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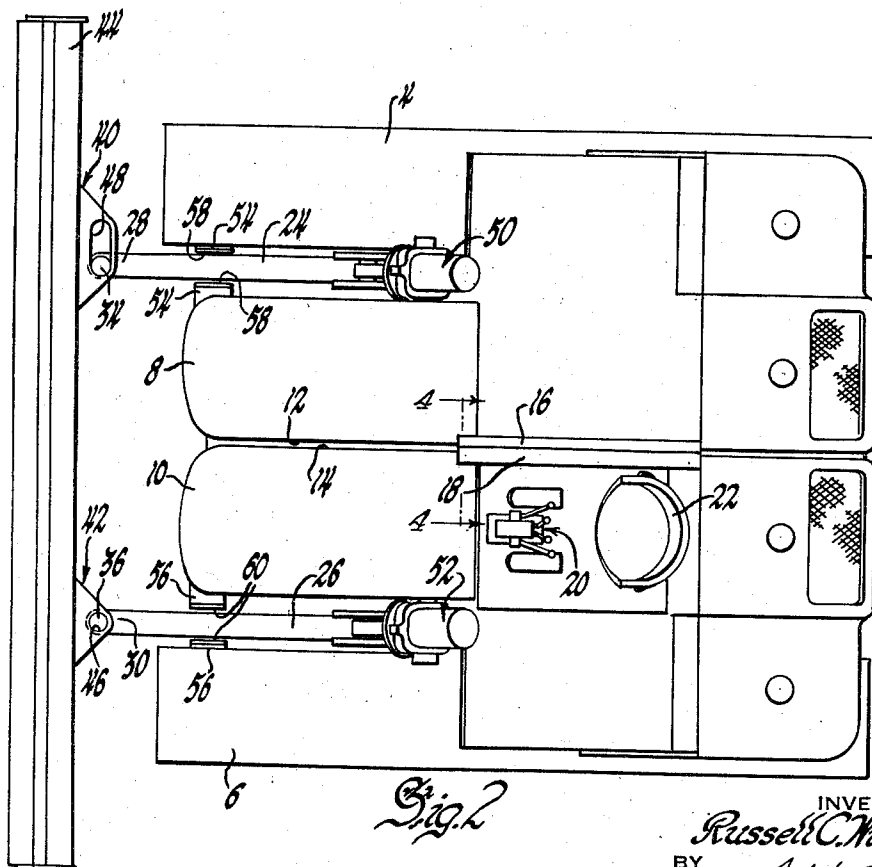
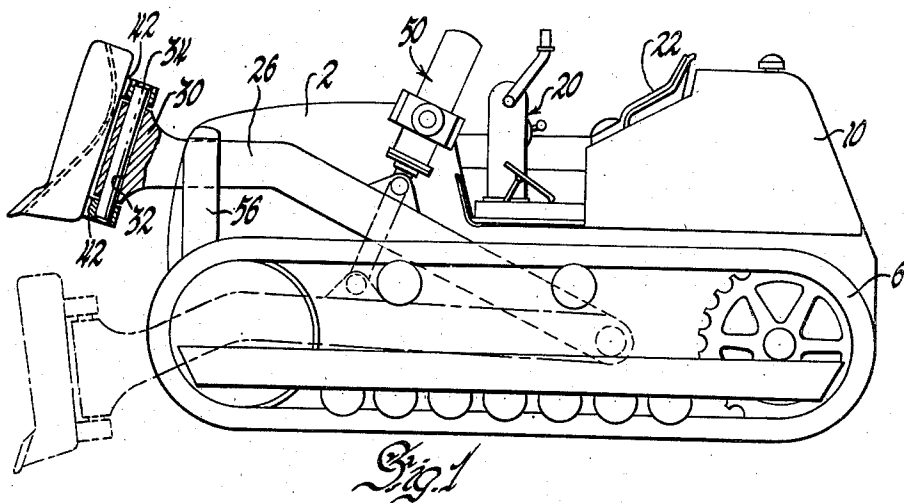
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BULLDOZER ANGLING ARRANGEMENT

