

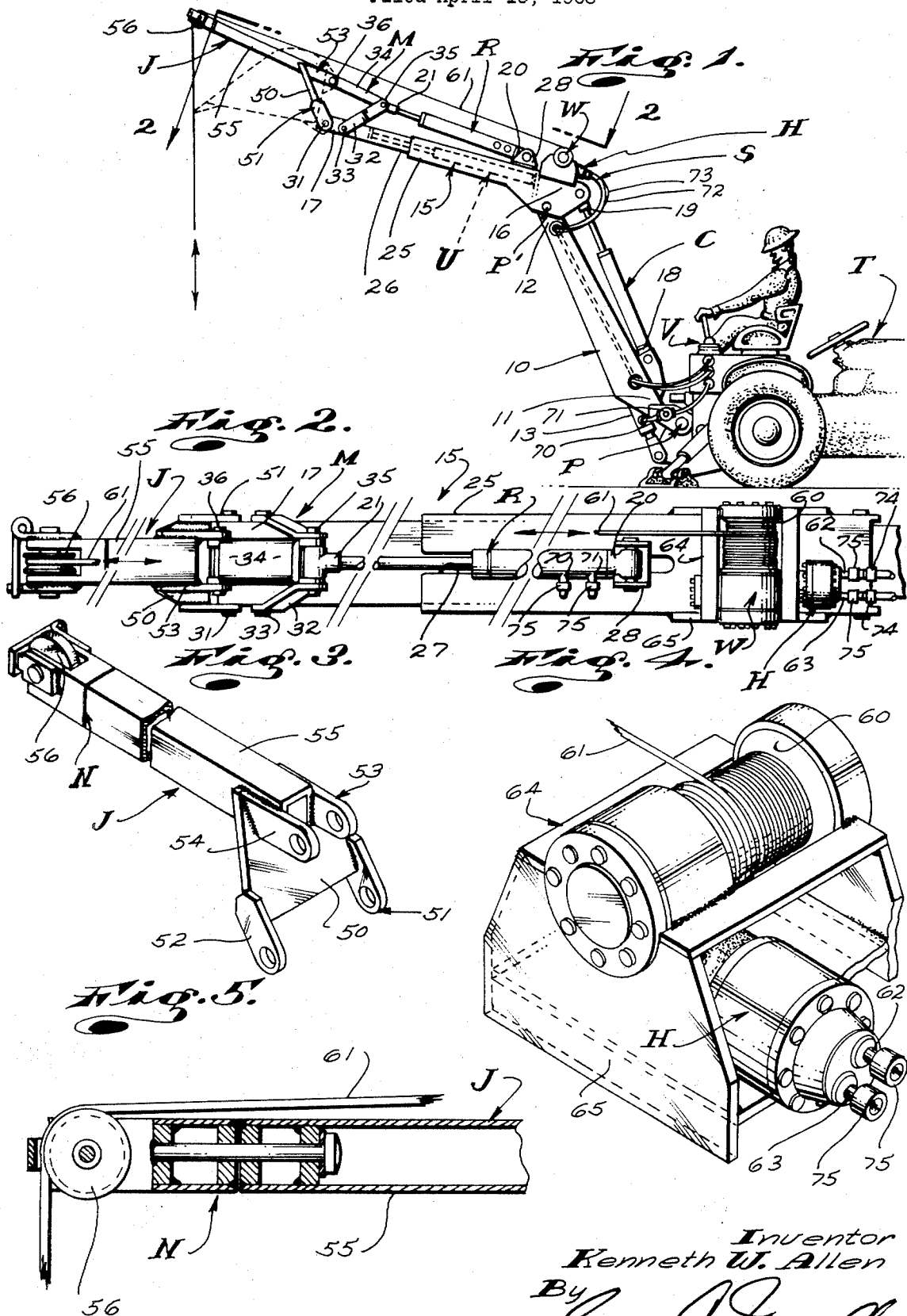
Sept. 8, 1970

K. W. ALLEN

3,527,362

CRANE ATTACHMENT FOR BACKHOE

Filed April 18, 1968



Inventor  
Kenneth W. Allen  
By  
George C. Maxwell  
Attorney

1

2

3,527,362  
CRANE ATTACHMENT FOR BACKHOE  
Kenneth W. Allen, 9034 E. Jeff St.,  
Bellflower, Calif. 90706  
Filed Apr. 18, 1968, Ser. No. 722,269  
Int. Cl. B66c 23/06

