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Love

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[54] **APPARATUS FOR IMPLACEMENT OF SUBTERRANEAN SCREW ANCHORS**

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[52] **U.S. Cl.** **173/26,** 52/157, 61/53.68, 173/147, 173/151

[51] **Int. Cl.** **E02d 7/22**

[58] **Field of Search** 173/26, 147, 148, 151; 175/162, 195; 61/53, 68; 52/157

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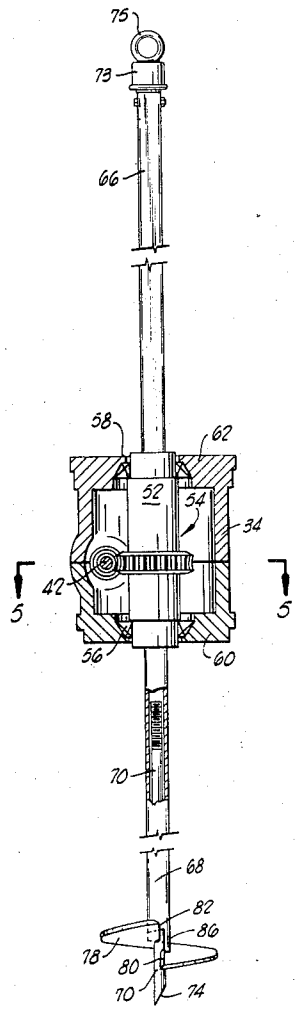
[57] **ABSTRACT**

Apparatus for locating a helical screw anchor in the earth comprising, a pointed helical screw anchor having an interrupted helical blade thereon terminating at a heel on the upper end of the blade, and further having an elongated shank extending upwardly from the blade; a sleeve extending over the shank and having a key at the lower end thereof laterally engageable with the heel of the blade to rotate the screw anchor when such sleeve is rotated; a polygonally cross sectioned rod secured coaxially to the upper end of the sleeve; a rotary kelly driving element engaging said polygonally cross sectioned rod for driving the rod in rotation; a derrick supporting the kelly deiving element and the sleeve; pulley and winch means on the derrick for applying downward force on the sleeve and anchor during rotation of the kelly; and means mounted on the derrick for driving the kelly in rotation.