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2 Sheets-Sheet 1



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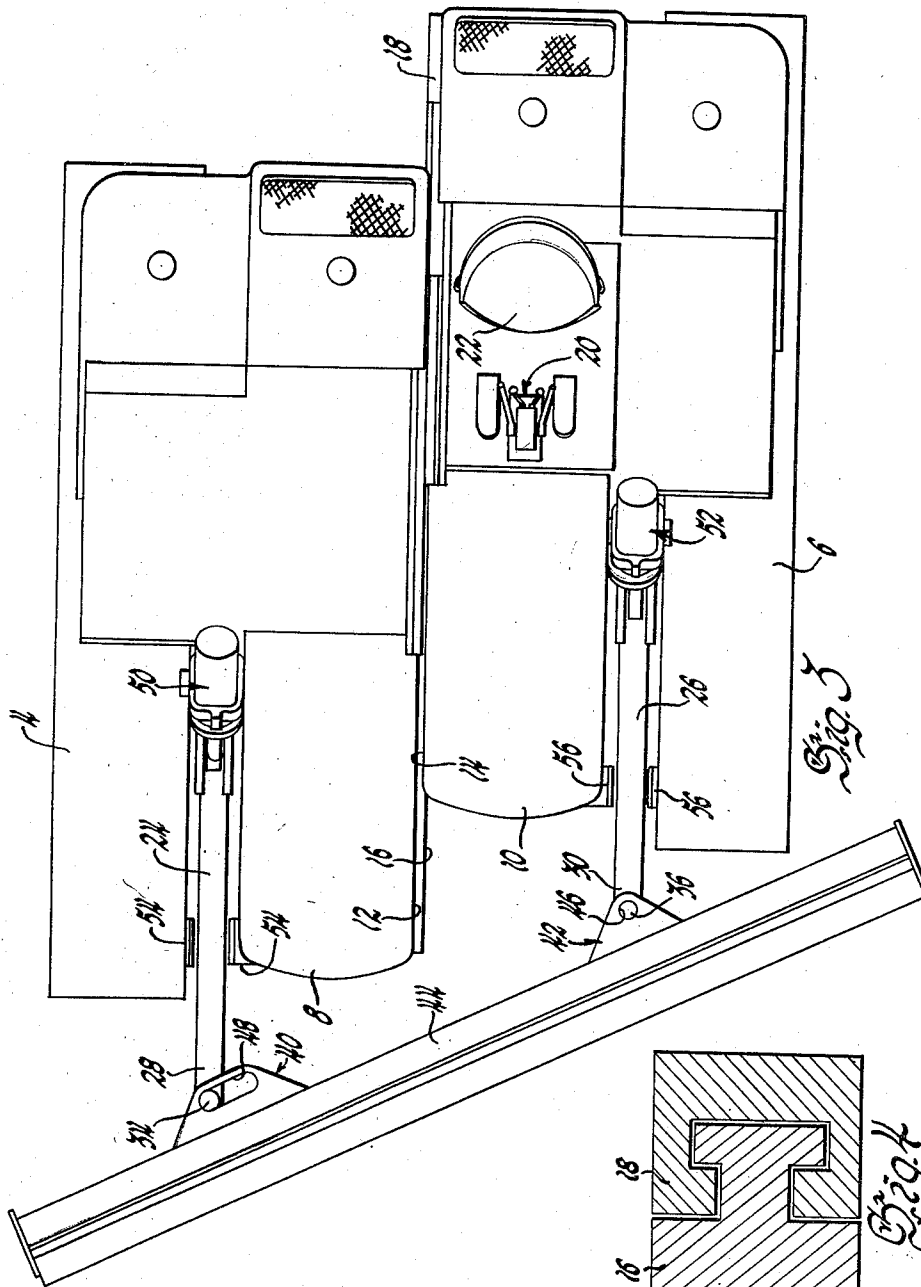


Fig. 4

Fig. 3

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BULLDOZER ANGLING ARRANGEMENT

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9 Claims. (Cl. 37—144)

This invention relates to earth working machinery and, more particularly, to an endless track vehicle having a bulldozer associated therewith.

