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Gibson

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[54] GROUND ROD DRIVER

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[52] **U.S. Cl.** **173/28,** 173/43, 173/147

[51] **Int. Cl.**.....**E21c 11/02**

[58] **Field of Search** 173/22–28, 43, 31

[56] **References Cited**

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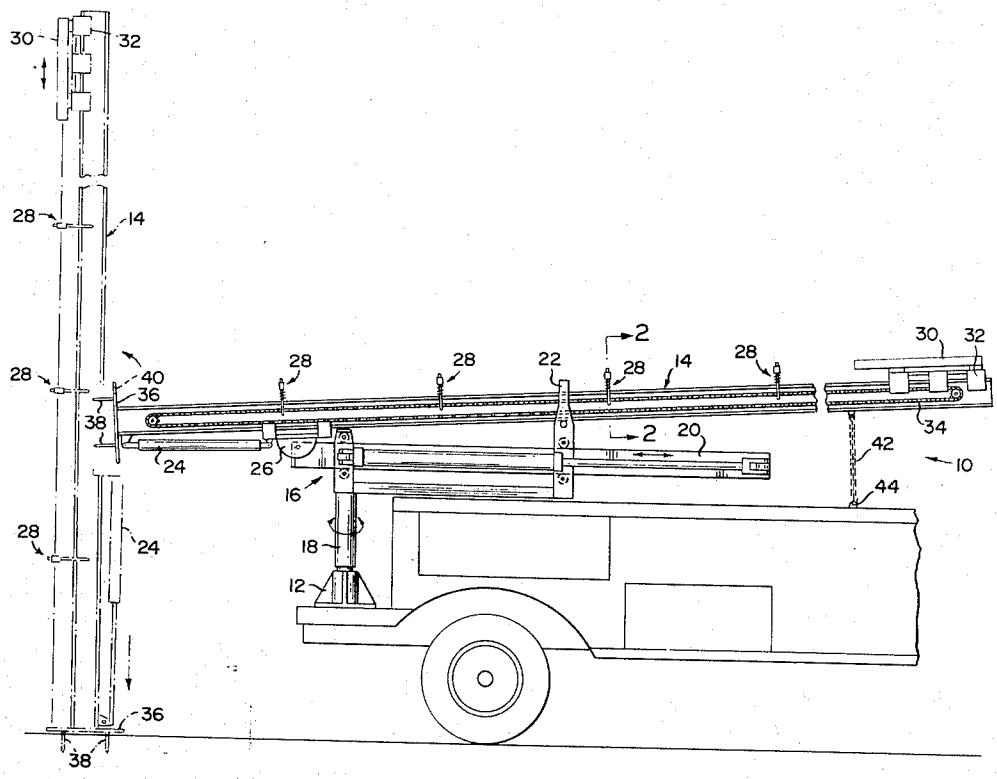
Primary Examiner—Ernest R. Purser

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[57] **ABSTRACT**

A device for driving ground rods of the type to be mounted on a suitable carriage or vehicle. A boom to engage ground rods as the rods are driven is attached to an adjustable horizonal beam. The adjustable horizonal beam interconnects the boom with a vertical cylinder attached to a base. The base interlocks the entire device to the bed or frame of the carriage. The movement of the horizonal beam and rotation of the vertical cylinder combined as a means of positioning the boom relative to the carriage. Attached to the boom is a hydraulically driven impact hammer for power driving the ground rods. The boom is pivotally mounted on the horizonal beam so that the boom may be carried in a substantially horizonal position while in transit and rotated to a vertical position when in use. Also included is a vertical adjustment means mounted on the beam so that the boom may be adjusted vertically to engage with the ground or supporting surface on which the vehicle rests.

