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LIFTER ATTACHMENT FOR MATERIAL HANDLING
AND EARTH MOVING APPARATUS

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2 Sheets-Sheet 1

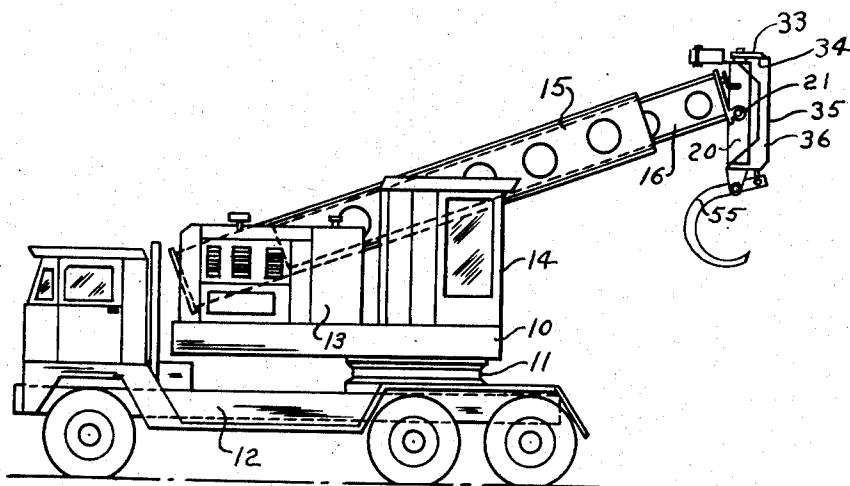


FIG. 1

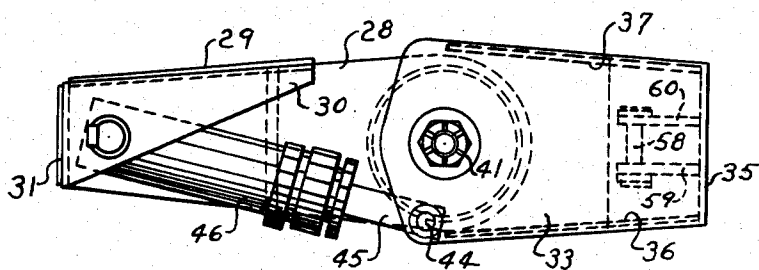


FIG. 3

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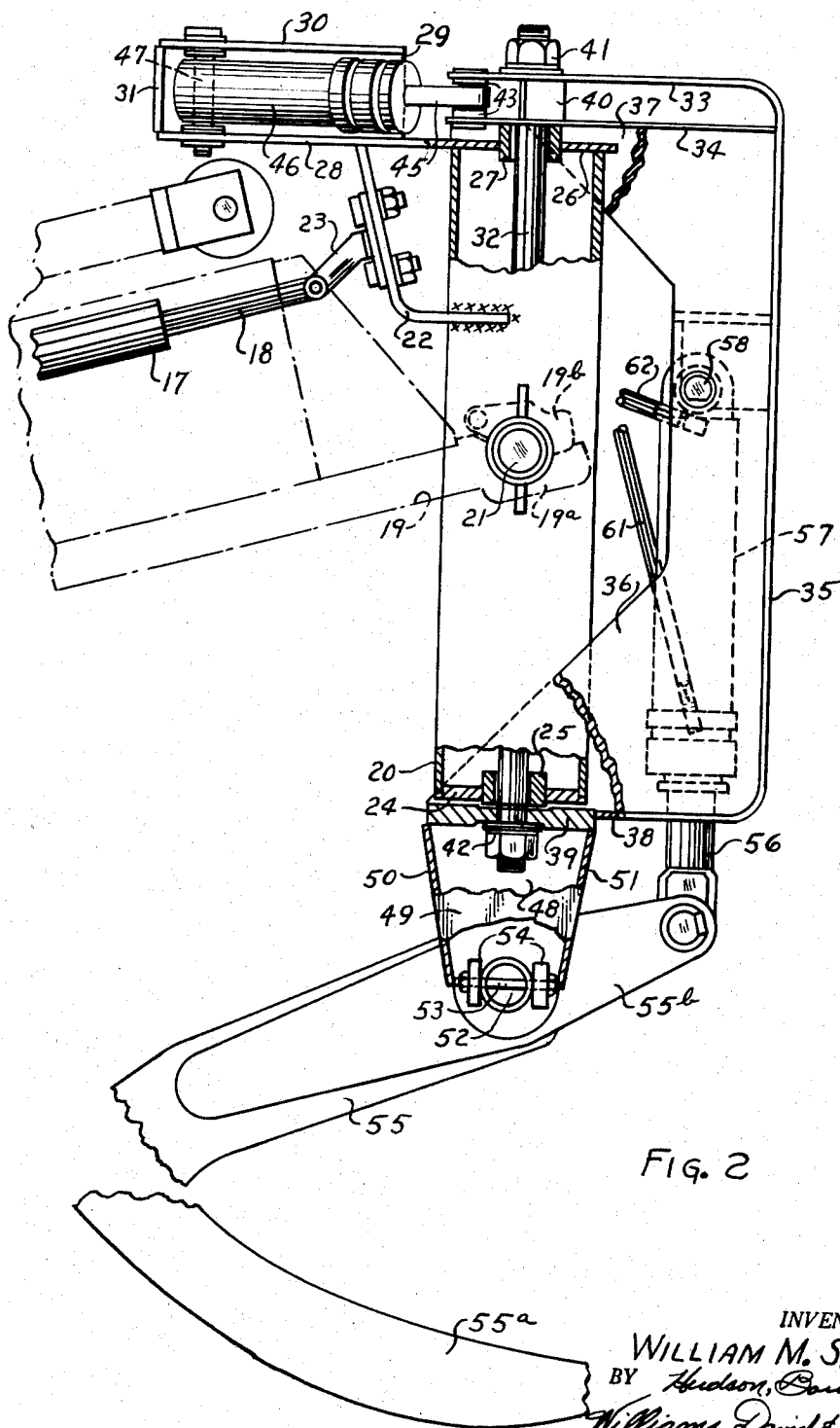


FIG. 2

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1

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LIFTER ATTACHMENT FOR MATERIAL HANDLING AND EARTH MOVING APPARATUS

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9 Claims. (Cl. 214-147)

This invention relates to a material or article lifter attachment and, more particularly, to such an attachment supported at the end of a movable boom as, for instance, the movable boom of a material handling or earth moving apparatus. Although the attachment embodying the invention has particular utility in connection with the lifting of coils of wire, it will be understood its utility is not limited thereto and it can be utilized for the lifting of various other types of coils, bundles, articles or the like.

Heretofore, lifters for the general purpose of the lifter embodying the invention usually have been supported from the free end of a movable boom in a manner designated as "free swinging," in that the lifter is supported by a cable extending from the end of the boom and is free to swing or turn with the cable. These "free swinging" lifters cannot be positively controlled and are difficult to manipulate so as to position the lifters, particularly the hooks thereof, accurately in relation to the articles to be engaged and lifted thereby. In other words, the "free swinging" lifters cannot be readily and positively positioned or oriented correctly with respect to the work and therefore are not of maximum efficiency.

An object of the invention is to provide an improved and novel lifter attachment that can be supported by the free end of a movable boom and such that the operator can readily and positively control the positioning and orientation of the lifter with respect to the work so as to facilitate and improve the efficiency of the lifting operation.

Another object is to provide a lifter attachment capable of suspension at the free end of a movable boom and wherein the lifter will have positive controlled turning and swinging movements in a plurality of directions to enable the operator to accurately locate the lifter in the desired relationship with respect to the work.

A further object is to provide a lifter attachment such as referred to in the preceding objects and wherein the positive movement of the lifter in a plurality of directions can be accurately controlled by the operator from a remote control station or position.

