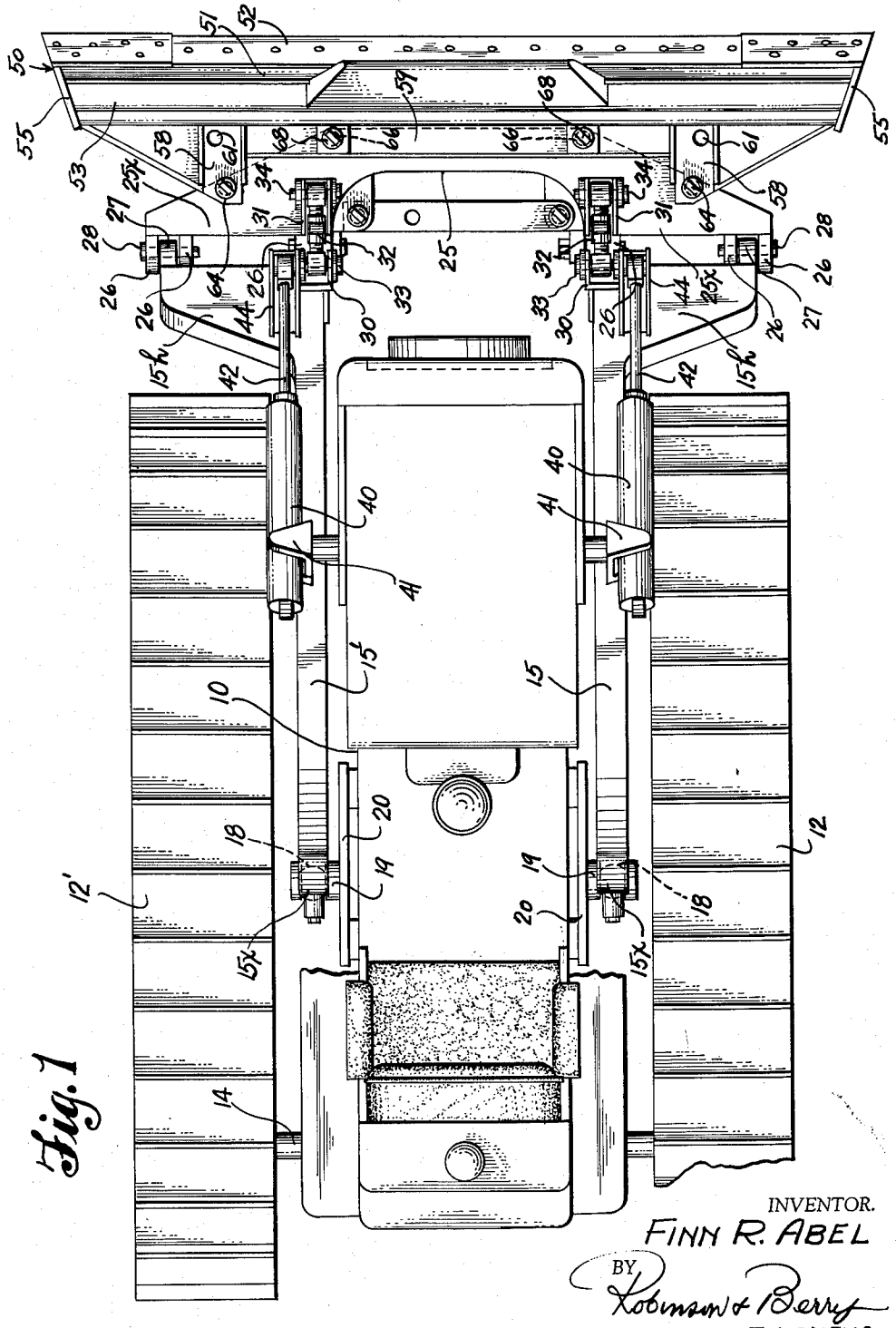


Fig. 1

