Oct. 7, 1969 R. A. DRURY 3,471,033

CRANE CONSTRUCTION

Filed Nov. 16, 1967 2 Sheets-Sheet 1

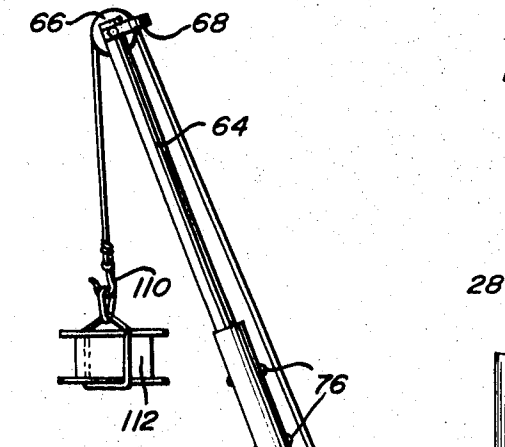


Fig. 1

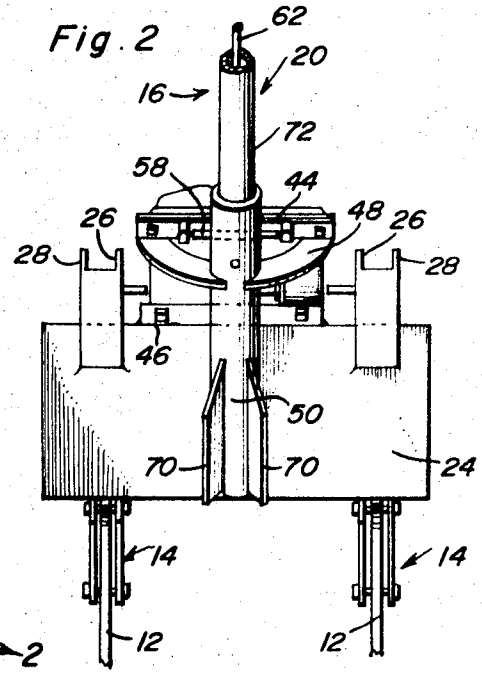


Fig. 2

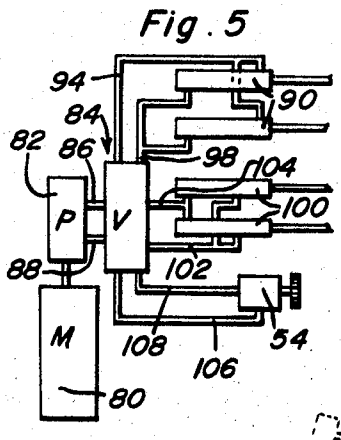
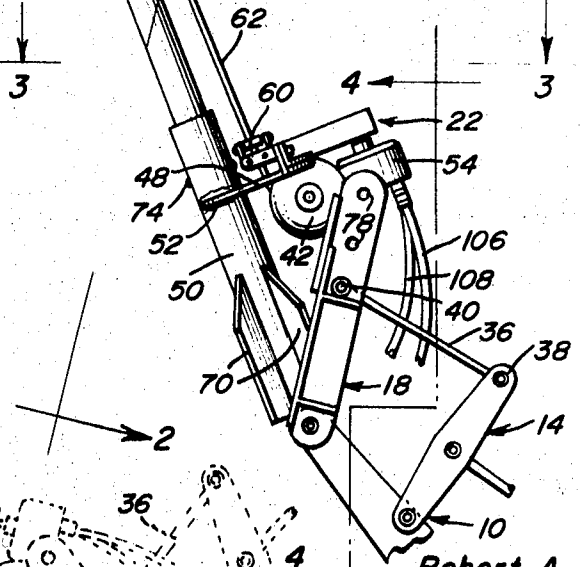
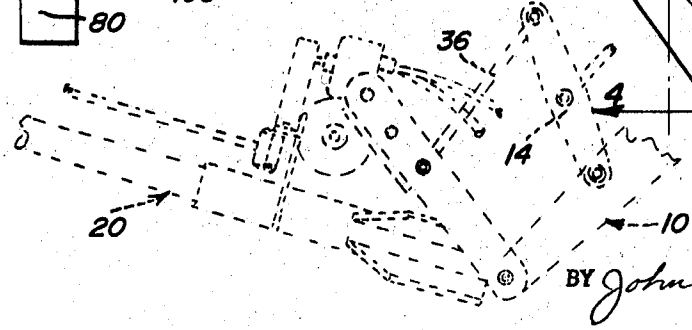