It is well known in the prior art to provide crawler tractors with bulldozers or push type scrapers. Usually, the bulldozer blade is connected to the forward ends of spaced apart push beams, the rear ends of which are pivotally connected at opposite sides of the tractor. In the most conventional form, the blade extends at right angles to the path of movement of the vehicle and either hydraulic or mechanical means are provided for raising and lowering the blade with reference to the ground. When arranged in this manner, the bulldozer is ideally suited for certain types of work, such as, uprooting, leveling, etc. However, other conditions are encountered in which it is desirable that the bulldozer blade be aligned at an angle relative to the path of movement of the vehicle other than at right angle. That is, under certain circumstances it is preferable that one edge of the blade "lead" the other edge. This arrangement is particularly desirable in operations such as pioneering roads or trail building where it is desirable that the displaced earth be continuously discharged laterally as the vehicle progresses forwardly. While prior art types of bulldozers have been susceptible to adjustment to provide angular disposition of the blade, in the past virtually without exception, it has been necessary to halt the vehicle and make such adjustments manually by disconnecting and repositioning the rear end mountings of the bulldozer push beams. This method not only requires stopping of the vehicle during the time required to make the change, but, has the additional disadvantage of requiring repeated alteration of the angle of the bulldozer at the end of each run, or a return trip during which no work is accomplished. Still other disadvantages of manually adjusted bulldozer blades are the limited number of bulldozer angles available and the complete impossibility of changing the angle during operation. As a consequence, in the past bulldozer equipment has frequently been operated with the bulldozer blade at an inefficient angle or, not infrequently, fully fifty percent of the total machine operating time is consumed merely to return to a position where work can be accomplished.

An object of the present invention is to provide an earth working machine comprising a crawler tractor power unit having a bulldozer operatively connected thereto which may be angularly adjusted without alighting from the tractor and while the machine is in operation.

Another object is to provide a crawler tractor propelled bulldozer structure wherein a pair of spaced apart independently propelled endless tracks are connected in longitudinal slidable relation, the bulldozer being angularly adjustable by longitudinal displacement of one track with reference to the other.

A further object is to provide a crawler tractor propelled bulldozer of the type described wherein the length

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of the bulldozer push beams remains constant regardless of the angle of the bulldozer blade.

Yet another object is to provide a device of the stated character wherein the angular adjustment of the bulldozer may be altered while the vehicle is moving.

Still a further object is to provide a device of the stated character wherein the push beams are so mounted as to provide optimum lateral stability regardless of the angle of the bulldozer.

These and other objects and advantages of the invention will become more full apparent as reference is had to the accompanying specification and drawings, wherein:

Fig. 1 is side elevational view, partly in section, illustrating the form and arrangement of the invention.

Fig. 2 is a plan view of the device shown in Fig. 1, illustrating the relative arrangement of the mechanism when the bulldozer blade is disposed at right angles to the path of movement of the tractor.

Fig. 3 is a view similar to Fig. 2 illustrating the relative arrangement of the mechanism when the right end of the bulldozer blade is in a leading position, and

Fig. 4 is an enlarged sectional view looking in the direction of arrows 4—4 of Fig. 2.

