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SHOVEL LOADERS

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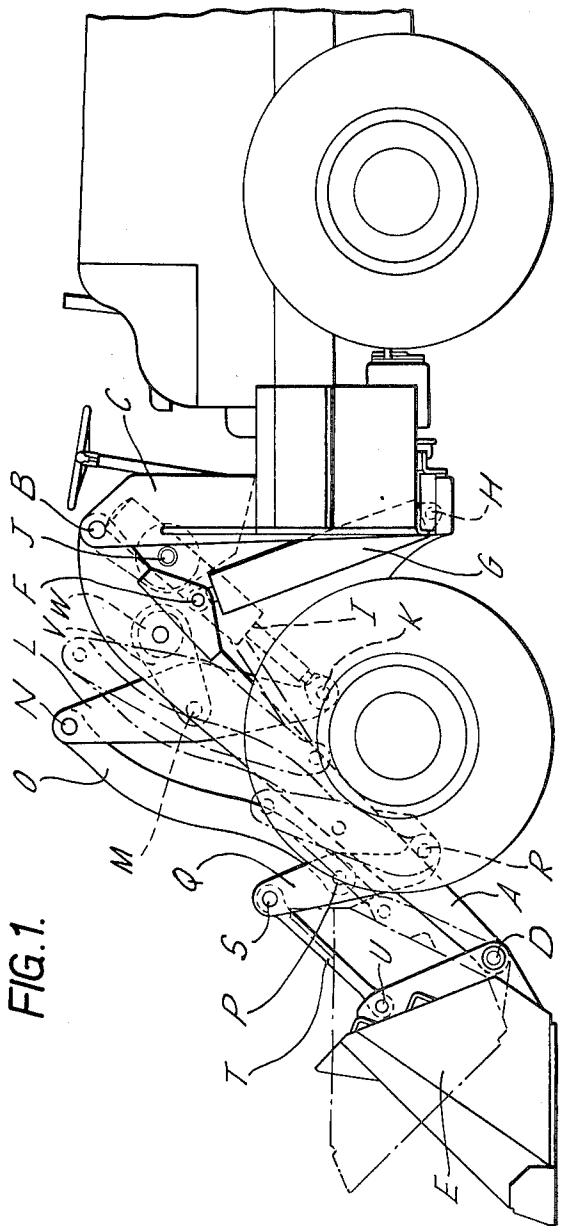

FIG. 1.

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FIG. 2.