7 Claims, 6 Drawing Figures



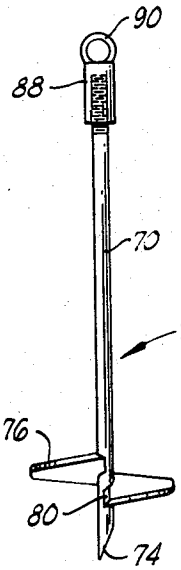


FIG. 3

FIG. 1

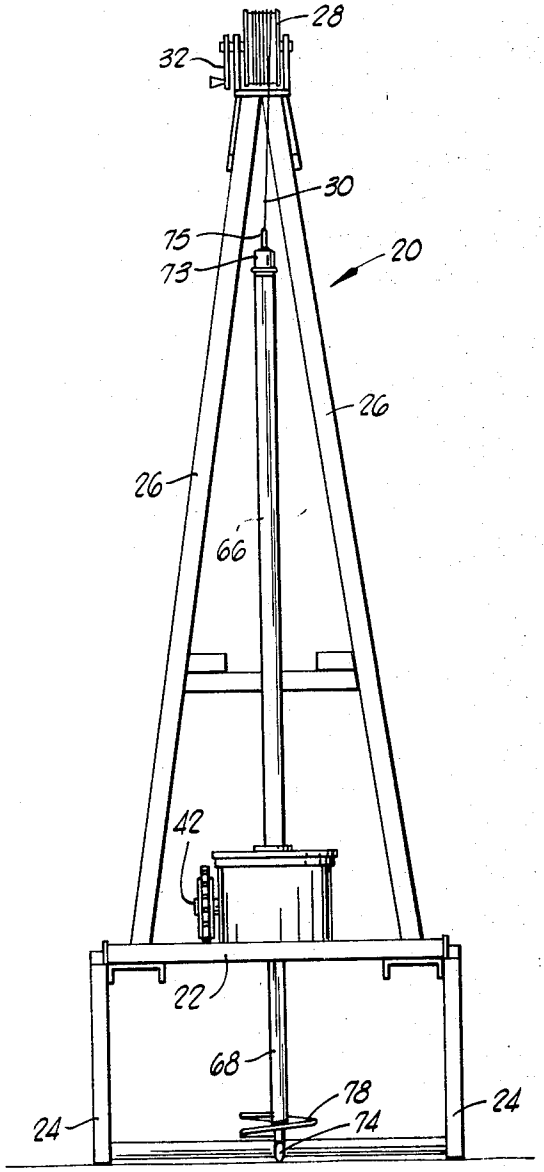


FIG. 2

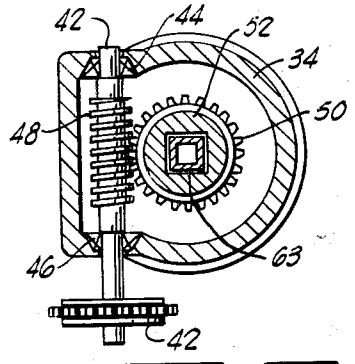


FIG. 5

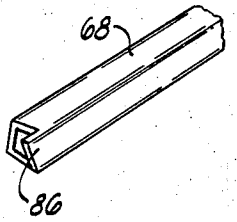


FIG. 6

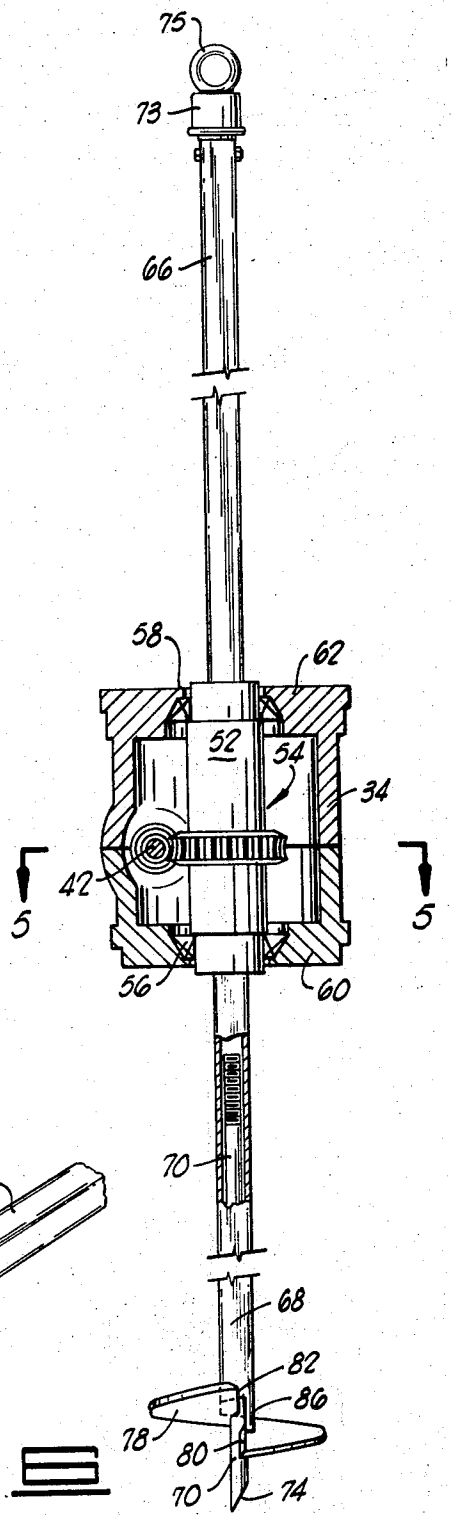


FIG. 4

APPARATUS FOR IMPLACEMENT OF SUBTERRANEAN SCREW ANCHORS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to screw type anchor devices used to anchor travel trailers and house trailers by the use of guy wires and tie downs, and more particularly, the invention relates to an apparatus or assembly for placement of screw anchors in the earth. 2. Brief Description of the Prior Art