Referring now to the drawings, and particularly Figs. 1 and 2, there is shown a crawler tractor 2 wherein a pair of the endless track assemblies 4 and 6 are arranged in lateral spaced apart parallel relation. Each track 4 and 6 is independently driven by means of a separate engine, transmission and drive train, not shown, which are disposed respectively in tractor sections 8 and 10. Tractor section 8 is aligned immediately inwardly adjacent to and rigidly connected to track supporting structure for track 4 while tractor section 10 is aligned immediately inwardly adjacent and rigidly connected to the track supporting structure for endless track 6. At their laterally adjacent inner margins 12 and 14, tractor sections 8 and 10 are provided with laterally interlocking longitudinally extending rails 16 and 18, respectively. Rails 16 and 18 serve to maintain the tractor halves in laterally spaced relation yet permit limited longitudinal displacement of one tractor half relative to the other. As seen best in Fig. 2, dual operating controls 20 are grouped in close coupled relation on the upper deck of tractor section 10 immediately ahead of the driver's seat 22. Controls 20 permit both synchronous and independent operation of either track 4 or 6. Thus, by manipulation of controls 20, the rate of movement of either track 4 or 6 may be regulated to cause one-half of the tractor to move forward or progress more rapidly than the other until the desired longitudinal displacement or lead is attained, whereupon the relative rate of movement of tracks 4 and 6 may be synchronized to maintain the longitudinally staggered relationship. Similarly, tracks 4 and 6 may be maintained in lateral alignment during movement of the vehicle by synchronization of rate of movement.

As seen best in Fig. 1, each tractor half is provided with forwardly extending push beams 24 and 26, the rear ends of which are pivotally secured at points intermediate the respective track supporting frame. At their forward ends, push beams 24 and 26 are formed with enlarged generally vertically extending hubs 28 and 30. Hubs 28 and 30 are drilled to provide axially extending bores 32 through which extend bulldozer mounting pins 34 and 36. The upper and lower ends of pins 34 and 36 are pivotally engaged by vertically spaced mounting brackets 40 and 42 which, in turn, are connected, as by welding, to the rear surface of bulldozer frame 44. As seen best in Fig. 2, mounting brackets 42 are provided with circular apertures 46 equal in diameter to the outside diameter of pin 36, while mounting brackets 40 are provided with lateral elon-

gated slots 48 which permit lateral shifting of the brackets 40 relative to the pin 34 when the bulldozer blade 44 is aligned in an angular position such as shown in Fig. 3, or the reverse thereof. To permit bodily raising and lowering of the bulldozer, each push beam 24 and 26 is operatively connected to a hydraulic lift assembly 50 and 52, respectively. Lift assemblies 50 and 52 in turn are mounted on tractor sections 8 and 10, respectively. Raising and lowering of the bulldozer is accomplished in the conventional manner by introducing and exhausting hydraulic fluid from lift assemblies 50 and 52.

Since variations in angularity of the bulldozer requires relative lateral sliding movement between either one or the other of push beams 24 and 26 and its respective mounting bracket, it is desirable that means be provided for assuring maximum lateral stability of the push beams. To accomplish this end in accordance with one feature of the present invention, vertically extending laterally spaced apart guide members 54 and 56 are disposed on each tractor half at the forward extremities thereof in straddling relation with the intermediate portion of the respective push beams 24 and 26. Each guide member 54 and 56 is provided with opposed wear plates 58 and 60 which occupy positions immediately laterally adjacent the side edges of push beams 24 and 26. Thus, push beams 24 and 26 may be raised and lowered by lift assemblies 50 and 52 but are restrained against lateral displacement regardless of the degree of angularity of the bulldozer.