11 Claims, 4 Drawing Figures



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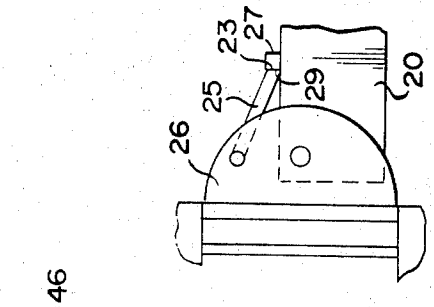


FIG. 4

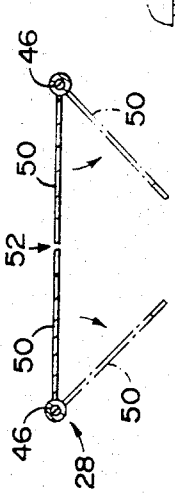


FIG. 3

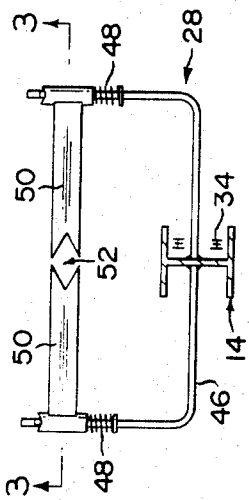


FIG. 2

FIG. 1

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GROUND ROD DRIVER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a mobile device for driving ground rods. More specifically, this invention relates to a boom with an impact driving means mounted thereon. The boom is suitably constructed to retain ground rods in operative engagement with the driving means as they are driven into the ground. The operative position of the boom relative to the carriage is adjustable.

2. Description of the Prior Art

There has been an ever increasing demand for mobile drilling and driving mechanisms. The physical demands and complexity of modern technology have created numerous diverse requirements for special tools and machinery. This is due in large measure to the limitations of manual labor as supplemented by limited mechanical assistance. Spiraling labor costs have added impetus to the development of such time and labor saving devices.

An area particularly affected by these increased demands is the rapidly expanding use of electrical power. Associated with this increased demand has been the expansion of Federal and local safety regulations. Included in these regulations is the requirement for increased use of ground rods in conjunction with electrical power sources. Although driving or placement of these ground rods is a relatively simple matter, it is a time consuming effort. The increased requirements, in light of existing labor costs, dictate the necessity for a relatively inexpensive mobile ground rod driver.

A review of the existing art reveals a wide variety of devices for drilling or post driving. Unfortunately, because these specific devices are structurally designed to fulfill particularized needs, these existing mechanisms are not readily adaptable to meet new needs or requirements.

Many of the conventional operating mechanisms readily available require specifically designed and constructed platforms due to their weight and size. The necessity of these specifically designed platforms generally increases the cost of the entire unit. Other devices disclose operating mechanisms in fixed positions relative to the platform chassis. This, of course, greatly reduces the area of accessibility of the entire device since the mechanism cannot be offset from the chassis. In addition, a number of the conventional devices are restricted in their movability in moving from site to site. This often results when the operating member is not suitably mounted on the chassis so that it may be adjusted to a "carry" position when in transit.

Since the sites requiring the installation of ground rods are usually widely separated it is essential that the entire unit be mobile. Of course, with increased mobility the cost of capital investment is reduced by reducing the number of such devices required. In addition, as the sites are widely separated the terrain is often different and various obstacles such as curbs and the like are often encountered. Therefore, only a fully adjustable driving device will insure efficient use of the device and the operator.

Accordingly, the present invention embodies the specific structure to fulfill the particularized requirements for a mobile inexpensive ground rod driver.

SUMMARY OF THE INVENTION

This invention relates to an adjustable ground rod driver designed and constructed to be mounted on a conventional truck bed.

Ground rods are widely used as a means of abating potential hazards associated with high voltage power sources. These voltage sources are located in a wide variety of sites, usually in the form of high power transformer. In many instances the terrain surrounding these sites is either too rough or not solid enough to support a mechanized means for driving these ground rods. Thus it is important that a device be designed whereby the supporting platform may be located at a minimum offset distance from driving mechanism when operatively positioned. To accomplish this, the present invention comprises a base designed for mounting a device on a conventional truck bed.

