This invention relates to material handling machines of the overthrow type adapted for association with tractors and the like. This application is a continuation-in-part of application Serial No. 775,316, filed September 20, 1947 (now abandoned).

Various types of tractor-operated overthrow loading devices have heretofore been proposed. Generally speaking, such loaders are of complicated structure and involve high operating and maintenance costs. Moreover, these structures usually impose excessive operational stresses on the tractor parts, such stresses resulting in frequent damage to or fracture of these parts.

An object of the present invention is to provide a material handling device of the overthrow loading type which is of simple structure and arrangement whereby it may be readily mounted on a tractor of usual construction, whereby substantially no operational loads or stresses are imposed upon the tractor, and whereby operating and maintenance costs are comparatively low.

The invention, thus contemplated, in combination with a tractor having a pair of track frames, the provision of an overthrow loading device comprising a supporting frame mounted on each of the track frames, a bucket-carrying yoke pivotally mounted about a fixed axis on the supporting frames, and means for swinging the yoke about its pivotal axis comprising a pair of lever mechanisms each having a relatively short arm and a relatively long arm having one end connected to an end of the short arm, the other end of the short arm being pivotally connected to one of the supporting frames about an axis fixed with respect to the frames, means pivotally connecting the other end of the long arm to a side arm of the yoke, and means pivotally connected to each of the short arms. This construction makes it possible to simply and effectively perform the complete overthrow function and to locate the two fixed axes mentioned above (which constitute the main fulcrum points about which the operational loads are applied) in closely adjacent relation longitudinally of the track frames whereby such loads are uniformly distributed throughout the supporting frames and applied unitarily to the track frame to effectively eliminate the application of bending or twisting stresses on the track frames. This avoids the breakages so common in previous overthrowing devices.

The invention will be described with reference to the accompanying drawings, in which

Figure 1 is a side elevation of a tractor with the material handling device of the present invention mounted thereon.

Figure 2 is a plan view.

Figure 3 is an end elevation, and

Figure 4 is a diagrammatic side elevation showing various operating positions of the device.

In the drawing, 1 is a tractor of usual type having a pair of crawler treads 2 each mounted on a forward sprocket 3 and a rearward sprocket 4. Each pair of sprockets 3 and 4 are mounted on a respective track frame which includes an outer channel beam 5, an inner channel beam 6, and a plurality of mounting pads 7 fixed to the beams 5 and 6, all in accordance with usual practice.

The machine of the present invention includes a pair of supporting frames each comprising a saddle 8 mounted on a respective one of the track frames and astride a tread 2 by means of outer and inner supporting plates 9 and 10. As shown and preferably, the saddles 8 are located above and between the axes 3' and 4' of the forward and rearward sprockets but adjacent the rearward axis 4' to position the saddles in the rearward portion of the tractor.

Each plate 9, which is substantially vertically disposed, has its lower edge portion fixed to a mounting pad 7 as indicated at 11 and 12, the saddle 8 being fixed to its upper edge portion as indicated at 13. Preferably, to provide adequate support, the base or lower edge portion of plate 9 extends throughout the major portion of the distance between axes 3' and 4'. As shown, the rearward end of the plate lies somewhat rearwardly of axis 4' and its forward end lies opposite the periphery of sprocket 3.

Each plate 10 has its lower edge portion fixed to a mounting pad 7 as indicated at 14, and the inner edge of the saddle is fixed to its upper edge portion as indicated at 15.

Saddle 8 preferably comprises a unitary casting having a pair of upwardly extending arms 16 in which are journaled the trunnions 17 of a hydraulic cylinder 18. The axis of the two pairs of trunnions, which is parallel to axes 3' and 4', is indicated at 17'.

Also pivotally mounted on each saddle 8 is a lever mechanism such as a lever 19 of bell-crank form having a short arm 20 and a long arm 21. It will be observed that the arm 20 is of considerably greater thickness than arm 21 to provide an inwardly extending portion 20'. The member 19 is normally positioned with the extremities of its arms 20 and 21 in a lowermost position, and its fixed pivot is constituted by the pivotal connection with saddle 8. Such pivotal connection comprises a pin 22 which extends through the bifurcated extremity of arm 20 and the interfitting bifurcated portion 23 of the saddle which is constituted by a rearward extension of the base of the saddle. It will be observed, therefore, that the bell-crank member is arranged to revolve about a fixed axis indicated at 19'.

The piston rod 24 of cylinder 18 is pivotally connected to the bell-crank member 19 at the juncture of arms 20 and 21 by means of a bushing 25 on the end of the piston rod which engages a pin 26 mounted in the portion 20' of arm 20. It will be observed that the axis of the piston rod is normally in substantially right angular relation to the arm 20. The pivotal connection of the piston rod with the lever is about the axis 26'.

The effective length of arm 20, i. e., the distance between axes 19' and 26', is preferably approximately one-third that of arm 21, i. e., the distance between axes 26' and 21'.

A material-carrying bucket or scoop 27 is carried by a yoke or boom 28, which is a U-shaped frame having a transversely extending member 28' and side arms 29 which are pivotally mounted adjacent their extremities on pins 30 carried by the lower edge portions of plates 9. The yoke is thus adapted to swing about a transversely extending axis 29', which is located in approximate alignment with the axes 3' and 4' but in adjacent relation to axis 4' at the rearward end of the machine and somewhat forwardly of the axis 19'.

The extremity of each arm 21 of the bell-crank members is pivotally connected by means of link 31 to a respective side arm 29. As shown, the link may comprise two complementary parts. The pivotal axis 31' of the links with the side arms is preferably slightly forwardly of the pivotal axis 21' of the links with the arms 21 in the normally lowermost position of the yoke 28. Preferably,
also, the distance between axes 29' and 31' is substantially equal to the distance between axes 19' and 21', and is a major portion of the length of each arm 29. Moreover, the links 31 are of such length that the distance between axes 21' and 31' is slightly greater than the distance between axes 19' and 29'.