In order to more fully understand the operation of the mechanism, assume that the machine is to be used in a trail building or pioneering operation requiring adjustment of the bulldozer blade to a position wherein the right corner thereof leads the left corner. Under such circumstances, the operator manipulates the controls to cause the right tractor section to move more rapidly than the left tractor section until the desired blade angle is attained, thereafter by throttle manipulation the rate of movement of the left tractor section is synchronized with that of the right tractor section, causing the bulldozer blade to move forwardly at a constant degree of angularity. At the end of a given run, the direction of movement of the vehicle is reversed in a conventional manner and by further throttle manipulation the left tractor section is caused to lead the right tractor section, thereby permitting useful work to be accomplished by the machine on the return trip. It will thus be seen that optimum blade angle efficiency is continuously under the control of the operator and it is at no time necessary to bring the vehicle to a halt to accomplish readjustment as has heretofore been necessary. In addition, it should be particularly noted that if unusual temporary conditions are encountered while the vehicle is in motion, temporary changes in blade angle may also be made. Thus, optimum blade angle efficiency is instantaneously available at all times. While the present invention is admirably suited for instantaneous changes in blade angle, under some circumstances it may be desirable that the right and left tractor sections be maintained in staggered relation by positive locking means. This may be accomplished in any of a number of well known manners.

From the foregoing, it will be seen that a novel and highly efficient bulldozer construction has been devised. By virtue of the present construction, the vehicle may not only be operated at maximum efficiency at all times, but, in addition, loss of time previously necessitated in making manual adjustments is completely eliminated.

While but one embodiment of the invention has been shown and described, it will be apparent that other changes and modifications may be made therein. It is, therefore, not intended to limit the invention to the embodiment shown but only by the scope of the claims which follow.

I claim:

1. An earth working machine comprising a pair of single track self-propelled crawler tractors, longitudinally ex-

tending slide means interconnecting said tractors, manual operating controls for regulating the rate of movement of each of said tracks, and a bulldozer structure having one end operatively connected to one tractor and the other end operatively connected to the other tractor, said controls being independently operable to permit longitudinal displacement of one of said tractors relative to the other whereby said bulldozer is adjusted at an oblique angle.

2. An earth working machine comprising a pair of single track self-propelled crawler tractors, longitudinally extending slide means interconnecting said tractors, manual dual operating controls for regulating the rate of movement of each of said tracks, and a bulldozer structure having one end operatively connected to one tractor and the other end operatively connected to the other tractor, said controls being independently operable to permit longitudinal displacement of one of said tractors relative to the other whereby said bulldozer is adjusted at an oblique angle.

3. An earth working machine comprising a pair of single track self-propelled crawler tractors, longitudinally extending slide means interconnecting said tractors, manual operating controls for regulating the rate of movement of each of said tracks, and a bulldozer structure having one end operatively connected to one tractor and the other end operatively connected to the other tractor, said controls being independently operable to permit establishment and maintenance of longitudinal displacement of one of said tractors relative to the other whereby said bulldozer is disposed at an oblique angle to the path of the machine.

4. An earth working machine comprising a pair of laterally spaced single track self-propelled crawler tractors, laterally interlocking longitudinally extending slide rails interconnecting said tractors, dual operating controls for said tractors permitting both independent and synchronous operation whereby one tractor may be propelled in longitudinally staggered relation to the other, a forwardly extending push beam pivotally mounted on each of said tractors, a transversely extending bulldozer pivotally secured at the forward ends of said push beams, and means permitting relative lateral movement between said bulldozer and one of said push beams.

5. An earth working machine comprising a first tractor having a single endless ground engaging track assembly, a first longitudinally extending rail on said first tractor, a second tractor having a single endless ground engaging track assembly, second longitudinally extending rail on said second tractor, said first and second rails being arranged in laterally interlocking longitudinally slidable relation, power means in each of said tractors for independently propelling the respective endless tracks, dual control means for each of said power means arranged on one of said tractors whereby said tractors may be initially displaced in longitudinally staggered relation and thereafter propelled forwardly at a uniform rate, a pair of forwardly extending push beams, one of said beams being pivotally secured on one of said tractors, the other of said push beams being secured on the other said tractors, a generally transversely extending bulldozer disposed adjacent the forward ends of said push beams, and means operatively connecting said bulldozer to said push beams, said last-mentioned means permitting relative lateral movement between one of said push beams and said bulldozer to accommodate changes in the angularity thereof.