U.S. Cl. 212—59

8 Claims

## ABSTRACT OF THE DISCLOSURE

A backhoe to crane conversion means which comprises an elongate jib boom with inner and outer ends adapted to replace the bucket of a backhoe and to project longitudinally outwardly from the dipper or outer secondary arm of a backhoe, said jib boom having a sheave rotatably mounted at its outer end and having means at its inner end to be cooperatively engaged by the backhoe bucket mounting and operating means, a hydraulically driven winch fixed to and carried by the dipper or secondary arm of the backhoe, at the rear or inner end portion thereof, quick disconnect couplings on the fluid lines normally conducting fluid to and from the cylinder and ram unit for the backhoe bucket and carried by the upper arm and engageable with the winch whereby said cylinder and ram unit is hydraulically locked to hold the jib boom in position, through the bucket mounting means related to it and the fluid supply means therefor is utilized to operate the winch.

In that phase of the construction industry concerned with the laying or placement of subterranean structures, such as pipe lines, electrical conduits, foundation pads and the like, the excavating and digging of trenches is required.

The earth moving equipment employed to excavate and dig trenches varies according to the size and extent of the job undertaken. Further, the means and equipment employed to introduce and position the structures to be arranged in the trenches or excavations varies according to the size and extent of the job undertaken.

While there is always a number of large and extensive pipe laying jobs and the like, where large, heavy and specialized equipment is provided for nearly all major operations, there is an overwhelming number of smaller jobs where the use of large and specialized equipment for the various operations to be performed cannot be used, or the use of such equipment would be economically impractical.

The most practical and most widely used specialized piece of equipment provided for work and use in or on the smaller, less extensive types of pipe laying jobs or the like is a backhoe, such as is produced by J. I. Case Co. of Racine, Wis. A backhoe is a specialized tractor construction and includes a basic 4-wheel tractor, an elongate, primary boom or arm with inner and outer ends, with its inner end pivotally mounted at the rear end of the tractor for pivotal movement about a horizontal and a vertical axis, a secondary elongate boom or arm with inner and outer ends, with its inner end pivotally connected to the outer end of the primary arm on a horizontal axis and a digger bucket pivotally mounted on the outer end of the secondary arm on a horizontal axis. Such a construction further includes operation means for pivoting and moving the arms and the bucket relative to each other and relative to the tractor, which means involves valve controlled hydraulic ram and cylinder units between the tractor and the primary arm, between the primary and secondary arms and between the secondary arm and the bucket. The cylinder and ram units are supplied with hydraulic fluid from a suit-

able fluid pump driven by the tractor engine and the supply of fluid to the cylinder and ram units is controlled by a bank of manually operable valves at or adjacent the operator or driver's seat on the tractor. The primary arm is adapted to swing in a vertical arc of from about 60° above horizontal to about 80° below horizontal, rearwardly of the tractor and to swing laterally, left or right, from the central longitudinal axis of the tractor about 45°. The secondary arm is adapted to swing from an extended position, where it is substantially parallel with the axis of the primary arm, downwardly and inwardly relative to the longitudinal axis of the primary arm in an arc of about 130°. The bucket is adapted to swing or pivot from an extended position where it extends longitudinally outwardly from the outer end of the secondary arm and opens downwardly, downwardly and inwardly through an arc of about 130° and to a position where its open side underlies and opposes the outer end portion of the secondary arm.