A still further object is to provide a lifter attachment to be supported by the end of a movable boom so that the attachment can have bodily turning motion about a substantially vertical axis and a bodily swinging motion about a substantially horizontal axis while the hook forming part of the attachment can have swinging motion relation to the attachment and about a substantially horizontal axis.

Although a lifter attachment embodying the invention can be utilized when used in connection with booms of various types, the invention has as a specific object the provision of a lifter attachment admirably adapted to be connected to the free end of the extensible and retractable boom member of a telescoping boom to increase the utility of a multi-purpose material handling and earth moving apparatus employing such a type of boom and capable of performing multiple earth moving operations or material handling operations by means of tools suit-

2

able for the particular operation and selectively connected to the free end of the extensible and retractable boom member.

Further and additional objects and advantages inherent in the invention and not hereinabove specifically referred to will become apparent hereinafter during the detailed description of an embodiment of the invention which is to follow, said embodiment being illustrated in the accompanying drawings forming a part of this specification and wherein,

Fig. 1 is a side elevational view of a multipurpose material handling and earth moving apparatus employing a telescoping boom and wherein the lifter attachment embodying the invention is mounted on the free end of the extensible and retractable member of the telescoping boom.

Fig. 2 is a view of the lifter attachment, partly in section and partly in side elevation, with the extensible and retractable boom member of the telescoping boom shown in dash and dot lines, and

Fig. 3 is a detached plan view of the lifter mechanism.

As previously stated, a lifter attachment embodying the invention can be advantageously used with various types of booms. However, for purposes of illustration and because it has particular utility when used with the extensible and retractable boom member of a telescoping boom, it will be so described herein. Also the lifter attachment will be described for illustrative purposes and without limitation thereto as a wire coil lifter because of its particular utility for this purpose.

In Fig. 1 there is illustrated a multipurpose material handling and earth moving apparatus that is capable of performing various earth moving and material handling operations. Inasmuch as this type of apparatus is well known and is commercially made and sold by The Warner & Swasey Company of Cleveland, Ohio, under the trademark "Gradall" a brief description of the apparatus should suffice herein.

The apparatus comprises a supporting platform 10 carried by a turntable 11 supported, in turn, by a wheeled mobile vehicle 12 which may be of the trailer type or it may be a self-propelled vehicle. The platform 10 may be provided with a power source 13, such as an internal combustion engine and a compressor or a pump for energizing the pressure fluid circuits and power devices that operate the boom and the tools secured to the outer end of the extensible and retractable member of the boom.

The platform 10 mounts an operator's control cab 14 and has suitable supports in which the nonextensible and nonretractable member of the telescoping boom indicated at 15 is pivotally supported for swinging movements about a horizontal axis, while the extensible and retractable member 16 of the boom telescopes within the boom member 15.

The boom member 16 is substantially triangular in cross-section and it pivotally mounts within it a tool actuating pressure fluid power device 17, the piston rod 18 of which extends outwardly of the free end of the boom member 16 and may be designated as the tool operating rod since it is adapted to be connected to the tool that may be supported at the free end of the boom member 16. The description thus far set forth per se forms no part of the present invention.

The boom member 16 at its outer or free end is provided with outwardly longitudinally projecting spaced parallel tool supporting elements 19 located substantially at the angle between the sides and base of the triangular boom member 16. The supporting elements 19 adjacent their outer ends include the fixed halves 19a and the removable halves 19b of bearing supports.

The lifter attachment embodying the invention comprises a vertically extending supporting cylinder 20 which

3

has substantially midway of its upper and lower ends and on diametrically opposite sides thereof trunnion posts 21 which are rockably journaled in the halves 19a and 19b of the bearing supports on the tool supporting elements 19, so that the supporting cylinder 20 can swing bodily about the axis of the trunnion post 21, i. e., about a substantially horizontal axis.