6. An earth working machine comprising a first tractor having a single endless ground engaging track, a second tractor having a single endless ground engaging track, a first longitudinally extending rail on said first tractor, a second longitudinally extending rail on said second tractor, said first and second rails being arranged in laterally interlocking relation and adapted to permit limited relative longitudinal movement of said tractors, power means in each of said tractors for independently propelling the respective endless tracks, dual control means for each of said

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power means arranged on one of said tractors whereby said tractors may be initially propelled at non-uniform rates to establish longitudinally staggered relation and thereafter propelled forwardly at a uniform rate to maintain said staggered relation, a pair of forwardly extending push beams, one of said beams being pivotally secured on one of said tractors, the other of said push beams being secured on the other said tractors, a generally transversely extending bulldozer disposed adjacent the forward ends of said push beams, pivot means operatively connecting said bulldozer to said push beams, one of said pivots being laterally movable relative to said bulldozer to accommodate changes in the angularity thereof, and means for raising and lowering said bulldozer.

7. An earth working machine comprising a first tractor having a single endless ground engaging track, a second tractor having a single endless ground engaging track, a first longitudinally extending rail on said first tractor, a second longitudinally extending rail on said second tractor, said first and second rails being arranged in laterally interlocking relation, power means in each of said tractors for independently propelling the respective endless tracks, dual control means for each of said power means arranged on one of said tractors whereby said tractors may be initially displaced longitudinally and thereafter propelled forwardly at a uniform rate, a pair of forwardly extending push beams, one of said beams being pivotally secured on one of said tractors, the other of said push beams being secured on the other said tractors, a generally transversely extending bulldozer disposed adjacent the forward ends of said push beams, pivot means operatively connecting said bulldozer to said push beams, one of said pivots being laterally movable relative to said bulldozer to accommodate changes in the angularity thereof, and means mounted on said tractors operatively engaging said push beams to raise and lower said bulldozer.

8. An earth working machine comprising a first tractor having a single endless ground engaging track, a second tractor having a single endless ground engaging track, a first longitudinally extending rail on said first tractor, a second longitudinally extending rail on said second tractor, said first and second rails being arranged in laterally interlocking relation, power means in each of said tractors for independently propelling the respective endless tracks, dual control means for each of said power means arranged on one of said tractors whereby said tractors may

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be initially displaced longitudinally and thereafter propelled forwardly at a uniform rate, a pair of forwardly extending push beams, one of said beams being pivotally secured on one of said tractors, the other of said push beams being secured on the other said tractors, a generally transversely extending bulldozer disposed adjacent the forward ends of said tractors, pivot means operatively connecting said bulldozer to the forward ends of said push beams, one of said pivots being laterally movable relative to said bulldozer to accommodate changes in the angularity thereof, means mounted on said tractors for raising and lowering said bulldozer, and guide means on each of said tractors for limiting lateral movement of said push beams.

9. An earth working machine comprising a first tractor having a single endless ground engaging track, a second tractor having a single endless ground engaging track, a first longitudinally extending rail on said first tractor, a second longitudinally extending rail on said second tractor, said first and second rails being arranged in laterally interlocking relation, power means in each of said tractors for independently propelling the respective endless tracks, dual control means for each of said power means arranged on one of said tractors whereby said tractors may be initially displaced longitudinally and thereafter propelled forwardly at a uniform rate, a pair of forwardly extending push beams, one of said beams being pivotally secured on one of said tractors, the other of said push beams being secured on the other said tractors, a generally transversely extending bulldozer disposed adjacent the forward ends of said push beams, pivot means operatively connecting said bulldozer to said push beams, one of said pivots being laterally movable relative to said bulldozer to accommodate changes in the angularity thereof, means mounted on said tractors for raising and lowering said bulldozer, and vertically extending guide plates on each of said tractors coacting with an intermediate portion of said push beams to limit lateral movement thereof, said guide plates being effective throughout the total range of vertical movement of said bulldozer.

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