In certain backhoe constructions, the secondary arm is made up of two telescopically engaged sections under control of a valve controlled cylinder and ram unit and is such that it can be selectively lengthened or shortened to vary the reach of the hoe, as desired or as circumstances require.

Still further, and of collateral interest, the tractor portion of the ordinary backhoe is provided at its forward end with a hydraulically controlled digger or earth handling bucket construction, commonly referred to as a skip-loader and so that the piece of equipment is a multipurpose piece of construction equipment.

The backhoe such as referred to above is a small, compact, highly maneuverable and fast operating piece of earth moving equipment and is widely and extensively used for excavating and trenching in those situations where the use of large power shovels and trenching machines is impractical.

While backhoes, particularly those backhoe constructions which also have skip-loading capabilities, are extremely versatile and are capable of performing many operations on a particular job, they are of little or no help or use in assisting the movement and placement of objects, for example, the movement and placement of pipes, in the excavations or trenches they establish. Accordingly, in most jobs, such as the laying of pipe lines, and between the operations of the backhoe establishing the trenches and subsequently filling the trenches, other special equipment, such as a crane must be called into use, to pick-up, carry and place the pipes in the trenches. The requirement to employ cranes for this single, intermediate function is extremely costly and undesirable and points to the desirability of providing a conventional backhoe construction with crane (lifting or hoisting) capabilities.

An object of this invention is to provide a novel means in the nature of an attachment for backhoes, of the general character referred to, which provides the backhoes with crane or hoisting capabilities and so that the backhoes can perform the function of a crane, when necessary or desired.

Yet another object of this invention is to provide an attachment of the character referred to which is such that it can be easily and conveniently applied to a standard or conventional backhoe construction and is such that it will not interfere with or adversely affect the operation of the backhoe.

It is an object of my invention to provide a backhoe attachment of the character referred to which includes a boom attachment to replace the backhoe bucket and to project outwardly and upwardly from the outer end of the secondary arm, a sheave at the outer end of the

boom, a pneumatically driven winch fixed to the inner end of said arm and a cable or line engaged about the winch and extending outwardly to engage the sheave and depend therefrom.

A feature of the invention is to provide a boom attachment and a winch such as is referred to above and to position and arrange said boom and winch in such a manner that those elements and the line related thereto are free and clear of other working elements and parts of the backhoe construction whereby the operation of the attachment and/or the operation of the backhoe construction are not adversely affected.

It is another object of the present invention to provide a hoist attachment of the character referred to, for a backhoe, wherein the winch is driven by the hydraulic system of the backhoe and is under control of a manually operable valve provided to control the cylinder and ram unit provided to operate the bucket when the hoe is in normal use.

Finally, it is an object of this invention to provide an attachment of the character referred to which is light, neat, compact, rugged, durable and which is easy and economical to manufacture, install and maintain.

The foregoing and other objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of my invention, throughout which description reference is made to the accompanying drawings, in which:

FIG. 1 is an elevational view of a portion of a tractor with a backhoe mechanism related to it and with the structure provided by my invention related to said backhoe mechanism;

FIG. 2 is a view taken as indicated by line 2—2 on FIG. 1;

FIG. 3 is an isometric view of the boom attachment provided by the invention;

FIG. 4 is an isometric view of the winch attachment that I provide; and,

FIG. 5 is an enlarged sectional view of the outer end portion of the jib boom of my invention.

The present invention has to do with a crane construction and is more particularly concerned with attachment and/or replacement parts applicable to a backhoe for easily, rapidly and conveniently converting the backhoe into a crane type mechanism.

