

PATENT SPECIFICATION

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(54) EARTH WORKING IMPLEMENTS

- (71) We, J. I. CASE COMPANY, a Delaware Corporation, of the United States of America, of 700 State Street, Racine, Wisconsin 53404, United States of America, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- 10 The present invention relates to earthworking implements such as backhoes of the type having a mast which is pivoted on a vertical axis and swung from side to side by means of hydraulic rams.
- 15 For many years now it has been common to mount the backhoe support structure or swing tower on a frame and utilize a pair of hydraulic fluid rams for pivoting the tower with respect to the frame. In
- 20 such a unit, the hydraulic cylinders are usually connected to the boom support or swing tower on opposite sides of the vertical pivot axis between the swing tower and the frame.
- 25 For example, in United States Patent No. 3,047,171, there is described an earthworking implement of the type described in which the free ends of the piston rods of the fluid rams are connected to the frame
- 30 structure at spaced locations while the cylinders of the fluid rams are connected at transversely spaced points to the swing tower or mast.
- 35 In recent years, the earthworking implement of the type disclosed in the United States patent has also been mounted in a manner that the entire unit can be shifted transversely with respect to the vehicle. An example of such unit is shown in United
- 40 States Patent No. 3,436,099. In this patent, the frame supporting the mast or tower is supported on transversely extending rails that are secured to the rear end of the vehicle. This allows the operator to position
- 45 the frame in any one of an infinite

number of positions with respect to the fixed rails and readily lock the unit with respect to the rails.

One of the problems encountered with a transversely shiftable unit of the type discussed above, is the limit of transverse shifting of the earthworking implement with respect to the vehicle. The length of the transversely extending rail is of necessity limited to the width of the vehicle so that the opposite ends of the rails do not extend beyond the outer edges of the rear wheels. Thus, in order to allow for sufficient transverse shifting of the earthworking unit, it has been proposed to mount all of the frame structure as well as the fluid rams rearwardly of the wheels of the vehicle to allow sufficient space so that the unit can be shifted transversely the desired amount. Such a proposed unit thus is capable of being shifted transversely a sufficient distance so that an operator can move the backhoe unit in alignment with the rear wheels and the implement can be used to dig directly adjacent a wall. However, such a unit has the disadvantage of having the center of gravity of the unit located substantially rearwardly of the rear axle for the vehicle. This presents substantial problems, particularly when the unit is being transported since the vehicle experiences a great deal of bouncing because of the substantial moment arm for the implement with respect to the rear axle of the vehicle.

Another proposal for mounting a backhoe on a vehicle so that a trench can be dug parallel to an obstruction, such as a building, is proposed in United States Patent No. 3,250,410. This patent incorporates a complicated supporting structure for the frame that supports the backhoe.

An aim of the present invention is to provide an earthworking implement

wherein the backhoe frame and the swing mechanism for the tower are mounted in such a manner that the backhoe frame can still be moved generally into alignment with either of the vehicle rear wheels while the center of gravity is located closer to the rear axle than has heretofore been possible.

According to the present invention there is provided an earthworking implement including a vehicle having a support structure at the rear end thereof, the support structure including a pair of horizontally oriented, vertically spaced elongated support members; a tower frame supported for horizontal movement on the rear end of the support members and adapted to be locked in position on the support members, a swing tower supported for pivotal movement about a vertical tower pivot axis on the tower frame, and a pair of vertically spaced fluid motors between the tower frame and the swing tower for pivoting the swing tower about the pivot axis, the fluid motors each including a cylinder and a piston rod, the tower frame having a portion extending between the support members towards the vehicle, the cylinders being supported on the portion by pivot means defining a vertical pivot located forward of the support members and the piston rods being connected to the swing tower at points spaced from the vertical tower pivot axis and spaced from each other.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 shows a fragmentary perspective view of a vehicle having an earthworking implement attached to the rear end thereof;

Figure 2 is an enlarged fragmentary sectional view, as viewed along line 2-2 of Figure 1; and

Figure 3 is an enlarged vertical sectional view, as viewed along line 3-3 of Figure 2.

Referring now to the drawings in detail Figure 1 shows an earthworking implement 10 consisting of a vehicle 12 having rear wheels 13 with an earthworking unit 14 secured to the rear end thereof. Vehicle 12 has a pair of horizontally oriented, vertically spaced, elongated support members or rails 16 secured to the rear end thereof. Each of the rails 16 is substantially rectangular in cross-section (Figure 3) and includes a rear vertical plate 18, with the rails releasably connected to vehicle 10 through frame 17. As most clearly shown in Fig. 3, tower frame 20 consists of upper and lower plates 22 and 24 that are interconnected by a pair of vertical beams 26. The transversely spaced vertical beams

or columns 26 each have a pair of lock members or means 28 supported thereon for securely locking the frame 20 in any one of a plurality of adjusted positions with respect to rails or support members 16. These lock members or means may be of the type disclosed in United States Patent No. 3,494,636 or may be hydraulically actuated assemblies well known in the art.