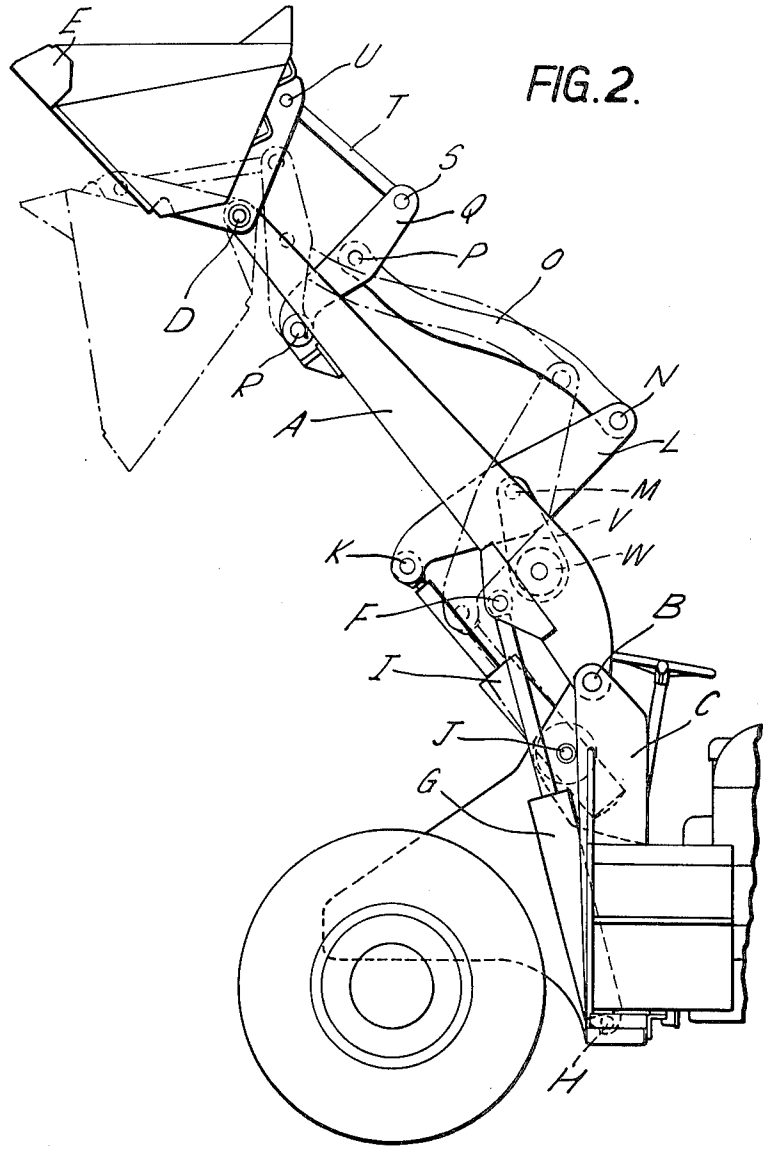

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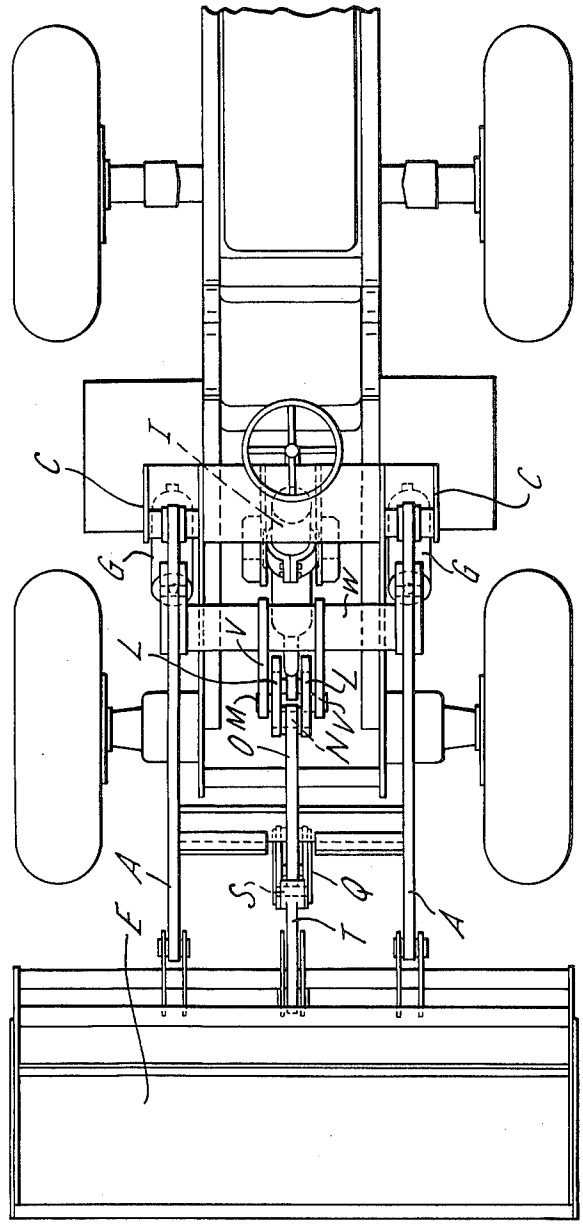
FIG. 3.



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SHOVEL LOADERS

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2 Claims. (Cl. 214—140)

The invention relates to shovel loaders of the kind in which lift arms are pivotally mounted on the vehicle frame so as to be movable through a wide arc by hydraulic rams, and in which a bucket or scoop is pivotally mounted on the end of the lift arms and tiltable through interlever linkage pivotally mounted on the side arms and operable hydraulically to move the bucket or scoop into position for filling and emptying.

A disadvantage of such loaders is that the greater the arc through which the lift arms are moved the more difficult it is to apply an effective force to the bucket or scoop to "pry-out" at an effective angle, the more difficult it is to keep the bucket or scoop level as it is raised, and the more difficult it is to tip the bucket or scoop to an effective angle and eject the load, at all heights.

The invention has among its objects, in addition to overcoming the foregoing, to effect a simplification in the production and maintenance of such a loading shovel and to reduce the binding action caused by two hydraulic jacks acting separately on opposite sides of an unevenly loaded bucket or scoop.

According to the invention, a shovel loader of the kind defined is constructed with the means for tilting the bucket disposed midway between the main lifting arms of the loader, and operated by a single hydraulic ram trunnion-mounted on the loader chassis.

According to the invention furthermore a shovel loader is provided in which the piston rod of the hydraulic ram is pivotally connected to the lower end of the rear interlever which is pivotally mounted at its mid-point on a cross arm between the main lifting arms, the upper end of the rear interlever being connected by a connecting link to a forward interlever, the lower end of which is pivotally mounted on a further cross arm, the upper end of the forward interlever being connected by a further connecting link to the loader bucket.

The invention further comprises the features of construction hereinafter described.

Thus in the construction according to the invention the fulcrum brackets of the bucket or scoop interlevers are not mounted on the lift arms, thus enabling a reduction in lift arm suction to be made due to the elimination of stress concentration. The larger angle through which the side arms can move enables the side arm pivot to be moved forward on the chassis and the side arms to be reduced in length whilst at the same time increasing the maximum height the bucket or scoop can be raised.

This enables the driver to be placed behind the side arms' pivot in a safe position. Furthermore the most effective use is made of the scoop jack by utilising the large area of the piston for a large "pry-out" force and the small area on the rod side for tipping.

The invention provides a shovel loader in which the side arms can be raised through an angle of 95°, and the scoop or bucket pivoted through an angle of 45° above the horizontal at any position of the side arms. When the side arms are raised the scoop or bucket remains substantially at 45° to the horizontal (2° zone of variation). The scoop or bucket can be tipped to 55° below the horizontal at the maximum height of lift of the side arms. This range of possible movement increases as the side arms are lowered to an angle of 70° below the horizontal, when the side arms are in the lowest position. The total angle of the scoop movement relative to the side arms is 195°.