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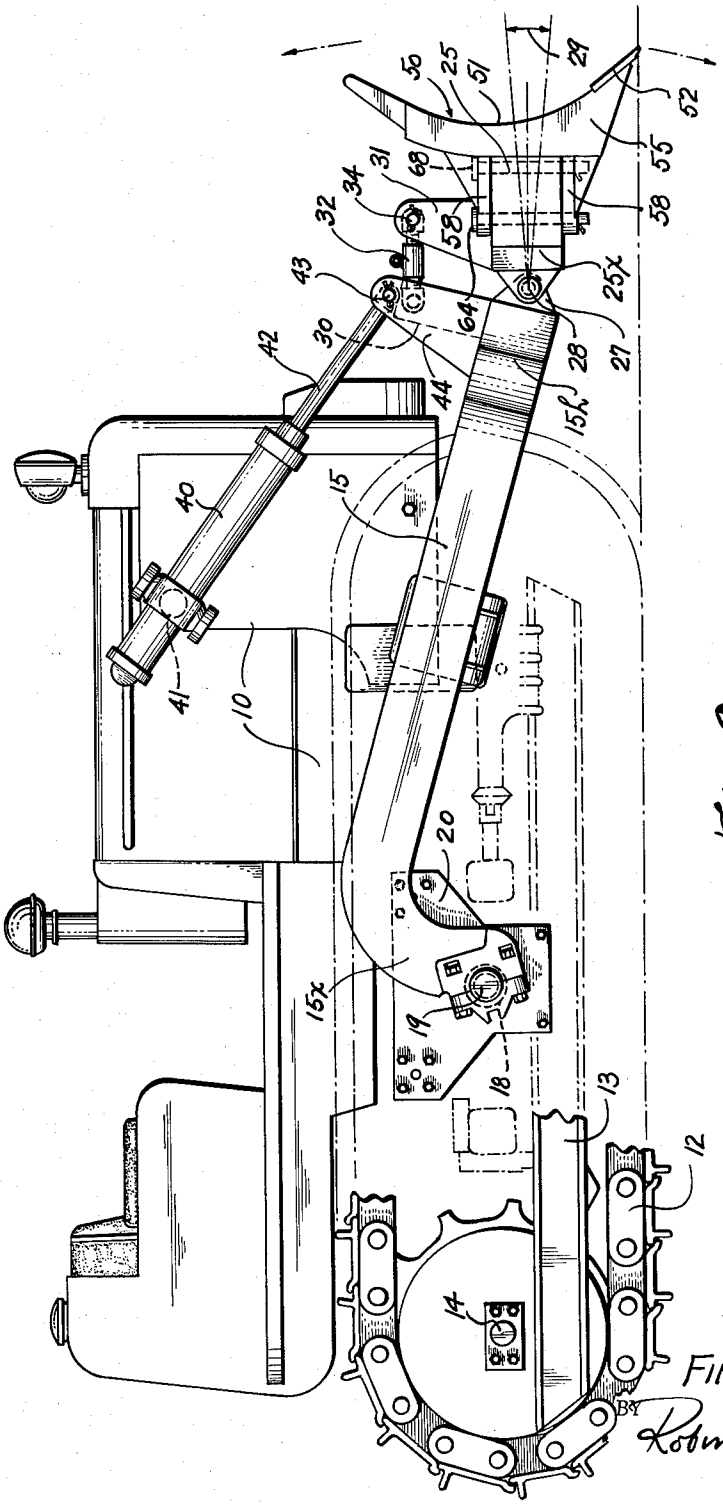


