Nov. 28, 1967 J. H. HOLAN ET AL 3,355,034

EXTENSIBLE BOOM WITH LOAD COMPENSATING MEANS

Original Filed Aug. 7, 1964 4 Sheets-Sheet 1

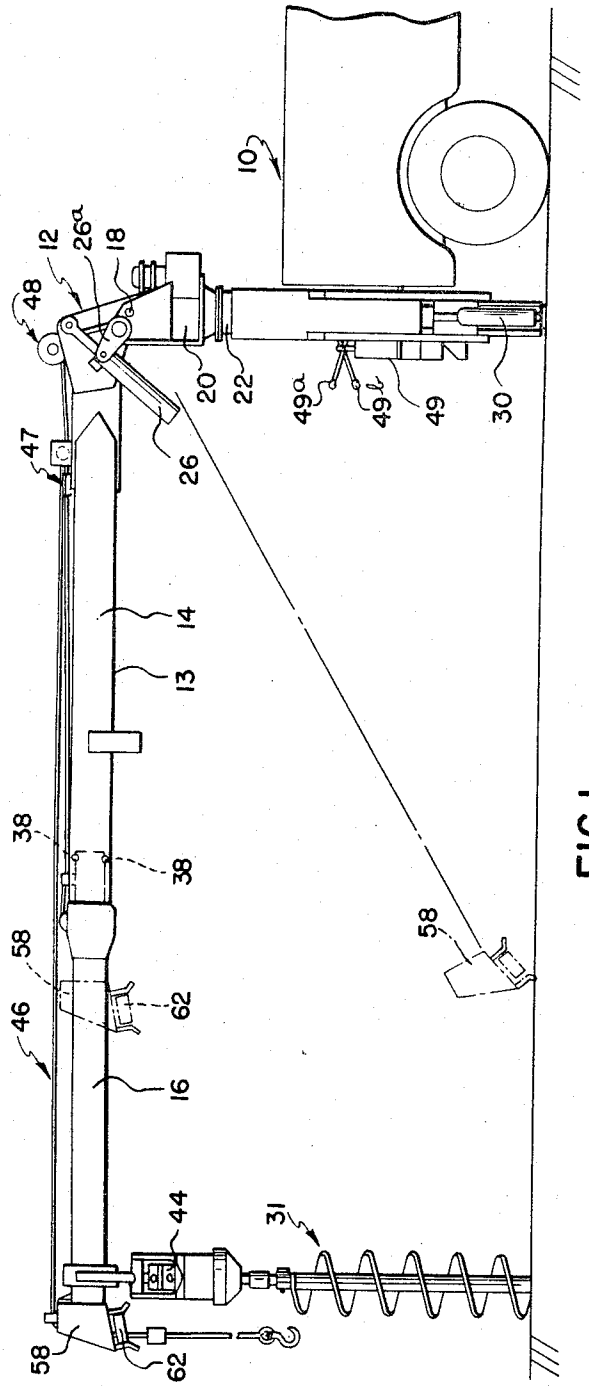


FIG. 1

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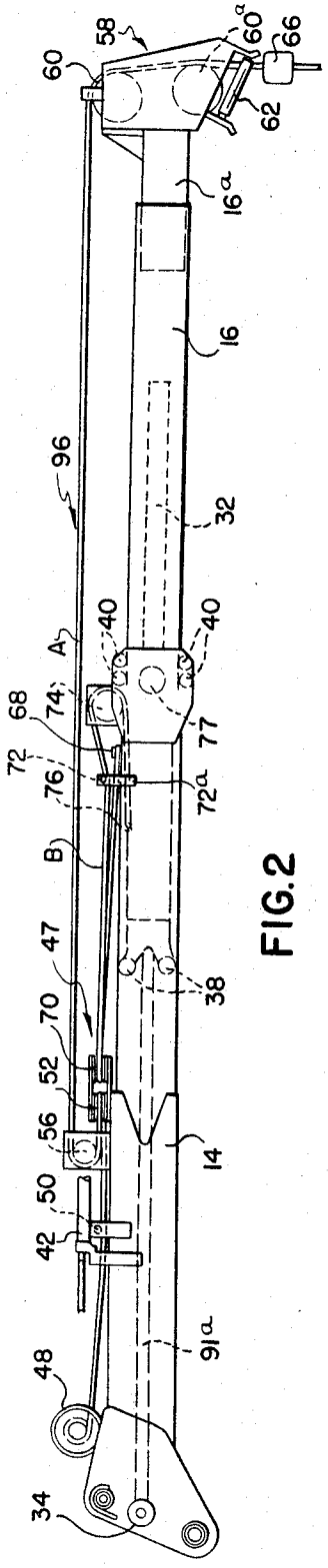