The backhoe construction with which my present invention is related and which is shown in the accompanying drawings, includes a conventional tractor construction T, the rear end portion of which is illustrated in the drawings, an elongate, primary arm 10 having inner and outer ends 11 and 12, means P pivotally mounting the inner end of the arm 10 to the rear end of the tractor for pivotal movement about a vertical and a horizontal axis for swinging the outer end of the arm about vertical and horizontal arcs, double acting hydraulic cylinder and ram means 13 related to the arm 10 and means P and connected with fluid pump means (not shown) driven by the tractor and under control of manually operable valve means (not shown) to effect the noted pivoting of the primary arm 10; an elongate secondary arm 15 with inner and outer ends 16 and 17, means P' spaced a predetermined distance outward from the inner end of the secondary arm 15 and pivotally mounting the secondary arm 15 to the outer end 12 of the primary arm 10 on a horizontal axis to effect pivoting of the secondary arm relative to the primary arm in a vertical arc, an elongate, double acting hydraulic cylinder and ram unit C with inner and outer ends 18 and 19 extending substantially parallel with and adjacent to the primary arm 10 with its inner end 18 pivotally connected to the inner end portion of the primary arm 10 and with its outer end pivotally connected with the inner end 16 of the secondary arm 15, suitable fluid supply means between the above-mentioned fluid pump and the unit C, under control of a manually operable valve (not shown) to conduct fluid

into and out of said unit C to effect vertical pivoting or swinging of the secondary arm relative to the primary arm, mounting means M at the outer end 17 normally adapted to pivotally mount an earth moving bucket (shown in dotted lines in FIG. 1 of the drawings) and an elongate, double acting cylinder and ram unit R with inner and outer ends 20 and 21 extending substantially parallel with and adjacent to the secondary arm 15, with its inner end pivotally connected to the inner end of the arm 15 and its outer end pivotally connected with the means M, fluid supply means S between the above-mentioned fluid pump and unit R, normally under control of manually operable valve means V to normally conduct fluid to and from the unit R and to normally effect pivoting of the bucket relative to the outer end of the arm, in a vertical arc about a horizontal axis at the end of the arm 15.

In the preferred carrying out of the invention and as illustrated in the drawings, the secondary arm 15 is an axially extensible sectional arm including an elongate rear outside box section 25 defining the inner end of the arm and an elongate inside forward box section 26 defining the outer end of the arm and having its inner or rear end portion slidably engaged in the outer or forward end portion of the outside section 25. One of the sides of the rear box section, preferably the top, normally upwardly disposed side thereof, is slotted as at 27 to slidably accommodate an upwardly projecting, apertured clevis 28 on the inner rear end of the section 26 and to which the rear end of the cylinder and ram unit R is connected and so the unit R moves or travels with the section 26.

In addition to the foregoing, an elongate, double acting cylinder and ram unit U is arranged within the sectional arm 15 with the opposite ends connected with the inner and outer end portions of the outside rear and inside forward sections. The unit U is connected with the above-mentioned fluid pump by means of suitable fluid supply means and under control of a manually operable valve (not shown), to effect axial extension and rotation of the arm 15 as desired or as circumstances require.

The mounting means M at the outer end of the arm 15, that is, the outer end of the forward section 26 of the arm 15 and with which the forward end of the cylinder and ram unit R is connected includes a horizontal pivot pin opening or bearing extending transversely through the forward or outer end of the arm and adapted to slidably receive a primary pivot pin 13, the outer ends of which are engaged in openings in spaced plates of a primary clevis on the part to be mounted on the arm, for instance, a bucket; a pair of elongate, laterally spaced, longitudinally inwardly or rearwardly and upwardly extending toggle links 32 arranged at the opposite sides of the arm 15 with their lower forward or outer ends pivotally connected to the arm 15 by means of pivot pins 33, rearward of the pivot pin 31, an elongate, forwardly or longitudinally outwardly and upwardly extending, central, drive link 34 with a rear end pivotally connected with the rear ends of the links 32 and with forward end of the cylinder and ram unit R by means of a common coupling pin 35 and a horizontal transversely extending pivot pin opening in its forward end to receive a secondary pivot pin 36, the ends of which are engaged in spaced apertured plates of a secondary clevis on the part to be mounted on the arm and spaced above the primary clevis thereon.