It will be understood that the trunnion posts 21 can be secured to the diametrically opposite locations on the circumference of the cylinder 20 by any suitable means such as by being welded to post supporting plates which, in turn, are welded to the cylinder.

The vertically extending cylinder 20 intermediate the trunnion posts 21 and the upper end of the cylinder has secured to it in any suitable way, such as by welding, an L-shaped bracket 22. The bracket 22 has fixed to it an arm 23, the free end of which arm is pivotally connected to the outer or free end of the piston rod 18 of the power device 17 that is located in the extensible and retractable boom member 16. It will be seen that actuation of the power device 17 will cause swinging or rocking movement of the cylinder 20 about the axis of the trunnion posts 21, i. e., about a substantially horizontal axis.

The lower end of the cylinder 20 is closed by a lower closure plate 24 which is provided centrally thereof with a bearing bushing 25, said closure plate 24 being secured to the cylinder 20 in any suitable manner. The upper end of the cylinder 20 is closed by a closure plate 26 welded or otherwise suitably secured to the upper end of the cylinder. The closure plate 26 mounts a bearing bushing 27 that is in axial alignment with the bearing bushing 25 in the lower closure plate 24. The upper closure plate 26 has a lateral or radial extension indicated at 28 and this extension 28 is provided on one edge with an upwardly extending portion 29, the upper end of which is turned inwardly to provide a flange portion 30 substantially parallel to the plane of the extension 28. The purpose of the extension 28 and portions 29 and 30 thereof will later be pointed out. The portions 29 and 30 may be integral with the extension 28 or they may be separate plates welded or otherwise suitably secured thereto. In order to stiffen the flange 30 a connecting member 31 may extend between the flange 30 and the extension 28.

A shaft 32 is supported in the bearing bushings 25 and 27 and extends below the closure plate 24 and above the closure plate 26 at the lower and upper ends of the supporting cylinder. The shaft 32 mounts a substantially C-shaped carrier support which will now be described.

The carrier support at its upper end is formed of two vertically spaced parallel arms 33 and 34, with the lower arm 34 bearing against the outer end of the bushing 27. The arms 33 and 34 are connected to a downwardly or substantially vertically extending plate 35 of the C-shaped carrier support and also to side plates 36 and 37. The plates 35, 36 and 37 form the intermediate portion of the carrier support. The plate 35 at its lower end is connected to or is integral with an inwardly extending arm 38 which is also connected to the side plates 36 and 37 and is substantially parallel to the arms 33 and 34. The arm 38 mounts a reinforcing or supporting plate 39 which also is secured to the side plates 36 and 37. The arms 33, 34 and the arm 38 straddle the opposite ends of the supporting cylinder. The parallel arms 33 and 34 are provided with vertically aligned openings through which the shaft 32 extends while a suitable spacer element 40 intermediate the arms 33 and 34 surrounds the shaft 32. The arms 33 and 34 are connected to the shaft 32 by means of suitable nut and washer members 41 screwed upon the threaded upper end of the shaft. The reinforcing and supporting plate 39 is provided with an opening through which the shaft extends and said plate is connected to the shaft 32 by a lower nut and washer arrangement 42.

4

It will be seen that the C-shaped carrier support formed of the arms 33 and 34; the plates 35, 36 and 37; the arm 38, and the reinforcing plate 39 can be swung on the axis of the shaft 32 about a substantially vertical axis.

The inner or free ends of the arms 33 and 34 are provided with bushings 43 which rockably mount a pin 44 carried by the free end of the piston rod 45 of a carrier support actuating pressure fluid power device 46, the cylinder of which is pivotally connected to a post 47 extending between the extension 28 of the upper closure plate 26 and the flange portion 30 thereof.

As indicated in Fig. 3, actuation of the power device 46 acts through the piston rod 45 to swing the C-shaped carrier support about the substantially vertical axis of the shaft 32.