With the current widespread acquisition and use of house trailers and mobile homes, and the employment of such structures, in many cases, as permanent residences, an experience which has been encountered in many parts of the country is the susceptibility of these structures to displacement and occasional overturning by high winds, which may in some cases approach tornadic velocity. For the purpose of rendering the structures safe for occupancy in environments where such high winds may occasionally occur, it has been a practice to employ guy wires or tie down cables for the purpose of anchoring such structures to the earth. The anchor devices which have been used vary in structure, but one of the more popular and widely used anchor devices is a screw or auger type anchor which is screwed deeply into the earth and which has a shank or shaft projecting from the screw portion thereof upwardly to the surface. The upper end of the shank carries an eye or other attachment structure to facilitate the attachment to the anchor of a guy wire, cable or the like.

The screw type anchor devices, as well as other anchor devices which have been used, have often been difficult to position in the earth at a depth sufficient to give the desired holding power. In some instances, these devices have been screwed into the earth by means of a wrench applied to the top of the shaft or shank projecting upwardly from the screw portion of the anchor, and the manual force which is required in such instances has made the location of the anchor an exhausting and time consuming job. With other types of buried anchor devices, pounding into the earth with sledge hammers or similar heavy objects has sometimes been used. Rotary screwing into the earth and driving has also sometimes been accomplished with complicated machinery.

BRIEF DESCRIPTION OF THE PRESENT INVENTION

The present invention provides an improved screw anchor device, and an apparatus which is used for implacement of such screw anchor device in a deep subterranean location. The apparatus used for implacing the screw anchor device is relatively inexpensive to manufacture, is mechanically sturdy and is very easily utilized. Moreover, the apparatus for implacing the screw anchor device is capable of quickly screwing the screw anchor device deeply into the earth in a true vertical direction.

Broadly described, the apparatus of the invention comprises a pointed helical screw anchor having an interrupted helical blade thereon which terminates at a heel at the upper end of the blade. The screw anchor further has an elongated shank which extends upwardly from the blade. The driving assembly used for implacing the pointed helical screw anchor at a desired depth in the ground includes an elongated sleeve which extends over the shank, and has a key disposed at the lower end thereof and laterally engageable with the heel of the blade to rotate the screw anchor when the sleeve is rotated. A polygonally cross sectioned rod is secured coaxially to the upper end of the elongated sleeve, and in a preferred embodiment of the invention, is formed integrally with, or made a part of, the elongated sleeve. A rotary kelly driving element is provided for engagement with the polygonally cross sectioned rod for driving the rod in rotation, which rotation, of course, also results in the rotation of the sleeve. A derrick is preferably provided for supporting the kelly driving element and the rod extended through the kelly driving element. Pulley and winch means are mounted on the derrick for applying a downward force on the sleeve and anchor during rotation of the kelly driving element. Means is mounted on the derrick for driving the kelly driving element in rotation.

An object of the present invention is to provide a simple, relatively inexpensive apparatus which can be used for implacement of subterranean screw anchors deeply in the earth in an expeditious and trouble free manner.

Another object of the invention is to provide an apparatus which can be utilized for more expeditiously screwing screw anchors into the earth to a desired depth, and then disconnecting the driving or screwing apparatus from the screw anchor so that the screw anchor may be immediately connected to a guy wire or cable used for anchoring a structure positioned at the surface.

Additional objects and advantages of the invention will become apparent from the following detailed description of preferred embodiments of the invention, when considered in conjunction with the accompanying drawings which illustrate the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation view of the apparatus of the present invention, showing the manner in which a power source is connected to the rotary kelly driving element forming a portion of the invention, and the way in which the rotary kelly driving element is supported on a derrick structure and drivingly engages the polygonally cross sectioned rod which slidingly engages the shank portion of the pointed helical screw anchor.

FIG. 2 is a front elevation view of the structure depicted in FIG. 1.

FIG. 3 is a side elevation view of the pointed helical screw anchor forming a portion of the present invention.