Fig. 5





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Fig. 3

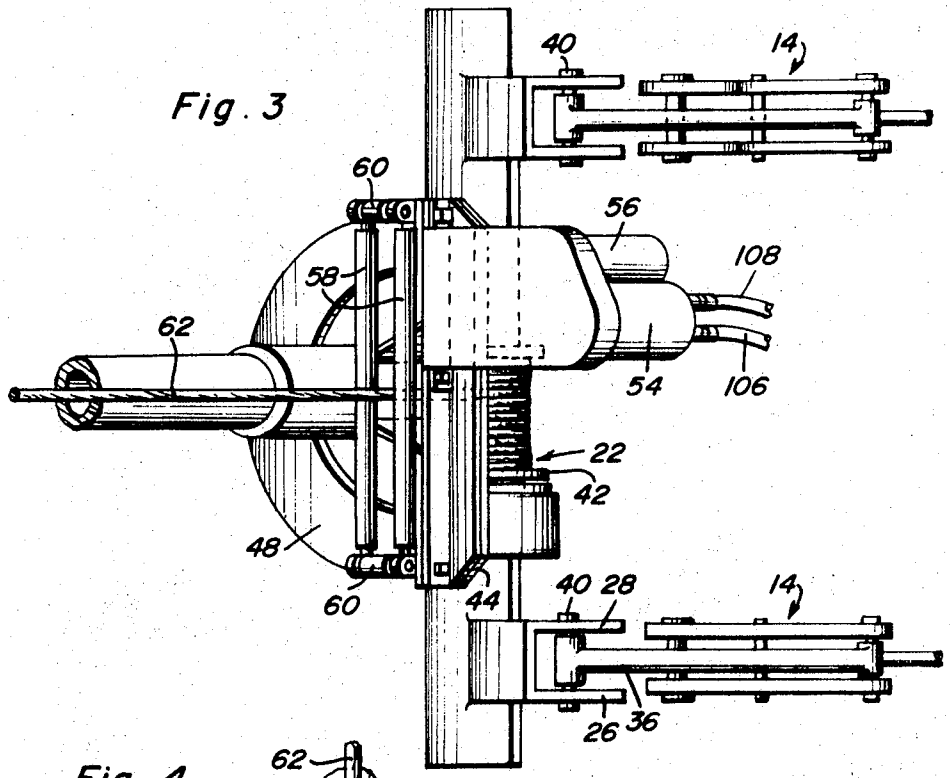
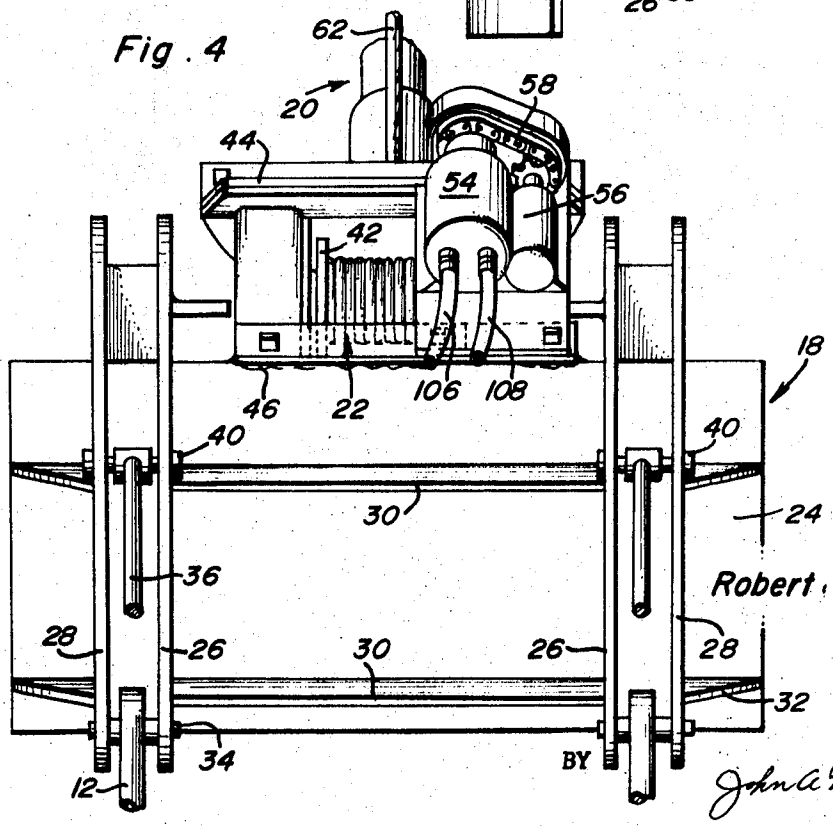


Fig. 4



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CRANE CONSTRUCTION

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ABSTRACT OF THE DISCLOSURE

A lifting boom mounted on a base supported from and oscillatable relative to the free ends of the lifting arms of a front loader-type of vehicle in lieu of the oscillatable bucket normally carried by the free ends of the lift arms, the lift arms usually including arcuate downwardly opening portions thereof disposed forwardly of the vehicle whereby the free ends of the arms may be caused to reach over an obstacle disposed forwardly of the vehicle.