FIG. 2

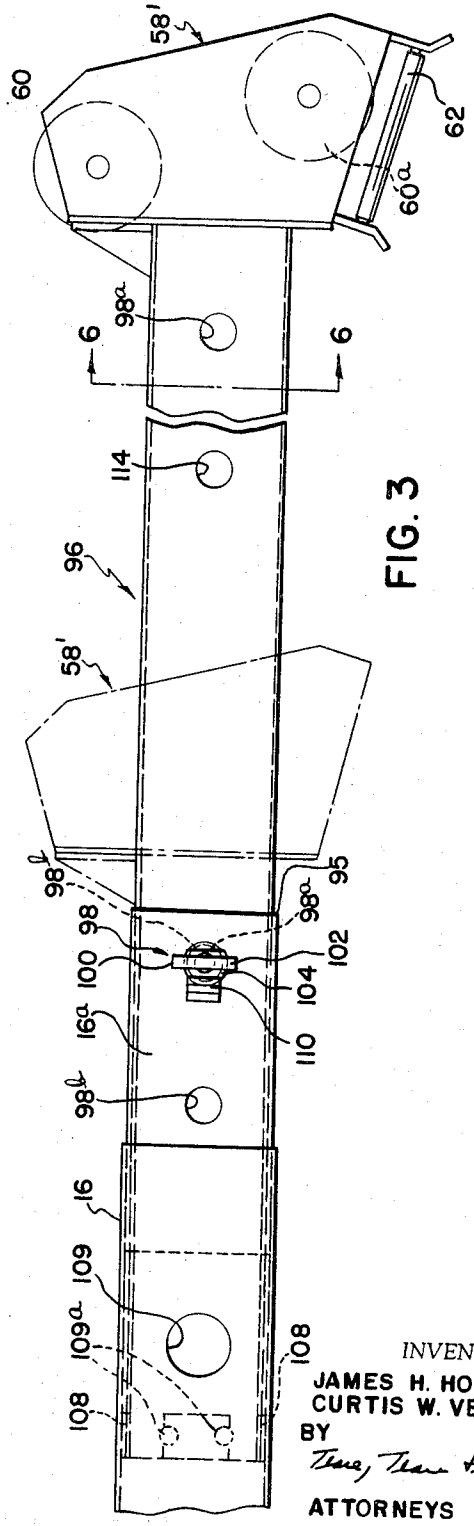


FIG. 3

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EXTENSIBLE BOOM WITH LOAD COMPENSATING MEANS

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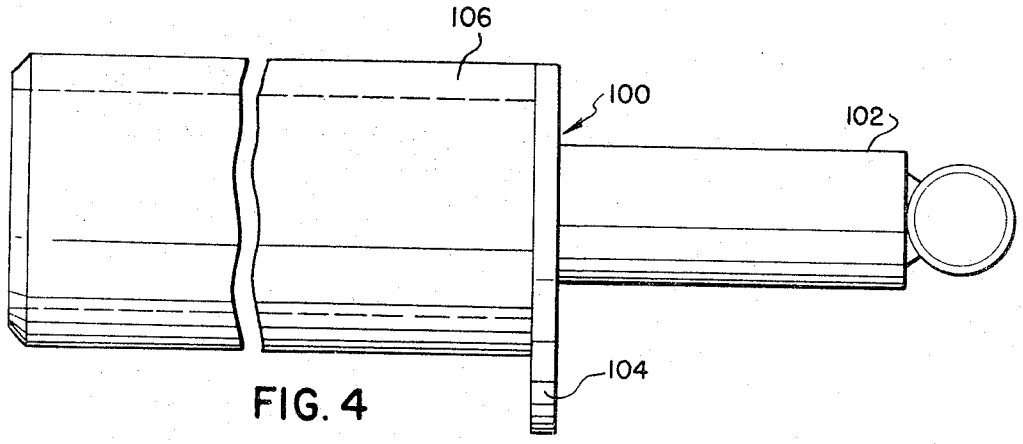