The scoop 27 is so constructed and arranged that it remains in fixed relation to the yoke during digging and loading operations. As shown, the scoop has a bottom wall 32, a rearwardly inclined back wall 33, and side walls 34 and 35. The scoop has a pivot connection 36 with the transverse member 28' and braces 36 extending from wall 33 to member 28' retaining the scoop in fixed relation to the yoke. The braces are preferably provided with means for varying their length to adjust the angular relation of the scoop with respect to the yoke. Preferably, the wall 33 is inclined rearwardly from a horizontal plane at an angle lying within the approximate range of 103°-113°.

The hydraulic cylinders 18 are connected to a source of hydraulic power through pipes 38 and hose connections 39, and appropriate controlling means therefor (not shown) are also provided, all in a well known manner. The tractor is also provided with an operator's cab 40.

The operation of the device will be clear from the foregoing description. Referring to Figure 4, which illustrates diagrammatically the major operating positions of the material handling machine. The bucket 28 is shown in the carry position A, the load position B, and C the dumping position. Moreover, the bucket may be moved downwardly for digging purposes to a position indicated at D. It will be observed that the yoke 28 travels through an arc of approximately 118° and not substantially greater than 125° from the load position at the forward end of the machine to the dump position at the rearward end. It will also be observed that the wall 33 of the bucket in the carry position is upwardly inclined at an angle of approximately 2° to 12° for effective carrying of the material therein and, in the dumping position, is downwardly inclined at an angle of approximately 30° to 40° for efficient discharge of its contents at the rearward end of the machine. The chosen angle of inclination of the wall 33 will depend upon the nature (i.e., angle of repose) of the material being handled. Thus, the structure described makes it possible to employ a relatively short arc of operating travel of the yoke in association with a bucket or scoop which remains in fixed relation to the yoke without the need of dumping mechanism therefor. It will further be observed that part of the end portion of each arm 20 adjacent the fixed pivot connection 22 is substantially directly above a respective side arm of the yoke (see Figure 3) and will thus be engaged by such side arm in the dumping position C, as will be clear from Figure 4. Therefore, such portions constitute a stop for the yoke to prevent swinging movement of the yoke therebeyond.

The structure described makes it possible to substantially eliminate all operational stresses and strains. The two main fixed axes 19' and 29' are located in closely adjacent relation to each other longitudinally of the tractor and thus the members pivot thereon are solidly supported on the midsections of the two supporting frames. For ease and effectiveness of operation, axis 19' is preferably located slightly rearwardly of axis 29'. This relative location of axes 19' and 29' permits the desired range of swinging movement of the yoke and bell crank members as will be apparent from Figure 4. The third fixed pivot axis 17', namely, that of the hydraulic cylinders, is supported at closely adjacent axes 19' and 29', such axis 17' being slightly forwardly of axis 29'. Thus, the cylinders are also solidly supported on the midsections of the supporting frames. Preferably, as shown, the three axes 17', 19' and 29' are all located within the rearward half of the tractor, i.e., in closer proximity to axis 4' than to axis 3'. Ease and smoothness of operation are further promoted by making the length of each arm 21 of the lever mechanism somewhat greater than half the length of the side arms 29 of the yoke and the length of each link 31 at least as great as the distance between the axis 29' of the yoke and the axis 19' of the lever. This smoothness of operation is additionally aided by arranging the pivot points 21' and 31' in equidistant relation to pivot points 19' and 29', respectively.

It will be apparent that the machine may be readily adapted to an ordinary earth-moving device or dozer by simply removing bucket 27 and replacing it with a dozer blade of suitable design.

I claim:
1. In combination with a tractor having a pair of track frames and forward and rearward crawler-supporting sprockets mounted on said frames, an overhrow loading device comprising a supporting frame mounted on each of said track frames, a bucket-carrying yoke having side arms pivotally mounted about a fixed axis on said supporting frames, and means for swinging said yoke about its fixed axis including a pair of levers each of generally scalene triangular shape, each said lever being pivotally connected adjacent the apex of its short and long sides to a respective one of said supporting frames about a fixed axis located rearwardly of said first fixed axis and directly above said rearward sprockets, a link having a pivotal connection with each said lever adjacent the apex of its intermediate and long sides and a pivotal connection with a respective one of said side arms of the yoke located forwardly of the axis of said forward sprockets in the lowestmost position of said yoke, and power means pivotally connected about a movable axis to each said lever adjacent the apex of its short and intermediate sides.

2. An overhrow loading device as defined in claim 1, said movable axis being located rearwardly of said first fixed axis.

3. In combination with a tractor having a pair of track frames, forward and rearward pairs of sprockets, and a crawler tread mounted on each pair of forward and rearward sprockets, an overhrow loading device comprising a pair of saddles each mounted astride the rearward portion of a respective one of said crawler treads and having a supporting frame fixed to one of said track frames, a bucket-carrying yoke having side arms pivotally mounted about a fixed axis on said supporting frames, and means for swinging said yoke about its fixed axis including a pair of levers each of generally scalene triangular shape and having an integral lateral extension at the juncture of the short and long sides thereof, the lateral extension of each said lever being pivotally mounted on a respective one of said saddles about a fixed axis located rearwardly of said first fixed axis and directly above said rearward sprockets, a link having a pivotal connection with each said lever adjacent the apex of its intermediate and long sides and a pivotal connection with a respective one of said side arms of the yoke located forwardly of the axis of said forward sprockets in the lowestmost position of said yoke, and power means pivotally connected about a movable axis to each of said lateral lever extensions.

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