June 11, 1963 C. M. WINTER 3,093,248

SELF POWERED BOOM ASSEMBLY

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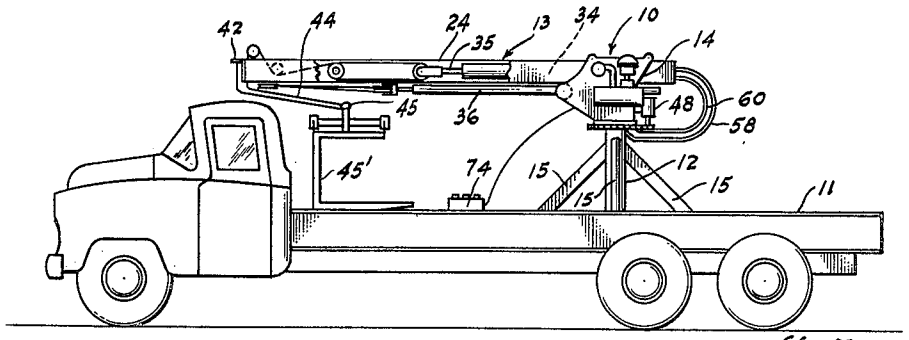

Fig. 1

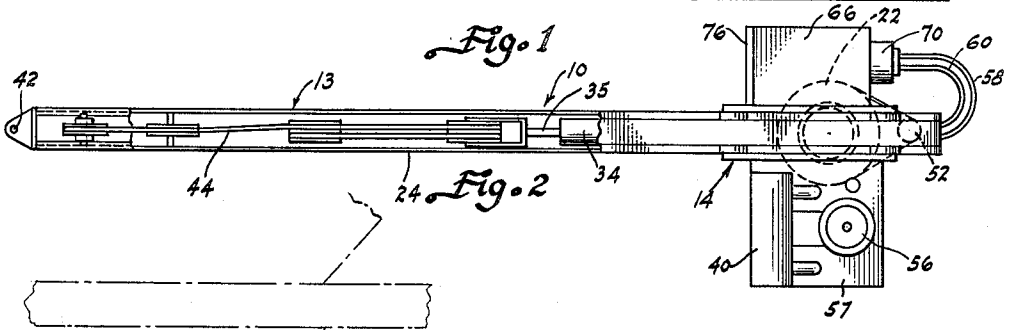

Fig. 2

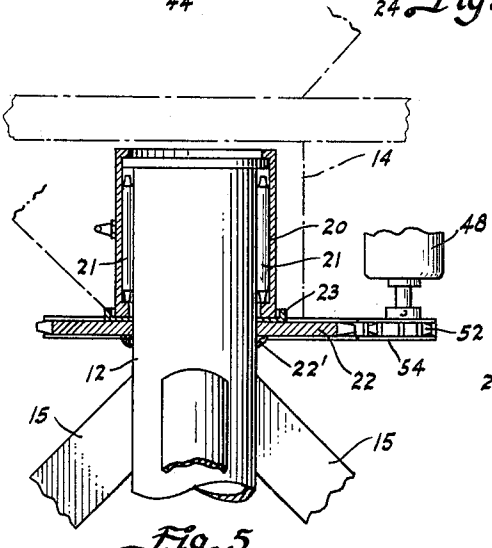

Fig. 5

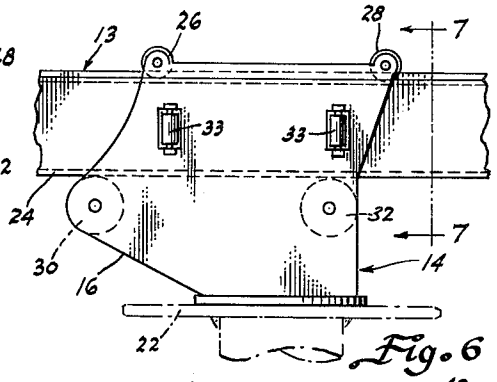

Fig. 6

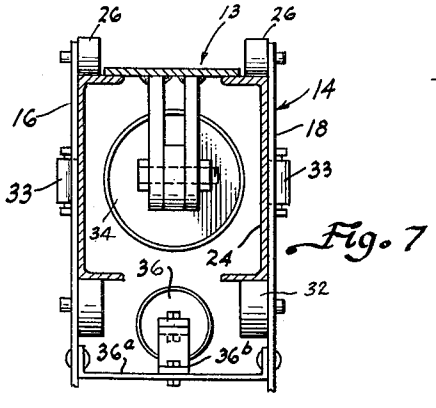

Fig. 7

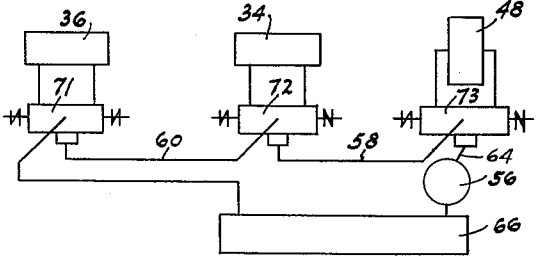

Fig. 8

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SELF POWERED BOOM ASSEMBLY

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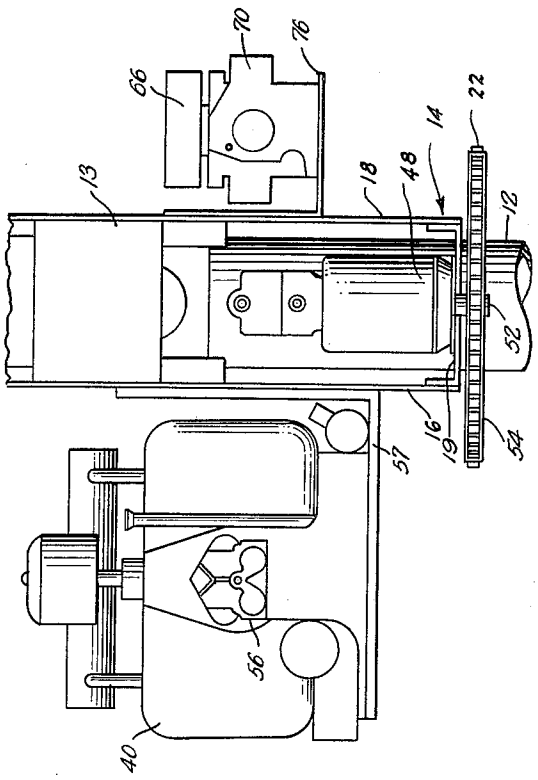

Fig. 3

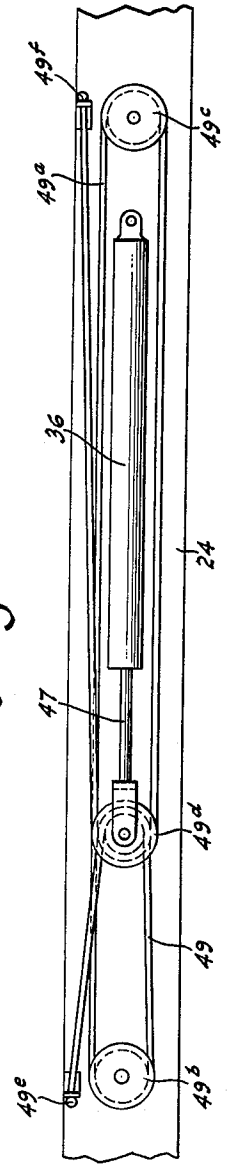

Fig. 4

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3,093,248

SELF POWERED BOOM ASSEMBLY

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4 Claims. (Cl. 212—55)

This invention relates to a hoisting assembly which is mounted on a platform such as a bed of a truck or the like. Specifically, the assembly has a power driven traversing type boom capable of a full circle movement.

A principal objective of this invention is to provide a hoisting assembly of the type described with the capability of rotating, projecting and lifting through power supplied by the assembly itself.

Another important objective of this invention is to provide a hoisting assembly which can easily be removed from a supporting structure and is self-contained to the extent that it may be packaged and transported as compact units ready for assembly.

A still further objective of the invention is to provide a hoisting assembly with a self-contained power unit which may readily be controlled at a point remote from the assembly.

Another objective of particular advantage in this invention is to provide a relatively uncomplex hoisting structure which has a boom supported on a mast, the boom having a full circle swing about the mast and slidable along its length over the mast. The boom encloses hydraulic means to raise and lower a lifting cable at one end thereof. The invention includes the structure and arrangement of power means whereby each of these operations is performed by power contained on the hoisting structure itself.