FIG. 4

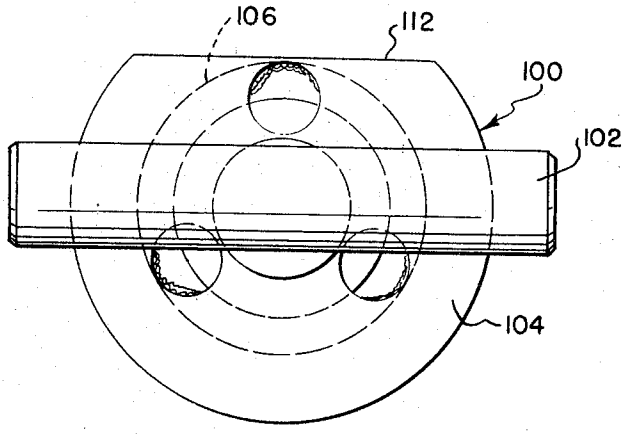


FIG. 5

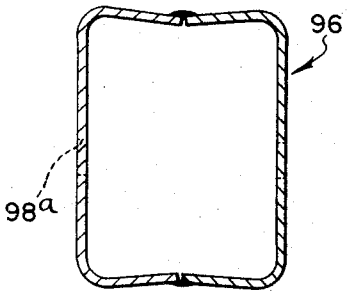


FIG. 6

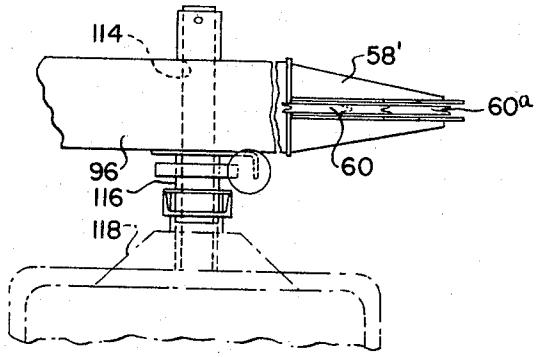
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EXTENSIBLE BOOM WITH LOAD COMPENSATING MEANS

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FIG. 9



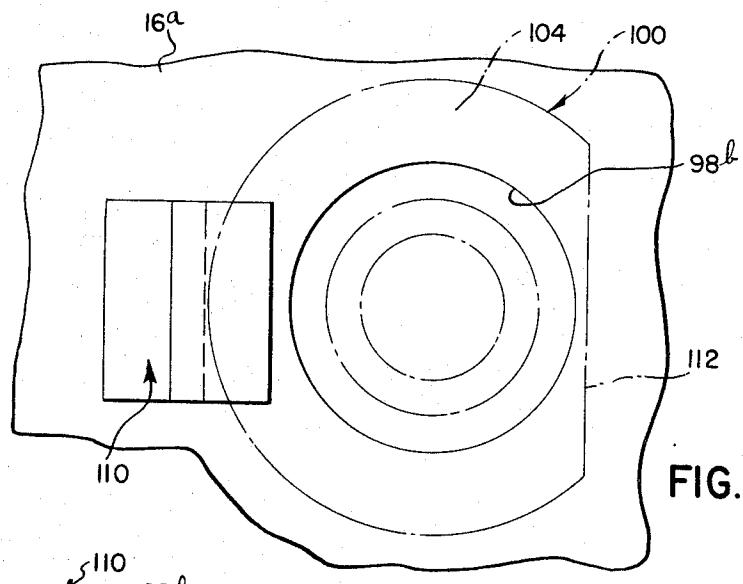


FIG. 7

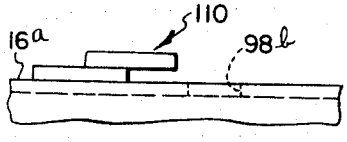


FIG. 8

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3,355,034

EXTENSIBLE BOOM WITH LOAD COMPENSATING MEANS

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Original application Aug. 7, 1964, Ser. No. 388,217. Divided and this application Sept. 19, 1966, Ser. No. 580,530

7 Claims. (Cl. 212—55)

ABSTRACT OF THE DISCLOSURE

An extensible boom for a derrick or the like having an inner boom section and a telescopically movable outer boom section with a motor unit for extending and retracting the outer boom section with respect to the inner boom section. A removable, auxiliary boom section mounting a sheave head detachably coupled to the outer boom section and a locking mechanism for selectively locking the auxiliary boom section in extended or retracted position with respect to the outer boom section.