Fig. 2

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Fig. 4

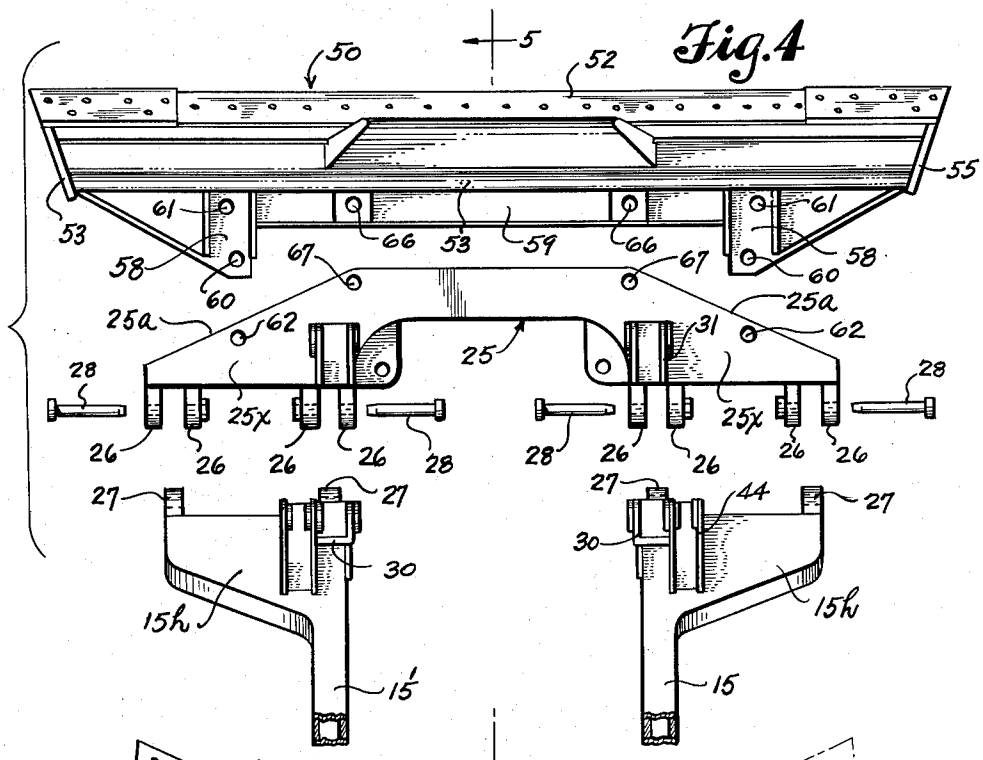
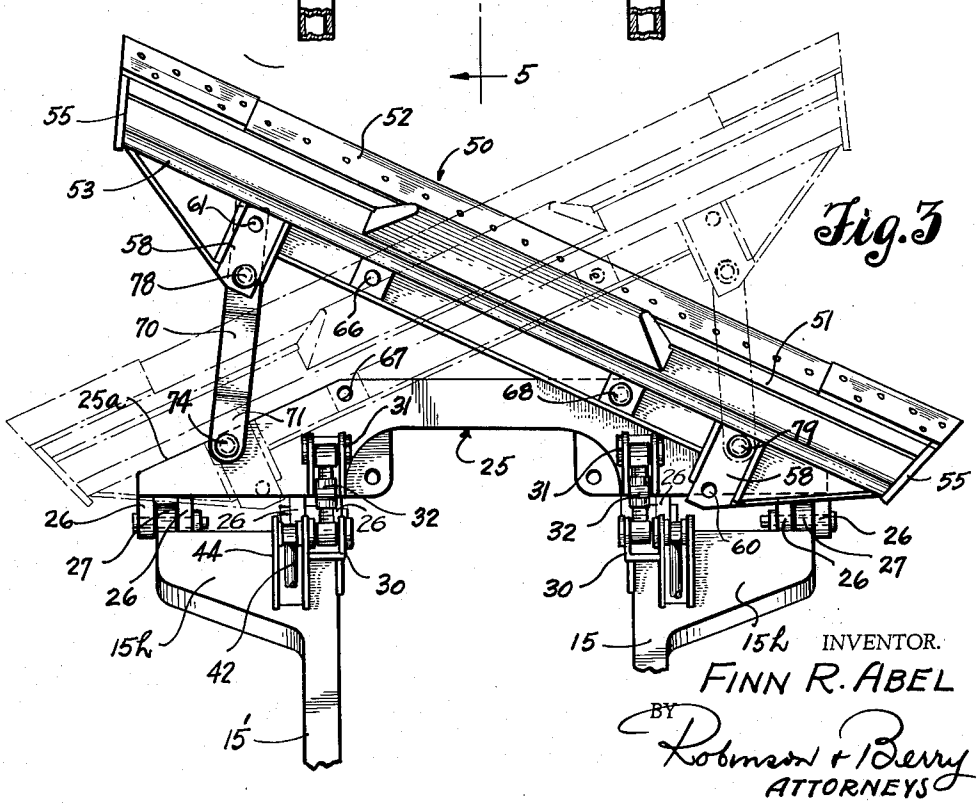