The boom construction of the instant invention has been primarily designed for use on a front loader-type of vehicle such as a Caterpillar Model 992B Traxcavator. The Caterpillar Traxcavator is only one model of a large number of similar front loaders presently being manufactured upon any of which the boom or crane construction of the instant invention may be readily used. In addition, some types of crawler treaded tractors include forwardly projecting lift arms from which the boom or crane construction of the instant invention may be readily mounted in a similar manner.

The Traxcavator is specifically mentioned herein only because it includes the aforementioned downwardly opening arcuate portions of its lift arms and it is also of sufficient weight to mount an inclined boom assembly with reasonable stability. Of course, the weight and length of the boom assembly may be readily varied as to the lifting requirements at hand but only within the limits of stability of the supporting vehicle.

The main object of this invention is to provide an attachment whereby a wheeled or track-type front loader or the like may be readily converted to a mobile crane. Although crane or boom assemblies have heretofore been mounted upon farm tractors and other pieces of construction equipment such as bulldozers, a particularly useful combination is provided when the boom construction of the instant invention is utilized in combination with a front loader of the aforementioned type.

Another object of this invention is to provide a boom construction including hydraulically powered winch means that may be readily powered and controlled from the hydraulic system of the supporting vehicle.

Yet another object of this invention is to provide a boom or crane construction which is extendable in length and which may therefore be varied in length in accordance with the lifting job to be accomplished and the stability of the supporting vehicle.

A very important object of this invention is to provide a boom or crane attachment for a front loader-type of vehicle and which may be readily substituted for the oscillatable bucket assembly normally pivotally supported from the lift arms of such front loading vehicles.

A final object of this invention to be specifically enumerated herein is to provide a boom or crane assembly in accordance with the preceding objects and which will conform to conventional forms of manufacture, be of simple construction and easy to use so as to provide a device that will be economically feasible, long lasting and relatively trouble free in operation.

These together with other objects and advantages which will become subsequently apparent reside in the details

of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a side elevational view of the crane or boom construction of the instant invention as supported from the free ends of the lift arms of a front loader-type of vehicle and with an alternate position of the boom construction fragmentarily illustrated in phantom lines;

FIGURE 2 is a vertical sectional view taken substantially upon the plane indicated by the section line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged fragmentary horizontal sectional view taken substantially upon the plant indicated by the section line 3—3 of FIGURE 1;

FIGURE 4 is an enlarged fragmentary vertical section taken substantially upon the plane indicated by the section line 4—4 of FIGURE 1; and

FIGURE 5 is a diagrammatic view of the hydraulic system of the vehicle from whose lifting arms the crane structure is supported illustrating the manner in which the various hydraulic cylinders of the vehicle as well as the hydraulic motor of the crane structure are actuated.

Referring now more specifically to the drawings, the numeral **10** generally designates the lift arm assembly of a front loader vehicle such as a Caterpillar Model 992B Traxcavator. The lift arm assembly includes a pair of lift arms **12** which are pivotally secured at one pair of corresponding ends (not shown) to the body of the Traxcavator and which have a pair of tilt arm assemblies generally referred to by the reference numerals **14** pivotally secured thereto at corresponding ends intermediate the opposite ends of the lift ams **12**.

As is conventional, the base ends of the arms **12** are pivotally supported from the frame of the Traxcavator at an elevated position (not shown) thereon and hydraulic cylinders (not shown) are operatively connected between the arms **12** and the Traxcavator frame for swinging the arms between forwardly and downwardly inclined lowered positions with the free ends of the arms **12** adjacent the surface upon which the Traxcavator rests and forwardly and upwardly inclined raised positions with the upper ends thereof elevated above the pivot axes of the arms **12** a distance at least closely approaching the effective length of the arms **12**.

The boom assembly of the instant invention is generally referred to by the reference numeral **16** and includes a base structure generally referred to by the reference numeral **18**, an elongated boom member generally referred to by the reference numeral **20**, and a hydraulically actuated winch assembly generally referred to by the reference numeral **22**.