This invention relates in general to derricks or cranes, and more particularly to a derrick or crane wherein the boom thereof may be selectively extended and retracted, for adjusting the operating range of "reach" of the derrick. This is a division of the application to James H. Holan and Curtis W. Verrell, Serial No. 388,217, filed Aug. 7, 1964.

The derrick or like apparatus of the invention is illustrated as being of a portable type, mounted on a utility type vehicle and having a load carrying cable system associated therewith, adapted for handling and/or erecting various objects, such as telephone or telegraph poles. Such load carrying cable system generally runs from a power operated winch on the vehicle, and then over the outer end of the extensible boom, and terminates at the load.

The present invention provides a novel removable, extensible auxiliary means for increasing the operating range or reach of the derrick boom. Such auxiliary means being readily adaptable for use with the load carrying and cable compensating system as disclosed in the aforementioned application, Serial. No. 388,217.

Accordingly, an object of the present invention is to provide a novel removable, auxiliary boom section for use with a derrick or crane of the type including an extensible boom incorporating a load carrying cable system.

Another object of the present invention is to provide an auxiliary boom section of the character described which includes means for coupling the same to one of a pair of extendible boom sections for extending the effective length of said one boom section.

A further object of the present invention is to provide an auxiliary boom section of the character described which includes means for locking the same in selected telescoped position with respect to one of a pair of boom sections.

Another object of the present invention is to provide an auxiliary boom section of the character described which, includes means for mounting a work platform thereon, and a work platform rotatably mounted on said means.

Other objects and advantages of the invention will be

apparent from the following description taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a fragmentary side elevational view of an extensible derrick boom having a load carrying cable system coacting therewith for handling a load, and including the automatic compensating means of the invention; a power driven earth boring auger is also illustrated as being supported by the boom;

FIGURE 2 is an enlarged side elevational view of the boom of FIGURE 1 with the boom being shown in an extended condition, and illustrating in greater detail the cable compensating means of the invention;

FIGURE 3 is a fragmentary, enlarged, broken side elevational view and showing means of the invention for extending the effective length of the extensible or outer boom section and illustrating an auxiliary boom section which is selectively locked or attached to the outer boom section of FIGURES 1 and 2, for extending the effective length of the boom; in phantom lines is illustrated the position of the head sheave assembly of such auxiliary boom section when the latter has been moved back into retracted condition in the outer boom section;

FIGURE 4 is an enlarged side elevational broken view of the pin used to lock the auxiliary extension boom section of FIGURE 3 to the outer boom section of the boom;

FIGURE 5 is an end elevational view of the locking pin taken from the right hand end of FIGURE 4;

FIGURE 6 is a transverse sectional view of the auxiliary boom etxension taken generally along the plane of line 6—6 of FIGURE 3;

FIGURE 7 is an enlarged, fragmentary, elevational view showing the retaining means for maintaining the locking pin of FIGURES 4 and 5 in locking position;

FIGURE 8 is a fragmentary view of the retaining means of FIGURE 7 taken from the bottom thereof, which is adapted to maintain the locking pin (shown in phantom lines in FIGURE 7) in position; and

FIGURE 9 is a fragmentary top plan view of the auxiliary boom section of FIGURE 3 showing a work platform coupled thereto adjacent the outer end thereof.

Referring now again to the drawings, and in particular to FIGURE 1, there is shown a fragmentary portion of a wheeled utility vehicle **10** having a truck body which carries a movable derrick or crane **12** thereon. The derrick boom **13** may embody an inner or lower generally hollow boom section **14**, and an outer, generally hollow extendible boom section **16** which may be received in telescoping relation in the lower or inner section **14** of the boom. Outer boom section **16** may include reduced size end portion **16***a* (FIGURE 2) rigidly attached, as by welds, to the main portion of the boom section **16**.

The boom, in the embodiment illustrated, is pivotally mounted, as at **18**, to super structure **20**, which in turn may be mounted on a pedestal **22** adapted for rotational movement about a generally vertical axis, for swinging the boom in a generally horizontal plane and which may be rotatable through 360°. Conventional power means may be provided for so swinging the derrick boom in a generally horizontal plane.

The boom being pivoted, as aforementioned, at **18** may be swung in a generally vertical plane with respect to the vehicle, and in this connection, it may be swung from a position below a horizontal plane passing through axis **18**, to a position well above such horizontal plane. Fluid

powered reciprocal motor means **26** and associated linkage **26***a* of known construction, may be provided for so swinging the boom in a generally vertical plane.