The reinforcing and supporting plate 39 has secured to it a tool carrier formed of downwardly extending spaced parallel ear plates 48 and 49 which have their longitudinal edges connected to strengthening side plates 50 and 51, said side plates also being connected to the plate 39 as by welding. The ear plates 48 and 49 adjacent their lower ends mount a pintle post 52 that extends through suitable openings formed in the ear plates and is held against displacement by bolts 53 extending diametrically through the pintle post and supported in brackets 54 carried by the ear plates and held in position by means of nuts screwed onto the opposite end of the bolt and engaging said brackets.

A substantially C-shaped hook member 55 extends between the ear plates 48 and 49 and is swingably mounted on the pintle post 52. The hook member 55 has a lower hook portion 55a and an extended portion 55b beyond the ear plates 48 and 49. The extended portion 55b of the hook member 55 has its outer or free end pivotally connected to the end of a piston rod 56 of a hook member actuating pressure fluid power device 57, the cylinder of which has its upper end pivotally connected to the intermediate portion of the C-shaped carrier support by a pin 58 extending through an opening in an attaching portion at the upper end of the cylinder and supported by parallel supporting brackets 59 and 60 extending from the end plate 35 of the carrier. The cylinder of the pressure fluid power device has its opposite ends connected to pressure fluid conduits 61 and 62 forming part of a pressure fluid circuit.

The pressure fluid power devices 17, 46 and 57 are all illustrated as of the reciprocating piston and cylinder type and it will be understood that the opposite ends of the cylinders of the power devices 17 and 46 are connected to pressure fluid conduits similar to the conduits 61 and 62 connected to the opposite ends of the cylinder of the power device 57.

These pressure fluid conduits form part of pressure fluid circuits and extend to suitable control devices which may be remotely located as, for instance, in the control cab 14, wherefore the operator can effect selective actuation of these power devices in opposite directions as will be well understood.

It will be seen that actuation of the power device 17 in opposite directions will effect through the piston rod 18 thereof and the bracket 22 swinging movement of the supporting cylinder 20 and the C-shaped carrier support in opposite directions about the axis of the trunnion post 21, i. e., about a substantially horizontal axis.

It will also be noted that actuation of the power device 46 in opposite directions will effect, through the piston rod 45 thereof, swinging movement of the C-shaped carrier support in opposite directions on the axis of the shaft 32, i. e., about a substantially vertical axis. Consequently the C-shaped carrier support can be swung in opposite directions about a substantially horizontal axis, i. e., the trunnion posts 21 and a substantially vertical axis, i. e., the shaft 32, and that these movements of the carrier support will impart swinging movements in a

plurality of directions to the hook member 55. In addition, actuation of the power device 57 in opposite directions will impart through the piston rod 56 thereof swinging movements in opposite directions of the hook member 55 about the substantially horizontal axis of the pintle post 52. All of the swinging movements of the C-shaped carrier support and of the hook member 55 just referred to are under the control of the operator in the cab 14 and provide for positive controlled and accurate positioning of the hook member relative to the work that is to be engaged by the hook member and lifted by the boom. The axes of the trunnion posts 21 and of the pintle post 52 are located in the vertical plane in which the axis of the shaft 32 is located.

Assuming that the work is a coil of wire, the vehicle 12 can first be positioned such that the operator can rotate the turntable 11, if necessary, and then swing the boom downwardly to the desired location relative to the coil of wire and can then manipulate the hook member 55 by effecting the necessary swinging movements of the carrier about the axis 21 or the axis 32 as may be required to position the hook portion 55a of the hook member in line with the central opening in the coil of wire. Then by extending the boom 16 the hook portion 55a can be passed through the coil of wire after which the powder device 57 can be actuated to cause the hook portion 55a to engage with and lift slightly the coil of wire. Following this the boom can be raised to elevate the coil of wire on the hook member and swung to approximately the desired unloading location, after which the operator by imparting the necessary movements to the boom and to the hook member can deposit the coil of wire wherever desired and then remove the hook member therefrom.