FIG. 4 is a vertial sectional view of the rotary kelly driving element housing, showing in elevation the polygonally cross sectioned rod driven by the rotary kelly driving element, the key carrying sleeve, and the pointed helical screw anchor, all forming a portion of the present invention.

FIG. 5 is a horizontal, transverse sectional view taken through the housing which contains the rotary kelly driving element.

FIG. 6 is a perspective view of the lower end portion of a sleeve forming a portion of the invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Referring initially to FIG. 1 of the drawings, shown therein is a tractor **10** or other suitable source of power used for driving the apparatus of the present invention. The tractor is provided with a conventional power take off **12** by which the driving power for the apparatus of the invention is conveyed through a standard or conventional power train forming a part of the power take off. A power shaft **14** extends from a gear box **16** forming a portion of the apparatus of the present invention, which gear box is mounted upon cross beams **18** constituting a portion of a vertically extending derrick **20.** The cross beams **18,** along with certain laterally extending frame members **22,** form a horizontal platform which is supported in vertically spaced relation to the ground by a pair of support or skid elements **24.** The derrick **20** further includes a plurality of upwardly extending stanchions **26** which have mounted at their convergent upper ends, a winch drum **28** upon which a power cable **30** is wound by means of a suitable handle **32.**

Mounted on the horizontal supporting platform which is formed by the cross beams **18** and the frame members **22** is a rotary kelly driving element housing **34.** The housing **34** encloses certain gear elements, hereinafter described, which gear elements drive in rotation, a rotary kelly driving element, also hereinafter described. For the purpose of transmitting driving power through the gear elements located in the housing **34** to the rotary kelly driving element, a drive chain **36** extends from the power shaft **14** to a sprocket **40** mounted upon a drive shaft **42** which projects through a suitable bearing and seal into the rotary kelly driving element housing **34.**

The gears and driving elements located within the housing **34** for the purpose of driving the rotary kelly driving element in rotation are illustrated in FIGS. **4** and **5.** As there shown, the drive shaft **42** which carries the sprocket **40** externally of the housing **34** has keyed thereto a pair of thrust bearings **44** and **46,** which thrust bearings are positioned in suitable journals provided within the housing for supporting the drive shaft therein for rotation with respect to the housing. The drive shaft **42** further carries over a central portion thereof, a worm **48** which meshingly engages a worm gear **50** which is secured around the periphery of a cylindrical driving sleeve **52** forming a portion of the rotary kelly driving element, designated generally by reference numeral **54.** The cylindrical driving sleeve **52** further has keyed to the opposite ends thereof, a pair of thrust bearings **56** and **58** which function to support and journal the rotary kelly driving element within the housing **34.** The upper and lower ends of the cylindrical driving sleeve **52** project through openings formed in the bottom and top closure plates **60** and **62** forming a portion of the housing **34** and closing the top and bottom sides thereof, respectively. The cylindrical driving sleeve **52** of the rotary kelly driving element **54** has a bore **63** formed therethrough which is of polygonal sectional configuration to facilitate keying with a polygonally cross sectioned rod as hereinafter described, and this bore is aligned with openings formed in the bottom and top closure plates.

An elongated, polygonally cross sectioned drive rod **66** projects through the bore formed through the cylindrical driving sleeve **52** of the kelly driving element **54.** The drive rod **66** may be of hollow or solid bar stock construction and is preferably of a length approximately equivalent to the depth in the earth at which it is desired to locate the subterranean screw anchor. At its lower end below the rotary kelly driving element **54,** the polygonally cross sectioned drive rod **66** is secured to, or formed integrally with, a sleeve **68** which projects slidingly downwardly over an elongated shank **70** forming a portion of the pointed helical screw anchor of the invention, designated generally by reference numeral **72.** In a preferred embodiment of the invention, the sleeve **68** and drive rod **66** are integrally formed, and constitute one single, elongated tubular element having a polygonal external peripheral cross sectional configuration which is complementary in configuration to the bore through the cylindrical driving sleeve **52** of the rotary kelly driving element **54.** The bore through the elongated tubular element thus constituting both the sleeve **68** and the drive rod **66** is of sufficiently large diameter to slidingly receive the shank **70** of the screw anchor **72.** At its upper end, the polygonally cross sectioned drive rod **66** has secured thereto by any suitable means, a driving block **73** which carries a ring or eye **75** to which one end of the power cable **30** is secured.