The invention is diagrammatically illustrated by way of example in the accompanying drawings in which:

FIGURE 1 shows a side elevation of a shovel loader according to the invention with the side arms in their lowest position. The position of the bucket after pry-out is shown in dotted lines;

FIGURE 2 shows the front end of a shovel loader with the side arms in a raised position. The broken line view shows the bucket lowered as when tipping;

FIGURE 3 shows a plan view of a shovel loader according to the invention showing the central disposition of the bucket tilting linkage.

In the drawings two parallel lift or side arms A are pivotally connected at B, in front of the steering column of the shovel, to a rigid chassis C. At the outer end of the lift arm A, at the pivots D, is pivotally connected the scoop or bucket E. At positions F on the underside of the lift arm A, near the pivots B, are pivotally connected the piston rods of the lift rams G, the rams being pivotally connected to the rigid chassis at pivot H. Movement of the pistons of the rams G raises and lowers the side arms A and the bucket or scoop E, which is pivotally connected thereto.

On the centre line of the chassis C a "pry-out" ram I is trunnion-mounted at J, the piston rod of the ram being connected at pivot K to the one end of the rear interlever L. The rear interlever L is is connected by bracket means V to the cross member W which extends between the side arms A. The rear interlever L is pivotable about pivot M and is further connected at the end opposite the pivot K at pivot N, to the interlever O. The interlever O is connected at pivot P to an interlever Q which at its lower end, at pivot R, is connected to the side arms A. At the upper end, the interlever Q is connected at pivot S to the interlever T. At the opposite end, the interlever T is connected at the pivot position U to the scoop or bucket E.

It will be understood that the side arms extend parallel to each other from pivot positions on the chassis, to the upper ends which are pivotally connected to the bucket or scoop, and that interlever linkage consisting of single connected linkages extend between the parallel side arms being mounted on cross-arms between the side arms, to be connected to the bucket or scoop at a mid-position in the width of the bucket or scoop.

In operation:

With the base of the scoop or bucket on the ground and roughly parallel to the ground, the loader is driven forward to drive the scoop or bucket into the material to be loaded. After the maximum penetration of the scoop or bucket has taken place, the pry-out jack I which is in the partly closed or collapsed state, is extended, causing the pivot positions K and N to move in opposite directions about the pivot M. The lever L thus reverses the direction of the applied force and enables the most effective side of the left jack piston to be used for "pry-out." As the pivot N is moved back the interlever Q also moves back, this movement being magnified by the positional relationship of pivots S, P, and R, causing the bucket or scoop to tilt upwardly on the pivot D. The pivot U thus moves relative to the side arms and describes an arc about pivot D until such time as the "pry-out" jack I is fully extended. At this time the base of the bucket or scoop E is at 45° to the ground. The lift rams G are then extended, causing the pivots D to describe an arc about the pivot B raising the scoop or bucket.

The relative positions of the pivots on the interlevers, and of the pivot J on the "pry-out" ram, cause the bucket

or scoop to move forward in relation to the side arms, retaining the base of the bucket or scoop at 45° to the ground level. This is achieved without any extension or retraction of the jack I, between the pivots K and J.

When the bucket or scoop E is raised to the required height over the discharge position the jack I is retracted to cause the bucket or scoop E to be tipped forward, and the load discharged. The smaller the arc through which the side arms are raised, the larger is the required retraction of the jack I and this is catered for in the design described.

I claim:

1. A shovel loader, comprising:

a chassis;

two parallel arms mounted on opposite sides of the chassis at the forward end thereof and extending forwardly therefrom;

a bucket pivotally mounted at the forward ends of said arms;

first hydraulic motor means pivotally mounted at one end on said chassis and at the other end on said arms and adapted for raising and lowering said arms;

cross members connecting said arms including a first cross member located in front of and close to the forward end of the chassis;

a plurality of serially arranged interconnected interlevers mounted between said arms for pivotal movement with respect to said cross members;

bracket means mounted on said first cross member and projecting forwardly therefrom, the central portion of the rearwardmost interlever being pivotally mounted on the forward end of said bracket means;

rod means connecting said bucket and the forwardmost one of said interlevers so that movement of said interlevers effects pivoting of said bucket;

a second hydraulic motor including an elongated cylinder and trunnion means on said chassis pivotally supporting said cylinder intermediate the longitudinal ends thereof, said motor having a piston pivotally connected to the lower end of the rearwardmost one of said interlevers, said hydraulic motor being located between said arms and being the sole power means for pivoting the rearwardmost interlever;

the pivot axis of said trunnion means lying in a horizontal plane which is below and spaced a substantial distance from the pivot axis of the arms.

2. A shovel loader according to claim 1, in which said second hydraulic motor, said interlevers and said rod means are so positioned and dimensioned that the inclination of said bucket to the ground is not altered by operation of said first hydraulic motor means to raise and lower said arms.

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