Fig. 3



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Fig. 5

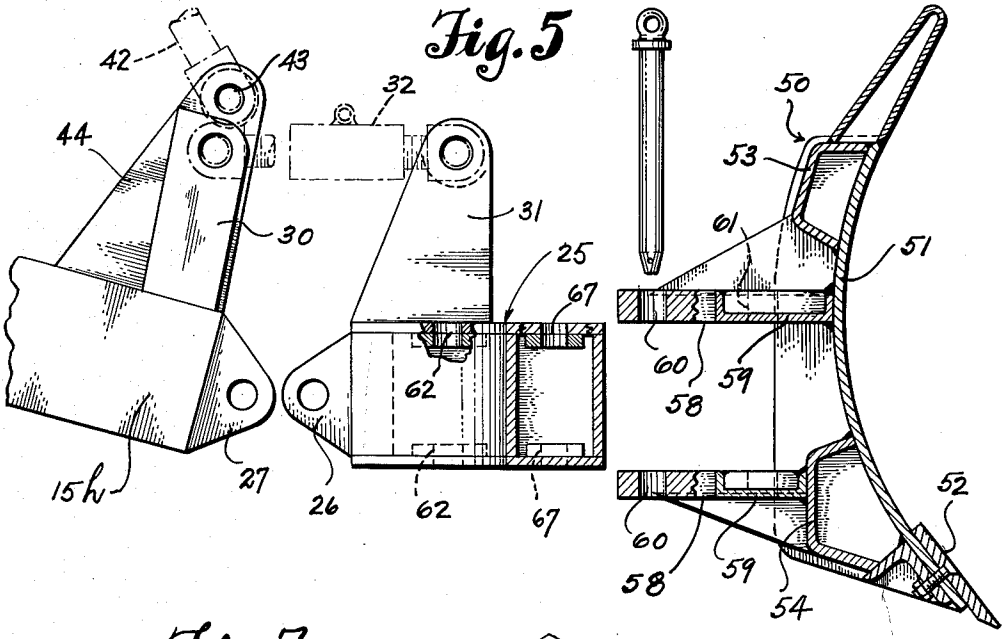


Fig. 7

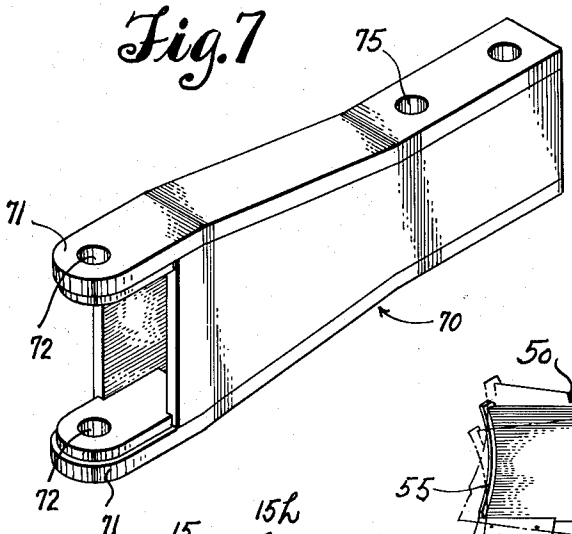
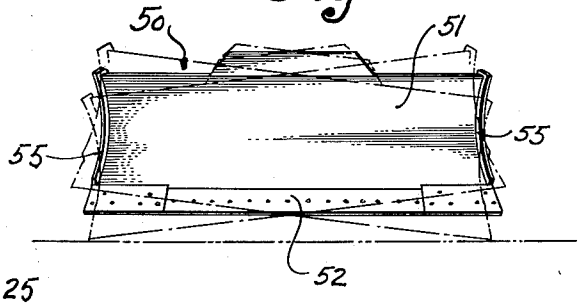