The screw anchor **72** further includes, in addition to the shank, a point **74** formed at the lower end thereof, and a helically turned, interrupted blade **76** secured around the periphery of the shank **70** adjacent its lower end which carries the point **74.** At its lower end, the blade **76** carries an edge which extends radially with respect to the shank **70** and is sharpened to provide a cutting edge **80.** At its upper end, the blade **78** also terminates in a radially extending heel or edge **82** which is sharpened to facilitate cutting into the earth. It will be noted in referring to FIG. **4** that the lower end of the sleeve **68** is cut along a plane which permits the lower end of the sleeve to bear flatly against the upper surface of the helically turned interrupted blade **76.** The sleeve **68** further carries a downwardly projecting key **86** which projects from one end of the sleeve and is positioned for laterally engaging the upper edge or heel **82** of the blade **76.** It will thus be perceived that when the sleeve **68** is rotated relative to the shank **70,** the pointed helical screw anchor **72** is driven in rotation as a result of the engagement of the key **86** with the heel or upper edge **82** of the blade **76.**

At its upper end, the elongated shank **70** is threaded around its outer periphery to facilitate the attachment to this end of the shank of a threaded hub or socket **88** forming a portion of an eye or hook **90** to which one end of a guy wire, cable or hauser may be secured for use in a manner well understood in the art to anchor or secure a mobile home or other large structure located on the surface of the ground.

OPERATION

In the operation and use of the present invention, the derrick **20** is positioned at the location where the first screw anchor is to be implanted in the ground. This will, in most instances, be relatively near to the structure which is to be anchored or secured by the use of guy wires or cables. Where the derrick is, as in the illustrated embodiment, mounted on a mobile vehicle, such as a tractor **10,** which also constitutes the source of power for driving the apparatus of the invention, the

tractor is driven to the location where the anchor is to be placed at a desired depth in the earth.

With the derrick **20** positioned in the illustrated upright position, the polygonally cross sectioned drive rod **66** is passed through the polygonally cross sectioned bore through the cylindrical driving sleeve **52** mounted in the housing **34.** This procures driving engagement between the rotary kelly driving element **54** and the drive rod **66.** After passing through the bore in the sleeve **52** of the rotary kelly driving element **54,** the sleeve **68** on the lower end of the drive rod **66** is passed over the shank **70** of the helical screw anchor **72.** The sleeve **68** is then rotated relative to the screw anchor **72** until the key **86** bears flatly against the sharp upper edge or heel **82.** The point **74** of the screw anchor **72** is then rested upon the ground at the precise location where it is desired to implant the screw anchor in the ground. The power cable **30** is then reeved around the sheave or pulley **33** and connected through a clip or buckle to the eye **75** secured to the upper end of the drive rod **66.** It will be perceived from this mounting arrangement shown in FIG. **1** that rotation of the winch drum **28** can now be effected to tension the power cable **30** and thus exert a downward force on the drive rod **66.**

As such force is applied through the power cable **30,** the power takeoff **12** from the tractor **10** is energized so that the power shaft **14** is driven in rotation. The chain **36** then drives the sprocket **40** and drive shaft **42** in rotation. This causes the cylindrical driving sleeve **52** to be driven in rotation, and the rotary movement and driving force is imparted through the rotary kelly driving element **54** to the polygonally cross sectioned drive rod **66.** The drive from the drive rod **66** is transmitted through the sleeve **68** to the pointed helical screw anchor **72** by reason of the force transmitted to the heel **82** from the key **86.** The lower or leading edge **80** of the helical blade **78** then commences to bite into the ground, and once the blade is substantially covered with earth, the screw anchor **72,** upon continued rotation, will pull itself downwardly in the earth in the same manner as any screw moves into the material into which it is being screwed.