Further objectives and advantages of this invention will be apparent from the following description and claims wherein the construction, arrangement and cooperation of the several parts of the assembly are set forth.

In the drawings:

FIG. 1 is a side elevation of an exemplary vehicle to which a boom assembly and supporting means has been connected to the bed thereof, said boom assembly and supporting means embodying the principles of the present invention.

FIG. 2 is a slightly enlarged top plan view of the boom assembly per se, otherwise illustrated in side elevation in FIG. 1.

FIG. 3 is a rear end view, on a still larger scale, of the upper portion of the boom assembly and supporting means illustrated in FIGS. 1 and 2.

FIG. 4 is a fragmentary bottom plan view of the boom per se and illustrating the hydraulic unit and cable operable to move the boom longitudinally relative to its supporting head.

FIG. 5 is a fragmentary vertical sectional view through the head and upper end of the mast which supports the head rotatably to illustrate certain details of the bearing structure and boom sluing mechanism.

FIG. 6 is a fragmentary side elevation of the supporting head for the longitudinally movable boom.

FIG. 7 is an enlarged vertical sectional view taken on the line 7—7 of FIG. 6 especially to show details of anchoring certain of the hydraulic cylinders.

FIG. 8 is a hydraulic circuit diagram of an exemplary power system used to energize and operate the various reciprocable and rotatable hydraulic motors of the boom assembly and by which the same is actuated to achieve its various movements and also raise and lower the hoisting cable.

Referring now to the drawings where like numerals indicate like parts, the numeral 10 indicates generally the hoisting assembly of this invention. The assembly 10 is comprised of a mast 12 which is fixedly secured to the bed of a truck or any suitable platform, and the boom assembly 13 which is supported on the mast. The lower end of mast 12 is secured to the bed and/or frame structure of the truck 11, preferably in suitably fixed manner, and a plurality of angularly arranged braces 15 are fixedly connected at the opposite ends thereof respectively to the upper portion of the mast 12 and the frame or bed of the truck 11. The boom assembly is comprised of a head member 14 which consists of heavy steel parallel side plates 16 and 18, which have a bottom piece 19 therebetween. A socket 20 to receive the upper end of mast 12 rotatably is vertically formed within the bottom piece 19 and also preferably is positioned between and secured to the opposite side plates 16 and 18 of the head 14 so as to be movable therewith. This socket arrangement rotatably supports the head member on the mast and the cylindrical sleeve which comprises socket 20 preferably is interiorly arranged to receive a circular row of vertical needle bearing members 21 as best shown in FIG. 5. Surrounding and fixed to the mast adjacent the lower end of the socket 20 and also at the lower end of the head 14 is a sprocket gear 22, the same being secured to the mast 12 by any suitable means such as a weldment 22' shown in FIG. 5.

A hollow boom 24, having a rectangular cross-section, is received between side plates 16 and 18 of head 14 and is supported therebetween by anti-friction members 26, 28, 30 and 32. These anti-friction members each consist of a pair of transversely spaced rollers respectively engaging the upper and lower surfaces of the boom and permit transverse movement of the boom with respect to the upper end of mast 12. The lower rollers 30, respectively supported by the interior of plates 16 and 18, extend horizontally outward, toward the hoisting end of the boom, beyond the upper rollers 26 and, correspondingly, the lower rollers 32 extend forwardly of the upper rollers 28, thereby affording maximum support of the boom against downward movement at the forward end for minimum weight and size of the side plates 16 and 18. Additional anti-frictional rollers 33 may be mounted on the side plates 16 and 18 to engage the outer surfaces of the sides of the boom and thereby prevent contact with and drag along the inner surfaces of the plates and the boom.