Fig. 6



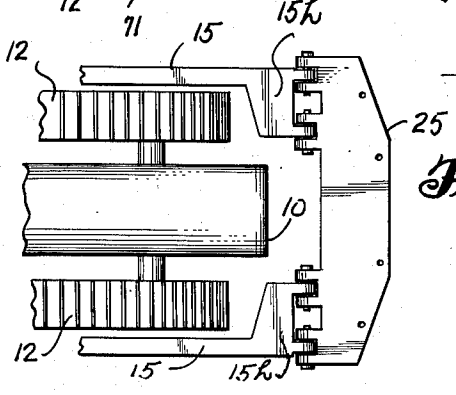


Fig. 8

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2,973,592

BULLDOZER

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Filed July 25, 1957, Ser. No. 674,226

2 Claims. (Cl. 37—144)

This invention relates to bulldozers, and it has reference more particularly to improvements in the details of construction and combination of those particular parts, including the push arms as applied to a bulldozer for operatively supporting the earth moving blade structure and especially as employed for adjusting it to and for holding it in its proper position of use.

It is the principal object of the present invention to provide a bulldozer wherein the earth moving blade structure is operatively supported by what is herein designated as a "front end frame" which is hingedly mounted by the push arms; this front end frame being adjustably fixed to the push arms and by reason of this and the pivotal mounting of the push arms, changes in the pitch and also in the tilt of a blade structure may be easily and readily made.

It is a further object of the present invention to provide a blade structure that is equipped with means for rigidly mounting it on the front end frame, and which may be fixed at a neutral, or "straight across" position of use, or may be angled to a predetermined degree toward either side.

Yet another object of the present invention is to provide hinge mountings for the front end frame as carried at the forward ends of the push arms, which will permit upward and downward tilting adjustment of said frame thus to change the pitch of the blade accordingly, and to provide extendable and retractable connections between the forward ends of the push arms and the opposite ends of the front end frame whereby angular adjustments may be made between arms and frame that will cause the blade to be tilted toward one side or the other and then maintained at the desired angle of tilt.

It is also an object of the present invention to provide a bulldozer wherein the above features of improvement are accomplished by the novel construction and combination of parts, and without detriment to the durability and utility of the machine or in any way complicating its mode of operation.

Further objects and advantages of the present invention reside in the various details of construction and combination of parts and in their mode of use, as will hereinafter be fully described.

In accomplishing the above mentioned and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings wherein:

Fig. 1 is a top, or plan view, of a bulldozer embodying the improvements of the present invention therein, and showing the blade structure as set in a "neutral" position of use.

Fig. 2 is a side view of the bulldozer as shown in Fig. 1.

Fig. 3 is a plan view of the front end frame as mounted on the forward ends of the push arms and showing the blade structure as fixed to the front end frame in one of its angled positions of use.

Fig. 4 is a view showing in plan the forward end portion of the push arms; the front end frame and the blade structure; these parts being shown in disconnected and separated relationship for a better showing of certain details of their construction.

Fig. 5 is a vertical section taken on line 5—5 in Fig. 4.

Fig. 6 is a front end view of the bulldozer showing the blade structure in a tilted setting.

Fig. 7 is a perspective view of the strut used for bracing the blade structure when fixed in an angled position of use.

Fig. 8 is a detail, in plan view, showing the design of the push arms providing for their use at the outside of the crawler tracks.

Referring more in detail to the drawings:

The present improvements apply particularly to bulldozers of those various types or makes wherein a tractor is used as the power unit and an earth moving blade structure is mounted by and is disposed forwardly of the tractor and is adjustably supported for change in its positions of use. The present improvements reside primarily in the blade structure and in the details of its supporting and adjusting means as used in combination with each other and with the tractor.