The boom may be mounted on a corner of the vehicle or it may be mounted any place on the vehicle body, and the vehicle may be provided with jack means **30** for aiding in stabilizing the vehicle during utilization of the derrick. In the embodiment illustrated, there is shown a power operated earth boring tool **31** mounted on the boom in a known manner for earth boring operations. Such earth boring tool may be adapted for coupling to either the inner boom section **14** or to the outer boom section **16** for extension and retraction with the outer boom section in a known manner. It will be understood however that the boom may or may not have such earth boring tool associated therewith.

Reciprocal fluid powered motor unit **32** (FIGURE 2) may be provided, pivotally connected to the outer boom section **16** and pivotally connected as at **34** (FIGURE 2) to the inner boom section, for selectively extending and retracting the boom. Such structural arrangement for connecting the reciprocal motor unit **32** to the outer boom section and to the inner boom section for extending and retracting the boom sections will be hereinafter described in greater detail.

The outer boom sections **16**, whose may be of a rectangular configuration in transverse cross-section, may embody roller means **38** thereon for facilitating antifrictional movement of the outer boom section with respect to the inner boom section during extension and retraction of the boom. There also may be provided roller means **40** (FIGURE 2) mounted on the inner boom section **14** adapted for rolling coaction with the outer boom section **16**, for facilitating lengthwise movement of the outer boom section with respect to the inner boom section. The boom may carry telescoping fluid transmitting lines **42** (FIGURE 2) which have been broken in the interests of clarity of illustration, for transmitting actuating fluid from a source of pressurized fluid disposed on the vehicle, outwardly along the boom and to for instance the motor unit **44** (FIGURE 1) of the earth boring tool **31**, for actuating the earth boring tool.

A load supporting cable means **46** is mounted on the boom for supporting a load, such as for instance a telephone pole, or other load, at the outer end of the boom, and automatic compensating means **47** (FIGURE 2) is provided in association with the load supporting cable system **46** for maintaining a load at a selected level while the boom is being extended or retracted. The construction and operation of such compensating means is set forth in the aforementioned application, Serial No. 388,217.

A preferably power operated winch mechanism **48**, which may be of conventional fluid powered rotary type, is preferably mounted adjacent the proximal end of the boom, for coaction with the load supporting cable means **46** to selectively extend and retract the cable. In this connection, a conventional spool type distributing valve bank **49** having a plurality of control handles **49***a*, **49***b* may be mounted on the vehicle and coupled into the fluid power system in the conventional manner. Control handle **49***a* may control the application of pressurized fluid to the fluid motor **48***a* of winch mechanism **48**, and control handle **49***b* may control the application of pressurized fluid to boom actuating motor unit **32**.

The cable system **46** may comprise two sections A and B (FIGURE 2) which sections coact between the inner boom section **14** and the outer boom section **16** for maintaining the cable means **46** in a selected position with respect to the boom during extension and retraction of the boom.

Cable section A may commence at the winch mechanism **48** and be reeved thereabout as best shown for instance in FIGURE 4, and then extends outwardly along the boom to pass under an idler roller means **50** (FIGURE 2) mounted on the inner boom section **14**. From roller **50** the cable section A may extend outwardly and be reeved about rotatable generally horizontal pulley **52** (FIGURE 2), of movable compensating pulley block **47**. Cable section A then reverses its direction, extending back from rotatable pulley **52** and passes upwardly around pulley **56**, which may be mounted on the inner boom section **14**. From pulley **56** the cable section A may extend outwardly along the boom as shown in FIGURE 2 to pass down through the sheave head **58** preferably removably attached as by bolts (not shown) to the outer end of portion **16***a* of outer boom section **16**.

Sheave head **58** may comprise a pair of generally vertically spaced rotatable pulleys **60**, **60***a* which receive the load cable **46** in antifriction relationship. From pulley **60***a*, the load supporting cable or section A of the cable preferably passes between a pair of laterally spaced stabilizing roller means **62** mounted on the sheave head, and which guide the cable. The cable is preferably provided with a frictionally slidable or movable plumb weight **66** thereon which is adapted to maintain the cable system **46** generally taut at all times. The slidable relationship between the weight **66** and the cable enables the weight to be moved outwardly along the cable if the cable is retracted by means of winch mechanism **48** so that the weight engages the sheave head **58**.