The base structure **18** includes a base plate **24** to which pairs of parallel flanges **26** and **28** are secured. The flanges **26** and **28** are secured to one side of the plate **24** in any convenient manner such as by welding and at opposite marginal edge portions of the plane. A pair of transverse stiffening flanges **30** are secured to the plate **24** and extend between the flanges **26** and four triangular gusset plates **32** are secured between opposite end portions of the flanges **28** and adjacent portions of the plate **24**.

The free ends of the lift arms **12** are pivotally secured between the lower ends of the corresponding flanges **26** and **28** by means of removable pivot pins **34** and a pair of elongated thrust rods **36** are pivotally supported at one pair of corresponding end portions as at **38** from the free ends of the tilting arm assemblies **14** while the other pair of corresponding ends of the thrust rods **36** are pivotally secured between the corresponding flanges **26** and **28** by means of suitable removable pivot pins **40** at locations spaced above the pivot pins **34**.

The winch assembly 22 includes a reel 42 journalled from a support frame 44 welded to the plate 24 as at 46 and bolted to a semicircular frame 48 welded to the base section 50 of the boom member 20 as at 52. The winch assembly 22 further includes a hydraulic motor 54 supported from the frame 44 and driving a gear reduction assembly 56 through a flexible endless chain 58. The gear reduction assembly 56 is also supported from the frame 44 and the latter additionally includes a pair of elongated guide rollers 58 which extend transversely of the base section 50 and also a shorter pair of guide rollers 60 extending between corresponding ends of the rollers 58. One end of a flexible cable 62 is secured to the reel 42 for winding thereon and for unwinding therefrom in response to actuation of the hydraulic motor 54 and the free end portion of the uppermost section 64 of the boom member 20 has a pulley 66 journalled therefrom over which the free end portion of the cable is trained. Further, the free end of the uppermost section 64 includes a U-shaped guide 68 embracingly receiving the pulley 66 therein and through which the cable 62 extends.

The base section 50 of the boom member 20 includes longitudinally extending and generally radially projecting buttress plates 70 secured between the base section 50 and adjacent portions of the side of the plate 24 remote from the flanges 26, 28 and 30 so as to rigidly support the base section 50 from the plate 24. The boom member 20 includes an intermediate section 72 extending between the base section 50 and the uppermost section 64. The intermediate section 72 is removably telescopingly secured within the end of the base section 50 remote from the plate 24 by means of a removable fastener 74 and the end of the uppermost section 64 remote from the pulley 66 is removably telescopingly secured within the end of the intermediate section 72 remote from the base section 50 by means of suitable fasteners 76. It is to be understood that the sections 64 and 72 include registerable longitudinally spaced diametric apertures or bores through which the fasteners 76 are secured and by which the uppermost section 64 may be secured in adjusted extended positions relative to the intermediate section 72. Further, the flanges 26 and 28 include pairs of registered apertures 78 through which the removable fasteners 40 may be selectively secured whereby the thrust rods 36 may be secured to the flanges 26 and 28 with the plate 24 in different angulated positions relative to the tilting arm assemblies 14.

With attention now invited more specifically to FIGURE 5 of the drawings, it may be seen that the Traxcavator to which the lifting arm assembly 10 is secured includes a prime mover 80 which drives a fluid pump 82. A control valve assembly generally referred to by the reference numeral 84 is provided and operatively communicated with the outlet and return lines 86 and 88 of the pump 82. A pair of hydraulic cylinders 90 are provided and are actuatable through hydraulic lines 92 and 94 extending from the control valve assembly 84 to the cylinders 90. The cylinders 90 are operatively connected between the lift arms 12 and the vehicle chassis for swinging the lift arm 12 relative to the vehicle chassis. Further, a pair of smaller hydraulic cylinders 100 are provided and operatively connected between the lift arm 12 and the tilting arm assemblies 14. The hydraulic cylinders 100 are serviced by hydraulic lines 102 and 104 extending between the control valve assembly 84 and the cylinders 100. Further, suitable hydraulic lines 106 and 108 extend between the hydraulic motor 54 and the control valve assembly 84.