With such a relationship of parts, it will be apparent that the unit R and the major portion of the means M occur above and extend substantially parallel with the arm 15 and that upon axial inward and outward shifting of the inner or rear ends of the pivotally connected links, by the unit R, the upper secondary pivot pin (and clevis) at the forward end of the drive link 34 are moved or caused to swing in a vertical arc parallel with the axis of the arm 15 and about the axis of the pin 31 to effect pivoting of the bucket or part, on a horizontal axis, about the outer end of the arm, as desired.

The foregoing describes a basic combination and rela-

tionship of parts of a backhoe construction and with which my present invention is related. The basic backhoe construction described in the foregoing is sufficiently well-known to those familiar or skilled in the art to which this invention relates so that further detailed description and consideration of the basic backhoe construction need not be undertaken at this time.

It is to be understood that the particular backhoe construction shown or illustrated is only typical of one form and carrying out of backhoe construction and that, in practice, such constructions, produced by different manufacturers of such equipment, are replete with minor variations from that which is shown, but none of which is such as would materially or adversely affect the present invention.

The special elements and/or parts that I provide and which cooperate with the backhoe construction described, to convert the backhoe construction into a crane and which cooperate with the parts of the backhoe to establish a new and novel combination and relationship of parts, includes a jib boom J and a winch W.

The jib boom includes a flat plate 50 adjacent the outer or forward end of the secondary arm 15, on an oblique, forwardly and upwardly inclined plane relative to the axis of the arm 15 and having a lower clevis 51 with rearwardly projecting, laterally spaced, apertured plates 52 to occur at opposite ends of the arm and in which the ends of the primary pivot pin 31 are engaged, an upper, secondary clevis 53 with laterally spaced, substantially rearwardly projecting apertured plates 54 to occur at the opposite sides of the forward end of the drive link 34 and in which the ends of the secondary pivot pin 36 are engaged, an elongate boom 55 with a rear end fixed to the plate and projecting forwardly and upwardly therefrom and having a sheave 56 rotatably carried by the forward end of the boom, on a horizontal axis extending transverse the axis of the boom.

It will be apparent from the foregoing, that the jib boom J substitutes or takes the place of the bucket normally provided with or on the backhoe and that such substitution or replacement of parts can be easily, quickly and conveniently accomplished by simply pulling the primary and secondary pivot pins 31 and 36 from engagement with a related bucket and the arm 15 and drive link 34 and reinserting them in the clevis 51 and 52 of the jib boom and with the arm 15 and drive link 34 of the backhoe construction in the manner illustrated.

The above substitution or replacement of bucket and jib boom can be accomplished by one man in a matter of minutes, without the use of any special skill and/or tools and with the bucket and jib boom resting on the ground so that the heavy parts being worked upon need not be manually lifted and manipulated.

The winch W is a standard, conventional, hydraulically driven winch construction, such as a model HW-7R, manufactured by Ramsey Winch Co., Tulsa, Okla.

The winch W includes a spool 60 on and about which a wire rope or line 61 is fixed and wound, and a reversible hydraulic motor H with in suitable reduction gear train incorporated therewith driving the spool. The motor H is provided with inlet and outlet fluid connections or fittings 62 and 63.

The basic winch structure is carried by a frame 64 having laterally spaced, vertical plates 65, which plates depend from the ends of the frame to occur at the opposite sides of the rear end portion of the secondary arm 15, where and to which they can be releasably fixed by screw fastener means, or, as illustrated, where and to which they can be permanently fixed by welding.

The winch W occurs above the rear end of the secondary arm 15 or the rear end of the rear sections 25 of the arm 15 in fixed spaced relationship and with its axis transverse the axis of said arm.

When the jib boom and winch are in use, the line 61 is drawn and extended forwardly from the winch and over the sheave at the forward end of the boom, which sheave,

in the preferred carrying out of the invention, is in the nature of a snatch block so as to facilitate engaging and disengaging the line with the sheave and to assist in maintaining the line engaged with the sheave when the construction is in use.

The line 61 normally depends from the outer end of the jib boom and so that its outer face end is available for engagement on and/or with a piece of work.