Enclosed within the boom 24 and fixed suitably at one end against longitudinal movement relative to the boom is a hydraulically operated cylinder 34 which operates the hoisting cable 44. The cylinder 34 operates the piston rod 35 therein which, in turn, is interconnected to the movable pulley block of a complete arrangement of pulleys constituting fixed and movable pulley blocks which are mounted within the boom to effect a raising and lowering of hoisting cable 44 in response to the longitudinal movements of the piston rod 35. These fixed and movable pulley blocks are clearly shown in FIG. 2 especially, together with suitable guide pulleys adjacent the left-hand, or forward end of the boom, as viewed in FIG. 2, over which the hoisting cable 44 is trained as best shown in FIG. 1, whereby a loop of said hoisting cable passes over a sheave 45, see FIG. 1, in the upper end of a material engaging member, such as a lift fork 45', by which appropriate products such as cement blocks readily may be lifted from and onto the bed of the truck 11. Movement of the movable block on the outer end of piston rod 35 toward and from the other block which has a stationary axis relative to the boom, will cause raising and lowering of the member 45', as desired. In order to effect such movement of

the hoisting cable 44 however, one end of the cable is fastened to clamp 42 carried by the outer end of the boom as shown in FIGS. 1 and 2.

Also associated with the boom 24, as shown particularly in FIGS. 1 and 4, is another hydraulic cylinder 36 but this cylinder is connected against longitudinal movement at one end relative to the head 14 as best shown in FIG. 7, by any suitable anchor means such as a transverse plate 36^a, the opposite ends of which are connected by any suitable means such as rivets to the side plates 16 and 18 of head 14, and an appropriate bracket 36^b extends between the anchoring plate 36^a and a lug at the end of the cylinder 36 opposite that from which the piston rod 47 extends as shown in FIG. 4. From FIG. 4, it will be clear that the operating piston rod 47 supports a movable pulley block 49^d around which cable 49^a passes, said cable also passing around sheave 49^c, the pivot of which is fixed relative to boom 24, while forwardly of the cylinder 36 and movable block 49^d is another sheave 49^b, the pivot of which is fixed relative to the boom 24. Opposite ends of the cable 49^a are fixed respectively to boom 24 at 49^e and 49^f as clearly shown in FIG. 4. It will be understood that the movable block 49^d is a double sheave and by tracing the arrangement of the cable 49, 49^a, it will be seen that movement of the piston rod 47 in opposite directions respectively will move the boom 24 in corresponding directions relative to head 14.

Rotation of the head 14 and the boom 24 carried thereby relative to the upper end of mast 12 is effected by a swing motor 48 which preferably is hydraulic and is fixed by any suitable bracket means relative to head 14, which bracket for example may be secured to one of the side plates such as plate 18 of said head. Extending from the lower end of swing motor 48 is a sprocket gear 52 of substantially smaller diameter than sprocket 22. Extending around gear 52 and sprocket 22 is a link sprocket chain 54. Inasmuch as the sprocket 22 is stationary with respect to the fixed mast 12, it will be seen that by rotating sprocket gear 52, the chain will cause the head member 14 to rotate about the axis of vertical mast 12. This, in turn, will allow the entire boom assembly to rotate a full 360°, selectively in either direction, as desired.

The boom assembly is self-powered. The power unit 40 in accordance with the invention preferably is a self-contained gasoline motor which activates a hydraulic pump 56. The motor and pump are mounted upon a suitable bracket or plate 57, as well illustrated in FIGS. 2 and 3. The pump 56 supplies hydraulic power to the hoist cylinder 34 and the boom cylinder 36 through the tubular connections 58 and 60 respectively as best shown in the fluid circuit diagram illustrated in FIG. 8, said diagram also showing a line 64 which supplies fluid power to swing motor 48. Conventional return lines shown diagrammatically in FIG. 8 carry the hydraulic fluid to an oil reservoir 66. From oil tank 66 the fluid is returned to pump 56 by appropriate conduits, also shown in the fluid power diagram of FIG. 8. The cylinders 34 and 36 remain stationary with respect to the pump 56.

A suitable solenoid valve control unit diagrammatically shown at 70 is associated with the power unit and the swing motor 48 and operating cylinders 34 and 36 such that the individual operations are under the control of an operator. A manual switch box 74 may be electrically connected to the valve unit by a flexible cable so that the assembly may be controlled at a point remote from the hoisting assembly. Referring again to the power circuit diagram in FIG. 8, it will be seen that three 4-way valves 71, 72 and 73, all of which are solenoid-operated, are connected in the hydraulic fluid line between the pump 56 and the hydraulic cylinders 36, 34, and hydraulic swing motor 48, the solenoids of said valves being operated by exemplary solenoid switch box 74 shown in FIG. 1.