The lift arms 12 of the Traxcavator include arcuate downwardly opening portions which adapt the free ends of the lift arms 12 to which the base structure 18 is pivotally supported to be extended over an obstacle disposed forwardly of the Traxcavator. The free end of the cable 62 may be provided with any suitable means such as the hook 110 for engaging a load such as I-beam 112 and if

the I-beam is not too heavy it may be lifted by swinging the free end of the book member 20 downwardly and engaging the hook 110 with the load 112 before subsequently upwardly swinging the free end of the boom member 20. However, if the load or beam 112 is too heavy, the boom member 20 may be maintained in the elevated position illustrated in FIGURE 1 of the drawings and the winch assembly 22 may be actuated to lower the hook 110 so that it may be engaged with the load 112 before again winding the unwound portion of the cable 62 on the winch 42.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to.

What is claimed is:

1. In combination with a vehicle including powered lift arm means including free and base end portions with the latter pivotally supported from an elevated position on said vehicle for generally vertical swinging of the free end portions of said arm means between lowered downwardly inclined positions adjacent the surface upon which said vehicle rests and raised positions elevated above the pivot axis of said arm means a distance closely approaching the effective length of said arm means, a base pivotally supported from said free end portions for oscillation about an axis normal to the plane of swinging movement of said free end portions, means operatively connected between said base and lift arm means for adjustably oscillating said base relative to said lift arm means, an elongated boom including base and free ends, means securing said base end of said boom to said base with said boom generally paralleling said plane, means carried by the free end of said boom adapted to support a load therefrom, said base being oscillatable relative to said arm means when the latter are in their raised positions to swing said boom toward an upstanding position with the free end of said boom elevated above said base a distance closely approaching the effective length of said boom, whereby a load supported from the free end of said boom may be elevated above said elevated position a distance closely approaching the sum of the effective lengths of said arm means and said boom.

2. In combination with a vehicle including powered lift arm means having free end portions swingable generally vertically, a base pivotally supported from said free end portions for oscillation about an axis normal to the plane of swinging movement of said free end portions, means including tilt arms pivotally secured to said lift arm means and thrust rods pivotally secured to said tilt arms and said lift arm means operatively connected between said base and said lift arms for adjustably oscillating said base relative to said lift arms, and an elongated boom including a base and free ends, means securing said base end to base and means carried by the free end of said boom adapted to support a load therefrom.

3. The combination of claim 2 wherein said boom includes telescopingly engaged boom sections extendable relative to each other, and means operative to maintain said boom sections in adjusted extended positions.

4. In combination with a vehicle including powered lift arm means having free end portions swingable generally vertically, a base pivotally supported from said free end portions for oscillation about an axis normal to the plane of swinging movement of said free end portions, means operatively connected between said base and said lift arms for adjustably oscillating said base relative to said lift arms, and an elongated boom including a base and free ends, means securing said base end to base and means carried by the free end of said boom adapted to support a load therefrom, powered winch means carried by said base, guide means carried by the free end of said

boom, and elongated flexible tension member means including one end portion operatively connected to said winch means for winding thereon, said tension member means being guidingly supported from said guide means for longitudinal shifting relative to the latter.

5. The combination of claim 4 wherein said winch means is powered by means of a hydraulic motor drivingly coupled thereto and supported from said base, said vehicle including a pressurized hydraulic fluid system powering said lift arm means and operatively connected to said hydraulic motor for selective actuation thereof.

6. In combination with a vehicle including powered lift arm means having free end portions swingable generally vertically, a base pivotally supported from said free end portions for oscillation about an axis normal to the plane of swinging movement of said free end portions, means operatively connected between said base and said lift arms for adjustably oscillating said base relative to said lift arms, and an elongated boom including a base and free ends, means securing said base end to base and means carried by the free end of said boom adapted to support a load therefrom, said means operatively connected between said base and lift arms including tilt arm means pivotally supported on one end from said lift arm means intermediate the opposite ends thereof, means operatively connected between said lift arm means and said tilt arm means operative to swing the latter relative to the former, and means operatively connecting the other end of said tilt arm means to said base for oscillating said base in response to oscillation of said tilt arm means relative to said lift arm means.

7. The combination of claim 6 including means operative to adjustably incline said base relative to said lift arm means independent of oscillation of said tilt arm means relative to said lift arm means, whereby the effective range of oscillation of said base relative to said lift arm means by said tilt arm means may be varied.

8. The combination of claim 7 wherein said boom includes telescopingly engaged boom sections extendable relative to each other, and means operative to maintain said boom sections in adjusted extended positions.

9. The combination of claim 8 including powered winch means carried by said base, guide means carried by the free end of said boom, and elongated flexible tension member means including one end portion operatively connected to said winch means for winding thereon, said tension member means being guidingly supported from said guide means for longitudinal shifting relative to the latter.

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214—130; 254—145