In the present instance the power unit employed comprises a tractor of the crawler or track laying type having a rigid main frame structure, not herein illustrated in detail but designated generally and in its entirely by reference numeral 10. This main frame structure is supported by and between the conventional crawler tracks which, in Fig. 1 are designated, respectively, by numerals 12 and 12', and which operate about track frames, as at 13 in Fig. 2; these frames being mounted at their rear ends for oscillation on opposite ends of cross shaft 14 which extends through and is fixed in the rear end portion of the main frame structure.

It is further to be understood that the forward end portion of the main frame structure 10 is supported from the track frames by spring means of conventional form, not herein shown, and that the crawler tracks are adapted to be driven for the operation and steering of the bulldozer by conventional or suitable means. The crawler tracks are parallel with and are spaced laterally from opposite sides of the main frame structure, thus providing for the convenient use of the push arms between the main frame and crawler tracks for the operative support of the bulldozer blade structure as presently will be described.

The push arms, as herein employed, comprise paired opposite side members designated by reference numerals 15 and 15'; their use between the crawler tracks and main frame structure being best shown in Fig. 1. Their use at the outside of the tracks will later be described in connection with Fig. 8. The opposite push arms are alike in size and shape, except as required for their use at right and left sides. Each has a downwardly curved rear end portion 15*x*, with a ball and socket form of mounting as designated at 18, whereby it is operatively fixed on a short stub axle 19 that extends laterally from a mounting plate 20 that is bolted or otherwise rigidly fixed to the corresponding side of the main frame structure. These two push arms 15—15' are co-extensive, and their rear end mountings 18 are in transverse axial alignment while their forward end portions terminate slightly beyond the forward end of the main frame structure, and are there formed with laterally widened head portions 15*h*, as best shown in Figs. 1, 3 and 4.

At their forward ends, the two push arms, 15 and 15' are joined by the previously referred to forward end frame, which frame is designated in its entirety by reference numeral 25. It is shown in Figs. 1 and 3 that this front end frame, which consists of a single element, extends substantially horizontally between the forward

ends of the two push arms. At its opposite ends, it is formed with rearwardly directed portions 25*x* of substantial lateral width, each of which, at its rearward edge, is formed with laterally spaced sets of paired lugs 26—26. The pairs of lugs 26—26 at each end of the frame 25 are arranged to receive between them, laterally spaced single lugs 27 that project forwardly from the forward edge of the head end portion 15*h* of the corresponding push arm. Pivot pins 28 are applied through the interfitted lugs 26—26 and 27. All pivot pins used in thus mounting the front end frame are in axial alignment transversely of the tractor, and provide for an up and down swinging adjustment of the front end frame on the push arms through an arc of approximately ten degrees; the extent of adjustment being indicated by the double pointed arrow 29 in Fig. 2.

In order that the hingedly mounted front end frame 25 may be held at any set position of adjustment relative to its supporting push arms, extendable and retractable links, or turnbuckles, are employed at its opposite ends for making and securing the adjustments. It is shown in Figs. 1 and 3 that vertical brackets 30 are fixed rigidly to the forward end portions of the push arms and that vertical brackets 31 are likewise fixed rigidly to the rearwardly directed opposite end portions 25*x* of the front end frame; these brackets 30 and 31, as applied to these parts at opposite sides of the vehicle, being in alignment longitudinally of the push arms. Aligned brackets 30 and 31 are joined at their upper ends by turnbuckle links 32—32; each turnbuckle link being pivoted at its ends, as at 33 and 34, to the brackets. Thus, by extending or retracting both turnbuckles equally, the front end frame can be inclined downwardly or upwardly to various degrees according to the extent of adjustment made. Also, it will be understood that by extending one turnbuckle and retracting or shortening the other, the angular relationship of each of the push arms and the front end frame will be so changed that the latter will be caused to tilt laterally accordingly, that is, it will be caused to drop at one end and be lifted at its other end. This angular tilting of the front end frame by adjustment of the turnbuckles can be effected in either direction, and its tilting results in a like tilting of the blade structure which is rigidly attached thereto as presently explained.