At this time, the downward force applied through the power cable **30** can be relieved. Rotation of the helical screw anchor **72** is then continued by driving the rotary kelly driving element **54** in rotation until the screw anchor has reached the depth that it should occupy in the earth to provide the desired anchorage. In most cases, this will be a depth such that the threaded upper end portion of the elongated shank **70** is exposed sufficiently to permit the socket **88** and hook **90** to be threadedly engaged with the shank.

In some instances, after the helical screw anchor **72** has been implanted at the desired depth in the earth, the earth will have caved or filled in around the sleeve **68** to an extent such that it is difficult to manually lift the sleeve and the drive rod **66** connected thereto out of the ground. In this case, the power cable may be connected directly from the winch drum **28** to the eye **75** at the top of the drive rod **66** without passing this cable around the sheave **35.** Then, when the winch drum is rotated to wind up the power cable **30,** an upward force is applied to the drive rod **66** and sleeve **68** to extricate this structure from the ground.

After securement of the socket **88** and hook **90** to the upper end of the elongated shank **70,** a guy wire or cable can be connected by one of its ends thereto in a manner well understood in the art and utilized for anchoring a mobile home or other surface located structure against displacement by high winds.

Although a preferred embodiment of the invention has been herein described in order to clearly demonstrate by way of example, the principles upon which the invention is based, it will be understood that various changes and innovations in the desired structure can be effected without departure from the basic principles of the invention. Changes of this type are therefore deemed to be circumscribed by the spirit and scope of the invention except as the same may be necessarily limited by the appended claims or reasonable equivalents thereof.

What is claimed is:

1. Apparatus for implacing a subterranean screw anchor in the earth comprising:

an elongated sleeve having a key at one end thereof adapted to drivingly engage a part of a screw anchor to drive the anchor in rotation, said sleeve key being configured for free sliding movement upwardly in an axial direction relative to the screw anchor for disengagement therefrom and thus projecting in an axial direction from said one end of said sleeve;

a rod projecting coaxially from the sleeve and connected thereto;

driving means engaging the rod for rotating the rod and sleeve about their axes; and

means for selectively exerting a force upon said rod and sleeve in opposite axial directions.

2. Apparatus as defined in claim **1** wherein said sleeve and rod are a single, integrally formed tubular structural element having a polygonally shaped external peripheral cross-section.

3. Apparatus as defined in claim **1** wherein said driving means is a rotary kelly driving element passing around and drivingly engaging said rod.

4. Apparatus as defined in claim **1** wherein said means for exerting a force upon said rod and sleeve comprises:

a derrick supporting said driving means;

a winch mounted on said derrick; and

a cable extending from said winch to said rod.

5. In combination:

a pointed screw anchor which includes an elongated shank terminating in a point, and a blade helically turned about a portion of the shank adjacent the point, said blade having a radially extending heel at the end thereof most remote from said point, and a cutting edge at the other end thereof;

an elongated tubular member slidingly telescoped over said shank on the opposite side of said blade from said point, said tubular member having a key formed on an end thereof adjacent said blade and laterally engaging the heel of said blade for transferring rotational movement from said tubular member to said screw anchor, said tubular member being freely slidable upwardly on said shank in a direction away from said point and blade whereby said tubular member can be freely withdrawn from said screw anchor when the blade portion of said screw anchor is buried in the earth;

a derrick adapted to be supported on the ground; and

a rotary driving element mounted on the derrick and engaging an intermediate portion of said elongated tubular member for driving said tubular member in rotation.

6. Apparatus as defined in claim **5** wherein the end of said tubular member adjacent said key is cut transversely on a bias inclined to the longitudinal axis thereof for resting flatly on said blade; and

wherein said apparatus is further characterized as including means on said derrick for exerting a force on said tubular member acting along the axis thereof toward the end thereof at which said key is located.

7. Apparatus as defined in claim **5** wherein said rotary driving element comprises:

a rotary kelly driving element passing around and engaging said elongated tubular member;

a mobile vehicle having a power take-off associated therewith; and

a drive shaft drivingly connected between said rotary kelly driving element and said power take-off.

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