Interconnecting the base to a boom mechanism is a positioning mechanism. The positioning mechanism includes a vertically disposed cylinder attached to the base and a horizonally disposed longitudinal actuator mounted on the upper portion of the vertical cylinder. A boom carriage support is arranged vertically on the horizonal longitudinal hydraulic actuator. The longitudinal actuator includes a hydraulic cylinder whereby the boom mechanism when operatively positioned, hereinafter described, may be moved inwardly and outwardly relative to the base. The vertical cylinder engages the base such that when the boom mechanism is operatively positioned both the boom mechanism and interlocking horizonal actuator may be rotated in an arc relative to the base. In addition, a vertical hydraulic actuator is mounted on the lower portion of the boom mechanism for adjusting the vertical position of the boom mechanism relative to the ground.

The boom mechanism is mounted on the longitudinal actuator by means of a swivel plate whereby the boom mechanisms may be pivoted from a substantially horizonal or "carry" position to a vertical or operating position. The boom mechanism includes a plurality of rod guides suitably mounted to engage ground rods and retain the relative position of the ground rods to an impact hammer, hereinafter described, during the driving operation. Also included in the mechanism is a hammer slide for mounting the impact hammer on the mechanism and a chain drive track attached to the boom mechanism which in combination with the hammer slide, controls the position of the impact hammer relative to the boom mechanism. A ground engaging plate is mounted on the lower most portion of the boom mechanism.

A retaining means is mounted on the upper portion of the boom mechanism which in combination with the retainer means mounted on the platform secures the entire device while in the transit position.

When operated, the entire mechanism is designed to be located in close proximity to the area in which the ground rods are to be driven. The operator then unlocks the retaining mechanism and manually rotates the boom mechanism to the vertical position. By actuating the horizonal longitudinal actuator the boom mechanism is positioned horizonally outward relative to the base. The mechanism and actuator are then moved in an arc about the base to the approximate position where the rods are to be driven. Then by alternately adjusting the longitudinal actuator and rotation

of the mechanism, the mechanism is positioned as desired. The entire boom mechanism is then moved vertically downward by means of the vertical actuator to securely engage the ground. The ground rod is then positioned in the series of the ground rod guides.

Once the ground rod is positioned the impact hammer is actuated. The impact hammer, as it travels down the boom mechanism, engages the ground rod and drives the rod engaged with the boom mechanism into the ground. The rod guides are so constructed as to permit the impact hammer to pass freely through in its movement along with the boom mechanism. After the rod has been driven into the ground the impact hammer is returned to its original position. A second ground rod is then secured to the first ground rod and the same procedure is continued until a sufficient number of ground rods have been driven.

After completing the operation the boom mechanism is disengaged from the ground surface by actuation of the vertical actuator. The entire mechanism is then swung into longitudinal alignment with the carriage bed. Then by actuating the horizonal longitudinal actuator the boom mechanism is moved forward relative to the base. In this position the boom mechanism is rotated forward and downward until the boom mechanism engages the vertical support mounted on the longitudinal actuator. The boom is then secured in position by locking corresponding retaining means.

The invention accordingly comprises the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings in which:

FIG. **1** is a side view of the ground rod driver mounted on a typical truck bed.

FIG. **2** shows a top view of the rod guide taken along line **22.**

FIG. **3** shows a cross sectional view of the rod guide taken along line **33.**

FIG. **4** shows a detailed view of the boom locking mechanism.

Similar reference characters refer to similar parts throughout the several views of the drawings.