Before describing the blade structure and the means for and manner of mounting it on the front end frame 25, it will be explained that the opposite side arms 15—15' are adapted to be raised and lowered at their forward ends to raise and lower the blade accordingly, and also to be held in different positions of vertical adjustment. In the present instance this arm adjustment is effected by means of paired hydraulic cylinders 40—40 that are applied to opposite sides of the power unit. However, it is to be understood that this adjustment can also be made by any of the well known "cable lifts" without departing from the spirit of the invention.

It is shown in Fig. 2 that each cylinder 40 is fixed by means of a pivotal mounting 41 to a member rigidly associated with the upper forward end portion of the main frame structure 10, and extends downwardly and forwardly therefrom. Each cylinder has a piston rod 42 extended from its lower end pivotally fixed as at 43, to the upper end portion of a vertical bracket 44 that is rigidly fixed to the forward end of the corresponding push arm. Conventional means may be employed for the application of hydraulic pressure medium to the cylinders to control the raising, lowering and the holding of the position of the push arms. As an example of such conventional means which may be adapted to the present use, reference is directed to the hydraulic system disclosed in United States Patent No. 2,125,481 in which hydraulic connections between the hydraulic cylinders at opposite sides are provided in order to permit compensating adjustment of the opposite side arms when a tilting adjustment is made through the mediacy of the turnbuckle connections.

The blade structure as employed with the present equipment is designated in its entirety by reference numeral 50. It comprises the transversely directed, curved mold board plate 51 that extends to the full length of the blade structure and which is equipped along its lower longitudinal edge with the cutting edge on blade 52. The back of the plate 51 is equipped with the spaced upper and lower longitudinally extending reinforcing channel beams 53 and 54 as seen in Figs. 2 and 5, and also, at its ends, it is equipped with vertical flanges 55. Fixed to the brace beams 53 and 54 as applied to the back side of the blade structure, near its opposite ends, are paired and vertically spaced brackets 58—58 and extending lengthwise of the plate 51, between the pairs of brackets 58—58 are vertically spaced beams 59—59.

The pairs of brackets 58—58 extend substantially rearward of the mold board plate 51 and those of each pair are so vertically spaced as to adapt them to receive between them the corresponding end portion of the front end frame, as has been illustrated in Fig. 2. These paired brackets are formed in their rearward end portions with vertically aligned holes 60 and in their forward portions with vertically aligned holes 61 as noted in Fig. 4. The holes 60 are adapted to be registered with holes 62 formed vertically through the front end frame 25 to receive securing bolts as presently explained.

Also, it is to be understood that the two vertically spaced beams 59—59 that extend between the brackets at opposite ends of the blade structure, are so spaced as to receive the somewhat forwardly crowned central position of the front end frame between them as has been shown in Fig. 2. These beams 59—59 have holes 66 formed therethrough in vertical alignment, for registering with holes 67 in the front end frame to receive securing bolts 68 therethrough as shown in Figs. 1 and 2.

In order that the blade structure 50 may be moved from that neutral or straight across position of use, as seen in Fig. 1, to angular positions across the line of travel of the machine, for example, to a position corresponding to that in which it has been illustrated in Fig. 3, the attaching bolts 64 at its opposite ends are first withdrawn. Also, the bolt 68 which is at that side of the tractor away from which the blade is to be angled, is withdrawn. The blade structure will then be pivotally attached to the front end frame only by the pivot bolt 68 which is at that side toward which the blade is to be angled. The blade structure is then swung about this remaining pivot bolt to the predetermined angular position in which it is to be fixed. To make this swinging possible, the forward edges of the front end frame, along its opposite ends, are angled rearwardly as at 25*a* in Fig. 4.