The other section B of the load cable **46** is anchored as at **68** to an anchoring lug on the top side of the inner boom section **14**, and then is passed rearwardly around idler pulley **70** of compensating pulley block **47**. From the pulley **70**, the cable section B passes forwardly and preferably under a roller or other holder **72** mounted by means of bracket **72***a* on boom section **14**, and then passes down around idler pulley **74** rotatably mounted on boom section **14**. Cable section B then passes through a slot in the top wall of the inner boom section **14** underlying pulley **74** and passes rearwardly interiorly of boom section **14**, and above the outer boom section **16**, to be anchored as at **76** to an anchoring lug on the top side of the outer boom section **16**, generally adjacent its innermost end. Aforementioned roller means **38**, **40** supports the outer boom section interiorly of the inner boom section **14** in antifriction generally spaced relation, and in nonbinding condition with respect to the interiorly disposed section B of the cable system.

Now in accordance with the present invention and with reference to FIGURES 3 to 6, it will be seen that the sheave head **58** has been removed from the outer end **95** of the outer end portion **16***a* of boom section **16**, and in its place there is provided an extensible auxiliary boom section **96** which has a sheave head **58'**, which may be identical in construction to the sheave head **58** of the first described embodiment, connected to its outer end. The extendible auxiliary section **96** may be preferably manually moved outwardly with respect to the power operated outer boom section **16**, and there is provided locking means **98** for maintaining the extendible, or movable auxiliary section **96** in a selected position with respect to boom section **16**. When auxiliary section **96** is pulled out, the winch mechanism **48** may be actuated to pay out cable to increase the fixed length of the cable from the winch to the sheave head **58'**. To retract auxiliary section **96**, locking means **98** may be removed and then the winch may be actuated until weight **66**, and associated hook (FIGURE 1) engages the sheave head **58'**, and then further operation of the winch will retract section **96** into outer boom section **16**, and to, for instance the position illustrated in dot-dash lines in FIGURE 3. The trunnion mounted power unit **32** enables retraction of the hollow boom section **96** without interference with power unit **32**.

In this connection, the auxiliary boom section **96** which may be of the generally rectangular configuration in cross-section, as shown in FIGURE 6, may possess preferably a series of openings **98***a* through a side wall thereof, and the outer end portion **16***a* of boom section **16** of the power operated portion of the boom may also be provided with

a series of openings **98***b* therethrough, through one of which openings is adapted to extend the locking pin member **100**, shown in FIGURES 4 and 5.

The lock pin member **100** comprises a handle portion **102**, a flange portion **104** connected to the handle portion, and a plunger portion **106**, which is adapted to extend through the opening **98***b* in boom section **16** aligned with a selected of the openings **98***a* in auxiliary boom section **96**, and lock auxiliary boom section **96** in a predetermined position with respect to the powered boom section **16**.

The inner end of auxiliary boom section **96** is preferably provided with wear plates **108** on the top, bottom and sides thereof, which are adapted to slidingly engage the inner surface of the hollow boom section **16** during manual adjusting of auxiliary section **96** with respect to boom section **16**. In this connection, outer boom section **16**, rearwardly of end portion **16***a* may be provided with an access opening **109** in each of the side and top and bottom walls thereof, for installing the wear plates **108** onto auxiliary boom section **96**, and welding them as by plug welds **109***a*, in place. The wear plates may have openings therethrough for facilitating the plug welds **109***a*.

As shown in FIGURES 3 and 7, the pin lock **100** is adapted to be frictionally held in place by a bracket **110** which has an overlapping frictional coaction with the circular flange **104** on the pin lock **100**, and with such flange having a cut away portion, as at **112**, which when the pin is turned 180° by means of the handle **102**, will permit withdrawal of the pin from locking coaction with the bracket **110** and with the boom sections, and thereby permit lengthwise movement of the manually extendible auxiliary section **96** of the boom, or complete removal of such auxiliary section **96** upon removal of the wear plates **108**. Of course in order to use the boom and cable system after removal of the auxiliary section **96**, a sheave head **58** should be attached to the outer end portion **16***a* of extendible boom section **16**. In phantom lines in FIGURE 3 there is shown the position of the sheave head **58'** of auxiliary section **96** when it is moved or slid inwardly or rearwardly its maximum amount and locked in place by lock pin **100**.

