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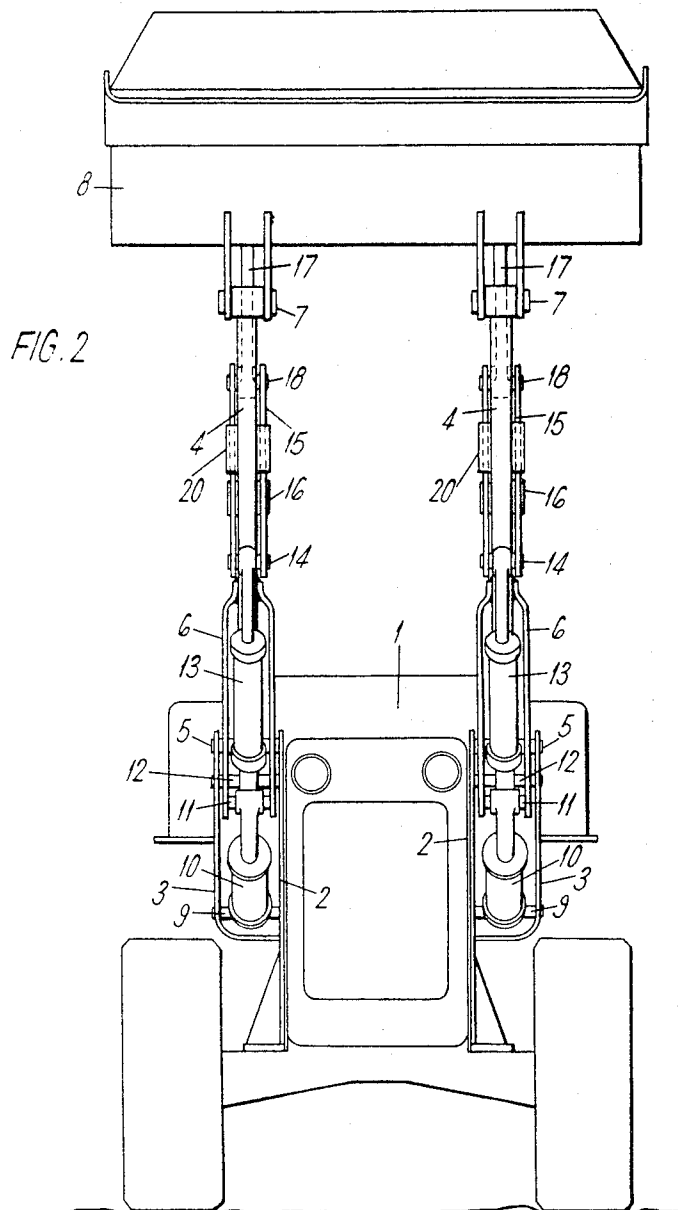
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VEHICLE LOADER LINKAGE

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2 Sheets-Sheet 2



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1

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## VEHICLE LOADER LINKAGE

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4 Claims. (Cl. 214—776)

### ABSTRACT OF THE DISCLOSURE

A vehicle loader having a hollow lift arm pivotally attached to the vehicle by paired side walls, the lift arms having a pivoted bucket at the outer end, a lever pivoted on the arm having a pivoted link connected to the bucket and a pivoted hydraulic cylinder inside the hollow lift arm connected to the vehicle, a hydraulic cylinder pivoted to the side walls and enclosed within the same and connected to operate the lift arm.

This invention relates to vehicle loaders and more particularly to linkages used in such loaders.

Vehicle loaders generally include one or a pair of lift arms pivotable at one end on a vehicle or tractor framework and pivotably supporting a bucket at the other end. The lift arm or arms can be raised by means of a hydraulic ram or rams acting between the tractor and the lift arms. The bucket can be pivoted forwardly or rearwardly by one or more bucket rams acting through a parallelogram linkage, but remains in a substantially constant attitude relative to the ground when the lift rams only are actuated. Several forms of parallelogram linkages have been used with one such form utilizing a cross-over lever pivoted intermediate its ends on each lift arm, links connecting the lower end of each lever to the bucket and bucket rams connecting the upper ends to the frame and giving certain advantages over other types of linkage.

One advantage of the above described type of linkage particularly in the case where the bucket ram cylinder is connected to the frame is that the full area of the ram piston is exposed to hydraulic pressure. The geometry of the linkage is such that the force generated is used to perform the heavy load of rolling back the filled lowered bucket. The relatively easy load of tipping the raised bucket forward for dumping its contents is performed by the hydraulic pressure acting on the reduced area available on the piston rod side of the ram piston. Such dumping movement is performed more quickly by virtue of the reduced volume of cylinder which has to be filled on the piston rod side of the piston because of the very presence of the piston rod.

The disadvantage of the known cross-over linkages is that various parts of the linkage foul each other unless the lift ram and bucket ram on each side are transversely offset. Such an offset imparts load couples to the linkage which are difficult to equilibrate and tend to cause undue stress and wear in parts of the linkage especially at pivot points.

Other linkages avoid the presence of loads arising from offsetting the rams by placing the bucket rams above and in the same plane as the lift arms. In this configuration, however, the advantage of the relatively large bucket roll back force and quick dump action is lost and occasionally the bucket ram tends to interfere with the driver's view of the bucket.

It is therefore an object of the invention to provide a bucket linkage for a vehicle loader that couples the advantages of a cross-over type without the normal disadvantages thereof.