For rigidly fixing the blade structure 25 in an angular position of use, a bracing strut, designated in Fig. 3 by reference numeral 70, is extended between the forwardly swung end portion of the blade structure and the corresponding end portion of the front end frame; this strut having vertically spaced ears 71—71 at its rear end designed to receive the forward edge portion of the frame member between them. The ears have vertically aligned holes 72 adapted to be registered with the hole 62 in that end of the frame to receive a securing bolt as shown at 74. At its forward end the strut has a hole 75 formed vertically therethrough registrable with the aligned holes 60 of the corresponding brackets 58 to receive a securing bolt 76. At its rearward end, the blade structure may then be additionally fixed to the front end frame by passing a securing bolt 79 through the vertically aligned holes 61 in the brackets 58 and the hole 62 formed through that end of the front end frame.

Assuming that the various parts are so constructed, and are assembled as described, it will be understood that the opposite push arms can be raised and lowered merely by extending or retracting the piston rods of the cylinders of

the hydraulic control system, and the blade structure will be lifted or lowered accordingly.

If it is desired to pitch the blade to more or less extent relative to the normal position in which it is shown in Fig. 2, the turnbuckle connections are equally extended or retracted, as may be required to obtain the adjustment.

It it is desired to tilt the blade to one side or the other, as indicated in Fig. 6, this is effected by differentially adjusting the turnbuckle connections. For example, to retract the turnbuckle at one side only will cause a downward movement of the blade at that end. However, for tilting in either direction, it is most practical to extend the turnbuckle at one side of the vehicle and retract that at the other side to a corresponding amount. The tilt that is effected is in accordance with the extent of the adjustments made and will be downwardly toward the side of the shorter turnbuckle connection. The fact that the side arms have ball and socket mountings at their rear ends makes this adjustment possible.

While I have illustrated the side arms as being applied to the bulldozer in those spaces that are between the main frame and crawler tracks, they may likewise be used outside the track frames as in many of the present day bulldozers, by slightly modifying the forward end structure of the arms. Such use of the push arms has been shown in Fig. 8, and it will therein be observed that the widened head portions 15*h* extend inwardly instead of outwardly from the line of the push arms, and the front end frame is lengthened as may be required to accommodate its use to this arrangement of the push arms. Otherwise, all parts are similar to those as used in the combination shown in Figs. 1, 2 and 3.

What I claim as new is:

1. A bulldozer comprising a tractor having a rigid frame structure, a pair of push arms pivotally fixed, respectively, at their rear ends to said frame structure at opposite sides of the tractor and extended forwardly therealong, a front end frame disposed forwardly and transversely of the tractor and pivotably mounted at its opposite ends on the forward ends of said push arms, an upstanding bracket on the forward end of each of said push arms, an upstanding bracket on said front end frame adjacent to and in paired relationship with each of said brackets on said push arms, a turnbuckle adjusting means interconnecting the paired upstanding brackets at the upper ends thereof and above the pivotal mounting between said arms and said front end frame, paired, hydraulic cylinders respectively secured at one end to opposite sides of the tractor substantially above said push arms and secured at their opposite ends to the upper ends of the brackets on said push arms, an earth moving blade structure adjustably mounted on said front end frame and disposed forwardly thereof, and a bracing strut removably secured between said blade and front end frame at only one side thereof whereby the transverse angle of said earth moving blade may be altered in relationship to said front end frame.

2. The bulldozer recited in claim 1 including crawler tracks spaced from opposite sides of said frame structure and said push arms being positioned between said frame structure and said tracks.

References Cited in the file of this patent

UNITED STATES PATENTS

2,084,690	Knapp	June 22, 1937
2,125,481	Allin	Aug. 2, 1938
2,290,477	Magee	July 21, 1942
2,365,677	Burns	Dec. 26, 1944
2,452,774	LeTourneau	Nov. 2, 1948
2,485,407	Peterson	Oct. 18, 1949
2,529,124	Austin	Nov. 7, 1950

FOREIGN PATENTS

819,249	Germany	Oct. 31, 1951