From the foregoing it will be seen that the invention embodies an improved and novel lifter attachment that can be supported by the free end of a movable boom, preferably an extensible and retractable boom, and that the operator can readily and positively control the positioning and orientation of the lifter with respect to the work so as to facilitate and improve the efficiency of the lifting operation.

Although a preferred embodiment of the invention has been illustrated and described herein it will be understood that the invention is susceptible of various modifications and adaptations within the scope of the appended claims.

Having thus described my invention, I claim:

1. A lifter attachment of the character described suitable for an extensible telescopic boom comprising a supporting cylinder provided on its circumference with diametrically located trunnion posts adapted to be journaled in bearings at the end of a carrying element such as a boom whereby said cylinder can swing about the axis of said trunnion posts, a shaft mounted longitudinally in said cylinder and having its opposite ends located beyond the upper and lower ends of said cylinder and with its axis extending transversely to the axis of said trunnion posts, a generally C-shaped carrier support having an intermediate portion at the opposite ends of which are parallel arms mounted on the opposite ends of said shaft whereby said carrier support straddles said cylinder and can swing relative thereto on the axis of said shaft, a carrier support actuating power device carried by said cylinder at the upper end thereof, means operatively connecting said power device to said carrier support to swing the latter relative to said cylinder, the arm of said carrier support at the lower end of said cylinder mounting a carrier having downwardly extending supporting means, a pintle post carried by said supporting means and parallel to said trunnion posts and extending transversely to the axis

of said shaft, a hook member swingably mounted on said pintle post and including a portion extending beyond said supporting means and underlying the intermediate portion of said carrier support, a hook member actuating power device pivotally connected to said intermediate portion of said carrier support, and operative connections between said last mentioned power device and said extended portion of said hook member whereby actuation of said power device rocks said hook member about said pintle post.

2. A lifter attachment as defined in claim 1 and wherein the axes of the trunnion posts and the pintle post extend transversely to the axis of said shaft but lie in the plane that includes the longitudinal axis of said shaft.

3. A lifter attachment as defined in claim 1 and wherein said supporting cylinder intermediate said trunnion posts and its upper end is provided with a bracket adapted to be operatively connected to a power device for swinging said cylinder about the axis of said trunnion posts.

4. A lifter attachment as defined in claim 1 and wherein the opposite ends of said supporting cylinder are closed by closure plates mounting bushings through which said shaft extends.

5. A lifter attachment as defined in claim 4 and wherein said closure plate at the upper end of said supporting cylinder is provided with a radially extending portion while said carrier support actuating power device is carried by said portion.

6. A carrier attachment as defined in claim 5 and wherein the radially extending portion of the closure plate for the upper end of said supporting cylinder has an upwardly extending portion along one of its edges provided at its upper end with a flange overlying said radially extending portion while said carrier support actuating power device is pivotally connected to a pin carried by said radially extending portion and said flange.

7. A lifter attachment as defined in claim 1 and wherein said carrier support includes at one end of the intermediate portion a pair of spaced parallel arms mounted on said shaft beyond the upper end of said supporting cylinder, said spaced parallel arms adjacent their free ends mounting bushings in turn rockably mounting a pin while said means for operatively connecting the carrier support actuating power device to the carrier support includes said pin.

8. A lifter attachment as defined in claim 1 and wherein said carrier support includes an arm mounted on said shaft below the lower end of said supporting cylinder and provided with a reinforcing plate through which said shaft extends, while said carrier includes downwardly extending spaced ear plates connected to said reinforcing plate and said pintle post extends between and is mounted by said ear plates with said hook member mounted on said pintle post and passing between said ear plates.

9. A lifter attachment as defined in claim 1 and wherein said carrier support actuating power device and said hook member actuating power device are of the reciprocating piston pressure fluid type with the piston rods thereof pivotally connected respectively to said carrier support and to said extended portion of said hook member.

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