When the backhoe construction is employed for use as a crane and its parts are related to the special parts that I provide, the cylinder and ram unit R normally employed to operate the articulated mounting means M is moved to its retracted or shortened position where the forward end of the drive link 34 of the means M is in its upper, rear position. The unit R is then taken out of service for its primary function and is employed as a safety release means, to prevent damage to the construction as a result of overloading the jib boom J and as will hereinafter be described.

The fluid supply means S from the cylinder and ram unit R and under control of the valve means V includes inlet and outlet fitting 70 and 71 on the unit R and fluid delivery and return lines 72 and 73 suitably connected with the valve means V and adapted to normally connect with the fittings 70 and 71.

In the instant invention, the fittings 70 and 71 and their related ends of the lines 72 and 73 are provided with cooperating elements or parts 74 and 75 of quick disconnect fittings and the inlet and outlet fittings 62 and 63 on the winch motor H are provided with cooperating elements 72 of like quick disconnect fittings whereby the lines 72 and 73 can be easily, conveniently and quickly disconnected from the unit R and connected with the motor H, or vice versa, as desired or as circumstances require.

The elements or ports 74 and 75 of the quick disconnect fittings are provided with check valve means so that when the fittings are broken or disconnected, fluid will not drain from the lines and will not leak or drain from the ram unit R or motor H.

With the above combination and relationship of parts, it will be apparent that no special, independent fluid supply and control means for the winch need be provided, and that the existing fluid supply and control means provided for the cylinder and ram unit R is employed to operate the winch.

It will be further apparent that the supply of fluid to and from the cylinder and ram unit R is closed or shut off when the jib boom and winch are in use and in operation and that the unit R normally, through the means M, holds and maintains the outer end of the jib boom J up, but is such that should excessive downward forces be exerted onto and through the jib boom, the cylinder and ram unit R will fail to hold the hydraulic pressure generated by such forces and will allow or permit the outer end of the boom to move or swing downwardly, thereby preventing damage to the boom and the remainder of the construction as a result of overloading the construction by and through operation of the winch W.

It is highly important to note that the winch W occurs above the rear end of the arm 15 where it is out of the way during all and any operation of the construction and that the jib boom J projects forwardly and upwardly from the outer end of the arm 15 and in such a manner that the line 61 is maintained clear and free of the cylinder and ram unit R and the means M. Further, the boom extends the effective reach of the construction and is arranged with its outer end in clear vision of the operator of the construction.

In practice and so that the line 60 does not become disengaged from and/or cut and damage the sheave 56 when said line is directed or driven laterally relative to the longitudinal axis of the boom 55, as it extends from the end thereof, the sheave 56 is rotatably mounted on or carried by the boom on an axis parallel and concentric with the boom. In FIG. 5 of the drawings, one structure or rotat-

ing mounting means N employed to rotatably mount the sheave to the boom is illustrated.

Since the structure shown in FIG. 5 is extremely simple and needs no verbal description, and since the sheave can be rotatably mounted on the boom by a great number of other means or structures without departing from the spirit of this invention, further detailed description of the rotary mounting means N illustrated will be dispensed with.

In practice, the fluid supply means for the cylinder and ram unit 13 related to the primary arm 10 of backhoes is provided with a pressure relief valve (not shown), which valve serves to bleed fluid into and out of the cylinder and ram unit when excessive forces are exerted into and through the arm 10 and so that the arm 10 pivots and yields to such excessive forces.

For satisfactory use of a backhoe construction as a crane, the primary arm 10 must be stopped or prevented from pivoting and yielding when subjected to those forces which it is designed to ordinarily yield to. Accordingly, it is necessary or desirable to put the pressure relief valve out of service and to effectively stop and seal off the flow of fluid into and out of the cylinder and ram unit to lock it in place by fluid lock means.

In the backhoe construction illustrated, a fluid line 70 is shown extending from the cylinder and ram unit 13 to operator's station on the tractor T where it connects with the above mentioned pressure release valve and a suitable control valve, neither of which is shown.