Auxiliary boom section **96** may also be provided with an opening **114** through the side walls thereof, rearwardly of sheave head **58'**, for receiving a shaft **116** (FIGURE 9) therethrough. Shaft **116** may rotatably support a work platform **118**, which may be of the well known bucket type, for carrying a workman on the outer end of the boom and locating such workman at any desired location within the range of movement of the derrick.

From the foregoing discussion and accompanying drawings it will be seen that applicants' arrangement provides a novel removable, extendible auxiliary section, for increasing the reach of the boom.

The terms and expressions which have been used are used as terms of description and not of limitation, and there is no intention in the use of such terms and descriptions of excluding any equivalents of any of the features shown and described, or portions thereof, and it is recognized that various modifications are possible within the scope of the invention claimed.

We claim:

1. An extensible derrick boom for use with mobile platforms or the like, said derrick boom comprising, an inner relatively stationary boom section and at least one outer extensible boom section disposed for telescopic movement with respect to said inner boom section, said outer boom section having a plurality of spaced openings adjacent the outermost end thereof, fluid actuated motor means operative on the boom for extending and retracting the outer boom section with respect to the inner boom section, an interchangeable auxiliary boom section detachably coupled in telescopic relation on said outer boom section for selectively varying the effective length of the boom, said auxiliary boom section having a plurality of spaced openings adjacent the innermost end thereof, and a locking mechanism for locking said auxiliary boom section in selective extended or retracted lengthwise position with respect to said outer boom section, said locking mechanism including a removable locking member insertable through selective of the openings in the respective outer and auxiliary boom sections, when in aligned position thereof, and a bracket member attached adjacent the outermost end of said outer boom section for interlocking coacting engagement with said removable locking member for retaining the same in said openings and for locking said auxiliary and outer boom sections in extended or retracted position.

2. An extensible derrick boom in accordance with claim **1**, including a sheave head attached to the distal end of said auxiliary boom section, a winch mechanism mounted on said inner boom section, cable means extending from said winch mechanism over and downwardly from said sheave head, and weighted abutment means attached to said cable means below said sheave head adapted for abutting engagement with said sheave head for retracting said auxiliary boom section with respect to said outer boom section upon actuation of said winch mechanism.

3. An extensible derrick boom in accordance with claim **1**, wherein said removable locking member includes an elongated, cylindrical plunger portion adapted to be inserted through said opening and a flange portion integral with and extending radially outwardly with respect to said plunger portion, said flange portion being adapted for interlocking underlying coacting engagement with said bracket member upon rotation of said removable locking member.

4. An extensible derrick boom in accordance with claim **3**, wherein said flange portion is cut-away adjacent one edge thereof so that when said flange portion is rotated through about 180° the plunger portion may be removed from said openings.

5. An extensible derrick boom in accordance with claim **3**, including a handle portion made integral with and extending transversely of the axis of said plunger portion.

6. An extensible derrick boom in accordance with claim **1**, wherein said inner, outer and auxiliary boom sections are of a hollow construction having a polygonal shape in transverse cross-section, the exterior surfaces of said auxiliary boom section adjacent the innermost end thereof each including wear plates attached thereto adapted for sliding coacting engagement with the confronting interior surface of said outer boom section, and said auxiliary boom section including enlarged access openings for access into the interior thereof for inserting and removing said wear plates.

7. An extensible derrick comprising, a boom assembly pivotally mounted on a support for swinging movement in a generally vertical plane, said boom assembly comprising an inner boom section and an outer boom section adapted for lengthwise movement relative to the inner boom section, fluid power operated means for extending and retracting the outer boom section with respect to the inner boom section for selectively varying the effective length of the boom, an auxiliary boom section detachably disposed in telescoping relation in said outer boom section, removable locking means locking said auxiliary boom section in predetermined position with respect to said outer boom section, said auxiliary boom section including a sheave head attached to its distal end, a winch mechanism mounted on said inner boom section adjacent the pivotal mounting of said boom assembly to said support, cable means coacting with said winch mechanism and extending along the boom assembly over said sheave head and downwardly therefrom for supporting a load thereon, said locking means includes a removable locking member insertable through openings in the respective outer and auxiliary boom sections when said openings are in aligned registration with one another, a bracket member attached to the exterior of said outer boom section adjacent the

outermost ends thereof, and a flange portion on said removable locking member adapted for interlocking underlying coacting engagement with said bracket member upon rotation thereof for retaining said removable locking member in holding coacting engagement in said opening.

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