DETAILED DESCRIPTION

As shown in FIG. **1,** the present invention, generally indicated at **10,** includes fixed base **12** interconnected to boom mechanism **14** by positioning mechanism **16.** Positioning mechanism **16** includes vertically disposed cylinder **18** attached to base **12** at its lower end and horizonally disposed longitudinal actuator **20** mounted on the upper portion of cylinder **18.** Mounted on longitudinal actuator **20** is vertically arranged boom carriage support **22.** In addition, vertical hydraulic actuator **24** mounted on the lower portion of boom mechanism **14** is included in positioning means **16.**

Boom mechanism **14** is attached to longitudinal actuator **20** by swivel plate **26.** Boom mechanism **14** includes a plurality of rod guides **28** suitably mounted on mechanism **14** to engage ground rods and retain the relative position of the ground rods to impact hammer **30** mounted on mechanism **14** by hammer slide **32** during the driving operation. Also included is chain drive track **34** which in combination with hammer slide **32** controls the position of impact hammer **30** relative to boom mechanism **14.** Ground engaging plate **36** is mounted on the lower portion of boom mechanism **14.** A plurality of spikes **38** are attached to plate **36** to secure boom mechanism **14** to the supporting surface when operatively positioned. Aperture **40** is formed on plate **36** so that the ground rods may pass through plate **36** during the driving operation.

Retaining means **42** is mounted on the upper portion of boom mechanism **14** which in combination with corresponding retaining means **44** attached to the chassis combined as a means of securing boom mechanism **14** in the transit position.

FIGS. **2** and **3** show guides **28** in detail. Guides **28** include substantially U-shaped frame **46.** Mounted on each side of frame **46** are tension springs **48** which in combination with a pair of members **50** secure ground rods during the driving operation. Aperture **52** formed by corresponding substantially V-shaped cutouts on members **50,** engage the ground rods during operation.

FIG. **4** shows a boom locking mechanism comprising locking lever **25** and locking post **27.**

When operating, the entire mechanism and chassis is located in close proximity to the area in which the ground rods are to be driven. The operator then unlocks retaining mechanism combination **42** and **44** and manually rotates boom mechanism **14** to the vertical position. To lock boom **14** in this position the outer portion **23** (as shown in FIG. **4**) of locking lever **25** is operatively engaged to the outer vertical surface **29** of locking post **27.** The base **12** to the intended position of the ground rod is achieved first by actuating horizonal longitudinal actuator **20** to move boom mechanism **14** horizonally outward relative to base **12.** Then mechanism **14** and actuator **20** are rotated in an arc by pivoting cylinder **18** on base **12.** By alternatively adjusting actuator **20** and rotating boom **14,** the operator locates the lower portion of boom **14** immediately over the area intended for the ground rods. The entire boom mechanism **14** is then moved vertically downward by means of vertical actuator **24** until ground plate **36** is securely engaged to the supporting surface by means of spikes **38.**

With mechanism **14** thus secured guides **28** are opened by rotating plates **50** upward and outward in opposite directions for 180°. A ground rod is then placed through aperture **40** and held in substantially vertical position parallel to the axis of boom **14.** Plates **50** are then rotated inward and down to their normal position. In this position the ground rod thus engaged will pass through aperture **50** formed in guides **28.**

The impact hammer **30** positioned at its upper most reach will be immediately adjacent to the upper end of the engaged ground rod. As impact hammer **30** is actuated it travels down boom **14** engaging the ground rod and driving the ground rod into the ground. The unique structure of rod guides **28** permit plates **50** to rotate downward as hammer **30** engages them in its downward movement. The movement of hammer **30** along boom **14** is controlled by hammer slide **32** in combination with chain drive **34** driven by an external means (not shown). After hammer **30** reaches its lower most point of travel, it is returned to its upper most position in response to operator signals. Again the construction of

the guides **28** permit hammer **30** to pass upwardly through plates **50** as they rotate to permit its passage.

Ordinarily a number of ground rods are required. Thus a second ground rod may be secured to the first ground rod and the same procedure is continued until a sufficient number of ground rods have been driven in series.