So as to put the pressure release and control valves out of operation and to lock the cylinder and ram unit 13 in fixed position, I insert a manually operable shut-off valve 71 in the line 70. It will be apparent that by selectively, manually closing the valve 71, the cylinder and ram unit 13 is effectively, hydraulically locked in position and is not subject to yielding and permitting the arm to pivot as a result of high forces being applied to the outer end thereof.

It is important to note that when employing the ordinary backhoe construction to lift, that is, when using it for or as a crane, it is important and desirable to remove the bucket construction, as such buckets weigh several hundreds of pounds and materially reduce the lifting capabilities of the remainder of the construction.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any modifications and/or variations that appear to those skilled in the art and which fall within the scope of the following claims.

Having described my invention, I claim:

1. In combination with a backhoe construction comprising a vehicle, an elongate, primary arm with inner and outer ends, means pivotally mounting the inner end of the arm to the vehicle about vertical and horizontal axes manually controlled hydraulic means for moving said arm about said axes, an elongate secondary arm with inner and outer ends, means pivotally connecting the inner end of the secondary arm to the outer end of the primary arm on a horizontal axis normal to the longitudinal axes of said arms, manually controlled hydraulic means for pivoting the secondary arm relative to the primary arm, mounting means at the outer end of the secondary arm normally adapted to pivotally support an earth moving bucket on a horizontal axis normal to the axis of the secondary arm, and a cylinder and ram unit carried by the secondary arm and connected with the mounting means and adapted to extend or retract upon pivotal movement of the mounting means, an elongate straight jib boom fixed to and carried by the mounting means and projecting substantially longitudinally outward from the outer end of the secondary arm and having a sheave rotatably supported at its outer end on an axis spaced above and normal to the axis of the boom and rotatable about an axis substantially parallel with the axis of the jib boom, a

winch fixed to the upper inner end of the secondary arm, an elongate line with an inner portion fixed to and wound about a spool in said winch and an outer portion extending outwardly and thence downwardly about said sheave and manually controlled drive means for said winch.

2. A structure as set forth in claim 1 wherein said secondary arm has a normally substantially upwardly disposed top side, said cylinder and ram unit extends substantially longitudinally of and in spaced relationship above said top side, said jib boom extending longitudinally outwardly and is inclined upwardly relative to the secondary arm and said winch is fixed to and projecting upwardly from said top side of the secondary arm whereby the line extends forwardly from the winch to the sheave in spaced relationship above the cylinder and ram unit.

3. A structure as set forth in claim 1 wherein said secondary arm has a normally substantially upwardly disposed top side, said cylinder and ram unit extends substantially longitudinally of and in spaced relationship above said top side, said jib boom extends longitudinally outwardly and is inclined upwardly relative to the secondary arm and said winch is fixed to and projecting upwardly from said top side of the secondary arm whereby the line extends forwardly from the winch to the sheave in spaced relationship above the cylinder and ram unit, said cylinder and ram unit holding the mounting means and jib boom in fixed position relative to the secondary arm and permitting limited vertical movement of the outer end of the jib boom about the axis of the mounting means.

4. A structure as set forth in claim 1 wherein said manually controlled drive means for the winch includes a fluid pump on the vehicle, a fluid motor on the winch to drive said spool, fluid delivery and return lines extending between the pump and the motor and a manually operable control valve on said vehicle and controlling the flow of fluid through said lines.

5. A structure as set forth in claim 1 wherein said secondary arm has a normally substantially upwardly disposed top side, said cylinder and ram unit extends substantially longitudinally of and in spaced relationship above said top side, said jib boom extends longitudinally outwardly and is inclined upwardly relative to the secondary arm and said winch is fixed to and projects upwardly from said top side of the secondary arm whereby the line extends forwardly from the winch to the sheave in spaced relationship above the cylinder and ram unit, said manually controlled drive means for the winch includes a fluid pump on the vehicle, a fluid motor on the winch to drive said spool, fluid delivery and return lines extending between the pump and the motor and a manually operable control valve on said vehicle and controlling the flow of fluid through said lines.