Top and bottom plates 22 and 24 each have a pair of transversely spaced abutments 27 secured thereto by bolts and the abutments engage the forward surfaces of plates 18 while the lower surface of upper plate 22 is supported on the edge of upper plate 18. Thus, the entire frame 20 may be laterally shifted with respect to rails 16 and locked in adjusted positions by lock means 28.

Mobile frame 20 supports a swing tower 40 that has a substantial C-shaped configuration with upper and lower portions 42 and 44 respectively pivotally supported on upper and lower plates 22 and 24 by pivot pins 46. Pivot pins 46 define a vertical tower pivot axis for supporting swing tower 40 for pivotal movement on frame 20. Swing tower 40 supports a backhoe assembly generally designated by reference numeral 48 for pivotal movement about a horizontal pivot 49. Since the backhoe assembly or earthworking unit 48 is well known in the art, no detailed description thereof appears to be necessary.

The swing tower is pivoted with respect to the frame by a pair of fluid rams that are mounted in a unique manner in order to allow the frame to be moved in close proximity to either side of the sliding rails while still having the center of gravity for the backhoe or earthworking implement 48 as close as possible to the rear axle for the vehicle. As most clearly shown in Figs. 2 and 3, frame structure 20 has a support portion consisting of three plates 50 extending between rails 16 and the plates terminate forwardly of the respective rails. The two fluid rams, which define the swing mechanism for swing tower 40, each include a cylinder 52 and a piston rod 54 that extends from one end of the cylinder. Each of the cylinders has a trunion mounting bracket 56 secured to the body thereof intermediate opposite ends with a pair of trunions 58 carried by the bracket 56. The trunions 58 are respectively received in openings 60 in the respective plates 50 so that the two cylinders are mounted in vertically spaced relation to each other and are located between an adjacent pair of plates 50. Also, the openings 60 are positioned so that both cylinders are supported on a common vertical pivot axis at the forward ends of the

respective plates. It will be noted in Fig. 2 that the common pivot axis defined by openings 60 and trunions 58 is located on a plane P which extends through the pivot axis defined by pins 46 and this plane is generally parallel to the longitudinal axis of the tractor.

Piston rods 54 of the respective fluid rams are respectively connected to an intermediate portion of swing tower 40. This connection consists of brackets 66 extending from the body of swing tower 40 with pins 68 extending through the apertures in the brackets and apertures in the end of piston rods 54. As shown in Figs. 2 and 3, the respective piston rods are connected to the intermediate portion at laterally and vertically spaced points, both of which are spaced from the vertical pivot axis defined by pins 46.

The mounting of the fluid rams in the manner described above will locate the opposite or free ends of cylinders 52 forwardly of rails 16 so that the ends of the cylinders are located between the rear wheels of the vehicle.

The specific trunion mounting of the cylinders in the manner described above has a number of advantages. A primary advantage of the present arrangement is that the center of gravity for backhoe 48 is positioned substantially closer to the rear axle of the vehicle than was heretofore possible. Furthermore, the mounting of the cylinders on a common vertical pivot on the frame allows the swing tower frame to be moved in close proximity to either side of the vehicle or ends of the respective rails 16. This particular feature is of extreme importance in designing a commercially acceptable unit.

Another advantage of the trunion mounting of the cylinders in the manner described above is that it allows the manufacturer to substantially reduce the transverse dimension of the swing tower frame which allows the frame, particularly the center of the backhoe to be moved closer to either side of the vehicle. It has been determined that with the present arrangement described above, the swing tower frame 20 can be laterally shifted to a position that will place the center line of the backhoe assembly, defined by plane P less than two feet of a theoretical wall extending parallel to the outer edges of the wheels of the vehicle.

A further advantage of mounting the cylinders in the manner disclosed herein is that the entire cylinders are totally protected by the rails as well as the plates which substantially reduces the possibility of damage resulting from material that might be dropped during the operation of the unit. Also, the piston rods for the re-

spective fluid rams are likewise substantially protected by the upper and lower plates 22 and 24 as well as the upper and lower portions of the swing tower.

Of course, it will be appreciated that trunion brackets 56 can be located at any position intermediate opposite ends of cylinders. For example, if trunion brackets were located adjacent the rod ends of cylinders 52, the spacing between the pivot means, defined by trunions 58, and pivot pins 68 would only have to be slightly more than the stroke of piston rods 54.