After completing the operation, boom mechanism **14** is disengaged from the ground surface by actuating vertical actuator **24.** The entire mechanism is then swung in longitudinal alignment with the carriage bed. Then by actuating the longitudinal actuator **20** the boom mechanism **14** is moved forward relative to base **12** to its forward most position. Locking lever **25** is rotated upward past locking post **27** permitting the boom mechanism **14** to be rotated forward and down about swivel **26** until boom **14** engages vertical support **22.** The boom is then secured in position by locking corresponding retaining means **42** and **44.**

It will thus be seen that the object set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

And it is also to be understood that the following claims are intended to cover all generic and specific features of the invention herein described, all statements of the scope of the invention which, as a matter of language might be said to fall therebetween.

Now that the invention has been described, what is claimed is:

1. A device for driving ground rods designed to be mounted on a mobile chassis, said device comprising: base means to mount said device on the chassis, boom means including guide means to operatively engage said ground rod to retain the position of said ground rod relative to said boom means, positioning means including longitudinal positioning means and pivotal positioning means interconnecting said boom means to said base means to operatively position said boom means in the horizontal plane relative to a supporting surface, driving means attached to said boom means and arranged to drive said ground rod when said ground rod is operatively positioned relative to said boom means, control means for actuating said positioning means and said driving means and locking means to fix the position of said boom means relative to said positioning means when said boom means is operatively positioned, said driving means operatively attached to said boom means and aligned with the upper extremity of said ground rod whereby said driving means operatively engages said ground rod to drive said ground rod vertically downward into a supporting surface when said device is operatively positioned and actuated.

2. A device as in claim **1** wherein said positioning means further includes vertical positioning means interconnecting said boom means and said longitudinal positioning means to operatively position said boom means and said driving means in the vertical plane relative to the supporting surface.

3. A device as in claim **1** wherein said pivotal positioning means comprises a vertically disposed cylindrical member pivotally mounted on said base such that said boom means and said longitudinal positioning means may be rotated in an arc about said pivotal positioning means to operatively position said boom means relative to said supporting surface.

4. A device as in claim **1** wherein said locking means comprises a locking lever arranged on said boom means to cooperatively engage a locking post on said positioning means.

5. A device as in claim **1** wherein said boom means is pivotally connected to said positioning means and mounted on said positioning means in relation to said chassis such that the longitudinal axis of said boom means may be adjusted from a substantially parallel position relative to said chassis during transit to a substantially vertical position relative to said chassis during operation of said device.

6. A device as in claim **5** wherein said boom means includes a stabilizing means comprising a substantially flat plate attached perpendicularly to the lower extreme of said boom and plurality of spikes arranged parallel to each other and mounted on said plate whereby said stabilizing means engages the supporting surface thereby preventing movement of said boom means relative to said supporting surface when said boom means is operatively positioned.

7. A device as in claim **1** wherein said guide means comprise a plurality of spring loaded members interconnected to said boom means by substantially U-shaped frame, said spring loaded members arranged in cooperative working relation to both said boom means and said driving means such that movement of said driving means along said boom means will cause said spring loaded members to rotate in the direction of travel of said driving means, whereby passage of said driving means is allowed, said spring loaded members positioned to return to original position relative to said boom means after passage of said driving means.

8. A device as in claim **7** wherein said spring loaded members include apertures formed in said members to engage said ground rods such that the longitudinal axis of said boom means when said ground rods are operatively engaged by said device.

9. A device as in claim **1** wherein said longitudinal positioning means operatively interconnects said pivotal positioning means and said boom means.

10. A device as in claim **9** wherein said boom means comprises an I-beam and said driving means includes a hammer slide operatively mounted on said I-beam to position said driving means relative to said ground rods.

11. A device as in claim **9** wherein said longitudinal positioning means comprises a horizontal member connected to said boom means, said horizontal member movably mounted on said pivotal positioning means such that movement of said horizontal member means relative to said pivotal positioning means will cause a corresponding change in the relative positions of said pivotal positioning means and said boom means.

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