6. A structure as set forth in claim 1 wherein said secondary arm has a normally substantially upwardly disposed top side, said cylinder and ram unit extends substantially longitudinally of and in spaced relationship above said top side, said jib boom extends longitudinally outwardly and is inclined upwardly relative to the secondary arm and said winch is fixed to and projects upwardly from said top side of the secondary arm whereby the line extends forwardly from the winch to the sheave in spaced relationship above the cylinder and ram unit, said cylinder and ram unit holds the mounting means and jib boom in fixed position relative to the secondary arm and permitting limited vertical movement of the outer end of the jib boom about the axis of the mounting means, said manually controlled drive means for the winch including a fluid pump on the vehicle, a fluid motor on the winch to drive said spool fluid delivery and return lines extending between the pump and the motor and a manually operable control valve on said vehicle and controlling the flow of fluid through said lines.

7. A structure as set forth in claim 1 wherein said mounting means includes a primary pivot pin extending transverse the outer end of the secondary arm, a secondary pivot pin spaced above and parallel with the primary

pin, toggle links with a forward end pivoted to said arm rearward of the primary pin, a drive link with a forward end pivoted to the secondary pin and coupling means spaced rearward of the pivot pins and above the top of said arm and pivotally connecting the rear ends of the links and the cylinder and ram unit together, said jib boom including a plate, upper and lower clevis on the plate engaged with the secondary and primary pivot pins and an elongate boom fixed to and projecting forwardly and upwardly from the plate and carrying said sheave.

8. A structure as set forth in claim 1 wherein said secondary arm has a normally substantially upwardly disposed top side, said cylinder and ram unit extends substantially longitudinally of and in spaced relationship above said top side, said jib boom extends longitudinally outwardly and is inclined upwardly relative to the secondary arm and said winch is fixed to and projects upwardly from said top side of the secondary arm whereby the line extends forwardly from the winch to the sheave in spaced relationship above the cylinder and ram unit, said cylinder and ram unit normally yieldingly holds the mounting and jib boom in fixed position relative to the secondary arm and permits limited vertical adjusting movement of the outer end of the jib boom about the axis of the mounting means, said manually controlled drive means for the winch including a fluid pump on the vehicle, a fluid motor on the winch to drive said spool, fluid delivery and return lines extending between the pump and the motor and a manually operable control valve on said vehicle and controlling the flow of fluid through said lines, said mounting means including a primary pivot pin

extending transverse the outer end of the secondary arm, a secondary pivot pin spaced above and parallel with the primary pin, toggle links with a forward end pivoted to said arm rearward of the primary pin, a drive link with a forward end pivoted to the secondary pin and coupling means spaced rearward of the pivot pins and above the top of said arm and pivotally connecting the rear ends of the links and the cylinder and ram unit together, said jib boom including a plate, upper and lower clevis on the plate engaged with the secondary and primary pivot pins and an elongate boom fixed to and projecting forwardly and upwardly from the plate and carrying said sheave.

#### References Cited

##### UNITED STATES PATENTS

|           |         |          |         |
|-----------|---------|----------|---------|
| 2,790,568 | 4/1957  | Mandt    | 212—135 |
| 2,914,203 | 11/1959 | Gafner   | 214—138 |
| 2,921,701 | 1/1960  | Ireland  | 212—66  |
| 3,092,259 | 6/1963  | Swanson  | 214—132 |
| 3,374,901 | 3/1968  | Ferwerda | 212—55  |
| 3,445,015 | 5/1969  | Sampo    | 214—138 |

##### FOREIGN PATENTS

|           |        |         |
|-----------|--------|---------|
| 1,452,819 | 9/1966 | France. |
|-----------|--------|---------|

HARVEY C. HORNSBY, Primary Examiner

U.S. Cl. X.R.

212—8, 144, 35; 254—145