WHAT WE CLAIM IS:—

1. An earthworking implement including a vehicle having a support structure at the rear end thereof, the support structure including a pair of horizontally oriented, vertically spaced elongated support members; a tower frame supported for horizontal movement on the rear end of the support members and adapted to be locked in position on the support members, a swing tower supported for pivotal movement about a vertical tower pivot axis on the tower frame, and a pair of vertically spaced fluid motors between the tower frame and the swing tower for pivoting the swing tower about the pivot axis, the fluid motors each including a cylinder and a piston rod, the tower frame having a portion extending between the support members towards the vehicle, the cylinders being supported on the portion by pivot means defining a vertical pivot located forward of the support members and the piston rods being connected to the swing tower at points spaced from the vertical tower pivot axis and spaced from each other.

2. An earthworking implement according to Claim 1, in which the cylinders each have trunions intermediate opposite ends thereof and the trunions are supported on the pivot axis of the portion of the tower frame.

3. An earthworking implement according to Claim 1 or 2, in which the portion of the tower frame includes vertically spaced plates and in which the cylinders are supported between the plates.

4. An earthworking implement according to Claim 3, in which the portion of the tower frame includes three vertically spaced plates and in which the cylinders each have trunions intermediate opposite ends thereof, the cylinders being respectively located between adjacent pairs of plates with the trunions rotatable on respective plates.

5. An earthworking implement according to any preceding claim in which the vehicle has transversely spaced rear wheels, the pair of horizontally spaced elongated support members being in the form of

respective plates. It will be noted in Fig. 2 that the common pivot axis defined by openings 60 and trunions 58 is located on a plane P which extends through the pivot axis defined by pins 46 and this plane is generally parallel to the longitudinal axis of the tractor.

Piston rods 54 of the respective fluid rams are respectively connected to an intermediate portion of swing tower 40. This connection consists of brackets 66 extending from the body of swing tower 40 with pins 68 extending through the apertures in the brackets and apertures in the end of piston rods 54. As shown in Figs. 2 and 3, the respective piston rods are connected to the intermediate portion at laterally and vertically spaced points, both of which are spaced from the vertical pivot axis defined by pins 46.

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The specific trunion mounting of the cylinders in the manner described above has a number of advantages. A primary advantage of the present arrangement is that the center of gravity for backhoe 48 is positioned substantially closer to the rear axle of the vehicle than was heretofore possible. Furthermore, the mounting of the cylinders on a common vertical pivot on the frame allows the swing tower frame to be moved in close proximity to either side of the vehicle or ends of the respective rails 16. This particular feature is of extreme importance in designing a commercially acceptable unit.

Another advantage of the trunion mounting of the cylinders in the manner described above is that it allows the manufacturer to substantially reduce the transverse dimension of the swing tower frame which allows the frame, particularly the center of the backhoe to be moved closer to either side of the vehicle. It has been determined that with the present arrangement described above, the swing tower frame 20 can be laterally shifted to a position that will place the center line of the backhoe assembly, defined by plane P less than two feet of a theoretical wall extending parallel to the outer edges of the wheels of the vehicle.

A further advantage of mounting the cylinders in the manner disclosed herein is that the entire cylinders are totally protected by the rails as well as the plates which substantially reduces the possibility of damage resulting from material that might be dropped during the operation of the unit. Also, the piston rods for the re-

spective fluid rams are likewise substantially protected by the upper and lower plates 22 and 24 as well as the upper and lower portions of the swing tower.

Of course, it will be appreciated that trunion brackets 56 can be located at any position intermediate opposite ends of cylinders. For example, if trunion brackets were located adjacent the rod ends of cylinders 52, the spacing between the pivot means, defined by trunions 58, and pivot pins 68 would only have to be slightly more than the stroke of piston rods 54.

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2. An earthworking implement according to Claim 1, in which the cylinders each have trunions intermediate opposite ends thereof and the trunions are supported on the pivot axis of the portion of the tower frame.

3. An earthworking implement according to Claim 1 or 2, in which the portion of the tower frame includes vertically spaced plates and in which the cylinders are supported between the plates.

4. An earthworking implement according to Claim 3, in which the portion of the tower frame includes three vertically spaced plates and in which the cylinders each have trunions intermediate opposite ends thereof, the cylinders being respectively located between adjacent pairs of plates with the trunions rotatable on respective plates.

5. An earthworking implement according to any preceding claim in which the vehicle has transversely spaced rear wheels, the pair of horizontally spaced elongated support members being in the form of



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slide rails located rearwardly of the rear wheels with the ends of said rails located behind the rear wheels, a lock means on the frame for locking the frame on the rails,
5 the swing tower having upper and lower portions pivotally mounted on the frame on the vertical pivot axis, the fluid motors being in the form of fluid rams, each of the ram cylinders having the piston rod extending from one end thereof, the piston rods being connected to the tower intermediate the upper and lower portions thereof, the frame having a portion extending forwardly between the rails with

the cylinders being located between the rails so that opposite ends of said cylinders are located between the wheels. 15

6. An earthworking implement substantially as herein described with reference to the accompanying drawings. 20

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