For purposes of counter-balancing the weight of the engine 40 and pump 56 which are carried by L-shaped bracket 57 mounted at one side of head 14, the opposite side of the head is provided with another L-shaped bracket 76 upon which is mounted the relatively heavy assembly of valve units generally designated 70 and comprising the individual solenoid-actuated 4-way valves 71, 72 and 73, as well as the oil reservoir tank 66. Further, it will be understood that, as illustrated in exemplary manner in FIGS. 1 and 2, most of the lines illustrated in the fluid power circuit diagram of FIG. 8 are flexible.

It can be seen from the above description that the self-contained boom mechanism is secured to the mast 12 only through the socket 20 and chain 54. In order to separate the hoist assembly from the mast, there is only required a separation of the sprocket chain from around the two sprocket gears 22 and 52. In other words, after the sprocket chain is separated, by removing a pin from one of its links, the entire head and boom assembly may be lifted directly from the mast. Hence, it is possible to ship the boom assembly as a separate package from the manufacturer.

The mast and its associated bracing members may also be shipped in a second package and mounted directly on a truck bed when a customer receives it. In order to mount the assembly on a truck, the customer only requires a derrick to lift the entire assembly onto the top of a previously secured mast and connect the sprocket chain around the sprocket and drive gear. The entire assembly is then in working condition.

Since there are no complicated drive connections between the unit and the truck (or other supporting structure), the boom assembly may readily be transferred from one mast to another. The mast and its supporting structure are relatively inexpensive pieces of equipment. This results in important financial savings to the owners of the equipment.

In a general manner, while I have in the above description, disclosed what I deem to be practical and efficient embodiments of my invention, it should be well understood that I do not wish to be limited thereto, as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

I claim:

1. A hoisting assembly comprising in combination, a mast connectable fixedly at the normally lower end thereof to a substantially horizontal supporting surface so as to extend substantially vertically upward therefrom in use for support thereby, a head having a socket receiving the upper portion of said mast and supported solely by said upper portion of said mast for rotation about the axis thereof, a boom extending substantially horizontally through the upper portion of said head and longitudinally movable relative to said head in opposite directions, flexible hoisting means operably supported by said boom and extending from one end thereof to raise and lower load means, self-energizing power generating means supported entirely by said head and not extending appreciably above the upper surface of said boom, and power transmitting means between said power generating means and said head and operable to rotate said head relative to the upper end of said mast and about the axis thereof.

2. A hoisting assembly comprising in combination a mast arranged to be secured stationarily and substantially vertically to the normally horizontal bed of a truck or the like, a head having a socket receiving the upper end portion of said mast and rotatably supported solely thereby for movement around the upper end of said mast, a boom very substantially longer than said head and received substantially horizontally by said head and supported thereby for longitudinal movement in opposite directions trans-

verse to the axis of said mast, the ends of said boom projecting in opposite directions from the opposite ends of said head, said boom being positioned for movement above the upper end of said mast, a self-energizing power generating unit supported substantially entirely by said head, hoisting means supported for raising and lowering movement at one end of said boom, actuating means operable by said power generating unit to move said boom longitudinally relative to said head and transversely to the axis of said mast, means supported by said head and operable by said power generating unit on said head to rotate said head and said boom as a unit about the axis of said mast, and a second actuating means operable by said power generating unit to actuate said hoisting means, and control means for distributing the required power selectively from said power generating means to said actuating means.

3. The hoisting assembly set forth in claim 2 further characterized by said power generating unit comprising a plurality of components and certain of said components being mounted upon said head at one side of the vertical axis thereof and other components being mounted upon said head at the opposite side of said vertical axis, thereby distributing the weight of said power generating unit upon said head to provide a counter-balancing effect.

4. The hoisting assembly set forth in claim 2 further characterized by said power generating unit comprising an internal combustion engine, a hydraulic pump, means to connect said engine to said pump to drive the same, and hydraulic control valves, said head also having supporting means at opposite transverse sides thereof, some of said items comprising said power generating unit being supported by one of said brackets and the rest of said items being supported by said other bracket, and means connecting said hydraulic control valves between said pump and the actuating means of said hoisting assembly.

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