According to the present invention a self propelled

2

power shovel or vehicle loader comprises a tractor, a pair of lift arms pivoted about a transverse axis on a portion of the tractor, lift rams for pivoting said lift arms, a bucket pivotally mounted on the lift arms, means for tilting said bucket relative to said lift arms including an intermediate lever carried by said lift arms, a link connecting said lever with the bucket, an extensible link connecting said lever with a fixed pivot point on the tractor vehicle, each said lift arm including a pair of members both of which carry the lift arm pivot and a lift ram pivot and defining between them a through aperture for the placement of said extensible link in the same plane as said lift arms.

Preferably the link connecting said intermediate lever to the bucket is pivotally connected to the top of the intermediate lever while the bottom of said lever is connected to said extensible link, the latter being constituted by a bucket ram having its cylinder pivotally connected to the vehicle.

Preferably also the portion of the vehicle carrying each lift arm pivot comprises a hollow box structure having paired side walls extending without break or interruption from the lift arm pivot to a pivot connecting the lift ram to the vehicle and the pivot connecting the bucket ram cylinder to the vehicle is also carried on said side walls.

The invention will now be described with reference to the accompanying drawings of which:

FIGURE 1 represents a side view of the self propelled shovel.

FIGURE 2 represents a front schematic view of the same shovel with the bucket raised.

FIGURES 3 and 4 are side views of the bucket linkage and lift arms in the carrying and dumping positions of the bucket.

A crawler tractor 1 carries a pair of lift arms and bucket linkages one on each side, only one of which will now be described, it being understood that the reference numerals used apply to the corresponding elements on the opposite side.

Inboard side plate 2 and outboard side plate 3 are joined at the top and the bottom to form a load carrying structure solid with the tractor. A lift arm 4, pivoted at pivot 5 on the two side plates 2 and 3, is also provided with the side members 6 secured thereto, and at its forward end pivotally supports a bucket 8.

Between and towards the rear of the side plates 2 and 3 is a pivot 9 joining the cylinder of a lift ram 10 to the tractor 1. The piston rod of lift ram 10 is pivoted at its free end to the lowermost end of side members 6 the arrangement being that extension of the lift ram causes the lift arms to rise and vice versa.

Pivot 12 is the point of connection of the bucket ram 13 to the side plates 2 and 3, the piston rod being pin-connected at pivot 14 to twin levers 15 placed one on each side of the lift arm 4. Intermediate their ends the twin levers 15 are pivoted intermediate the ends of the lift arm 4 and at their upper ends pivot 18 connects them with bucket tilt link 17, itself pinned to the bucket structure at 19. It will be apparent that extension of jack 13 causes clockwise tilt (as seen in FIGURE 1) of the bucket such a motion being known as roll back. Further it will be appreciated that hydraulic pressure acts on the full area of the ram piston to cause roll back, and on the opposite side of the ram piston to cause anticlockwise tilt or dump. Thus the twin advantages of having high forces acting in the roll back direction of movement of the bucket and quick dump movement are present with the configuration described above.

The pivots 12, 5, 16, 14 and pivots 16, 18, 19 and 7 ideally should constitute the corners of two rough parallelograms connected by having two common sides, namely

3

lift arm 4 and levers 15. Such a parallelogram linkage would keep the bucket at the same attitude with respect to the ground irrespective of its height. However, it is sometimes convenient to change the bucket attitude slightly as it is raised or lowered and for this purpose the pivot 12 may be placed nearer or farther away from pivot 5 according to the attitude change required.

Stops 20 are provided on the lift arms to limit the forward tilt of the twin levers 15 and bucket 8.

It will be seen that the thrusts exerted by the lift and bucket rams are all transmitted and equilibrated in a single plane without any rocking couples being exerted on any of the pivots. The fact that the lift ram is tucked away almost horizontally also aids the visibility from the driver's position.

The two side plates 2 and 3 which extend smoothly and without a break or interruption from pivot 5 to pivot 9, carry tension loads between these two points and provide a simple and strong force path which is free of any joints, or other stress risers.

Further the disadvantage of obstructed vision due to the presence of the bucket rams above the lift arms is not present with the linkage described above.

It will be clear that the invention could be applied to a single lift arm loader wherein the bucket is centered on a single lift arm carried by the tractor. These and other applications will be readily apparent to those skilled in the art.

I claim:

1. A vehicle loader having a box like structure carried on each side of the vehicle, a pair of parallel lift arms each having a hollow portion pivotally connected to and within one of said box like structures, a bucket carried on the ends of said lift arms, a pair of lift rams each pivoted within one of said box like structures and to one of said lift arms, a pair of intermediate levers each carried

4

intermediate its end on one of said lift arms, links connecting one end of each intermediate lever to said bucket, a pair of hydraulic rams each pivotally connected at one end to one of said intermediate members and at the other end to one of said box like structure, said last mentioned hydraulic rams extending through the hollow portions of said lift arms in the same general planes as the lift arms.

2. In a vehicle loader having a hollow box like structure having paired side walls, a lift arm assembly pivoted on the side walls, a lift arm connected to the side walls and lift arm assembly for raising and lowering said lift arm, a bucket pivotally mounted on said lift arm, an intermediate lever pivoted intermediate its ends on said lift arm intermediate the ends thereof, a link connected to one end of said intermediate lever and said bucket, an extensible link connecting the other end of said intermediate lever and said vehicle, said lift arm assembly including a hollow portion through which said extensible link extends, whereby said extensible link lies in the same plane as said lift arm.

3. The vehicle loader of claim 2 wherein said extensible link comprises a hydraulic ram connected between the lower end of said intermediate lever and a pivot point on said paired side walls.

4. The vehicle loader of claim 3 wherein said hollow portion of said lift arm assembly extends into the space between said side walls.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,412,885

November 26, 1968

Pietro Pensa

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 10, "arm" should read -- ram --.

Signed and sealed this 10th day of March 1970.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM E. SCHUYLER, JR.

Commissioner of Patents