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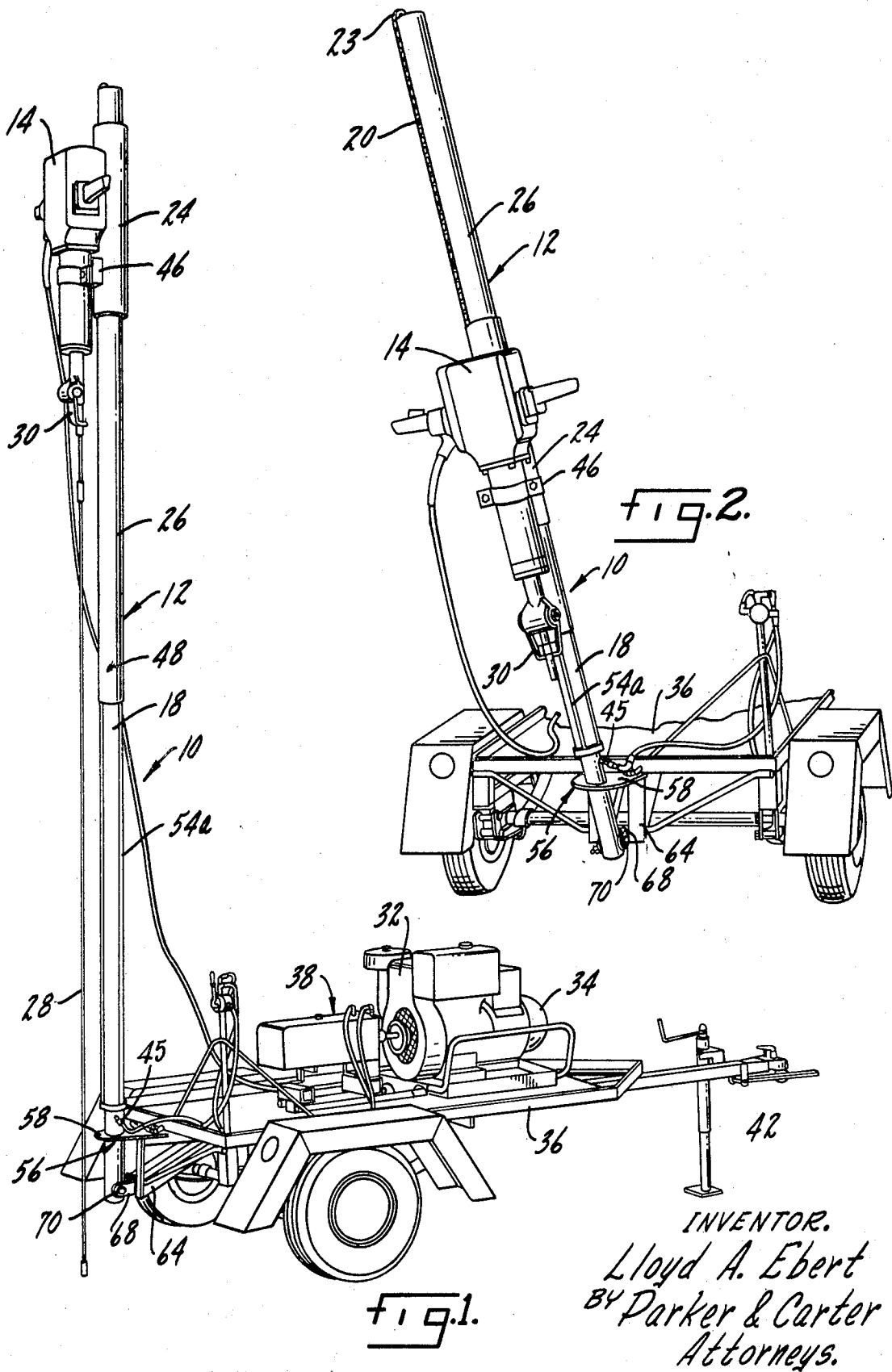
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FLUID ACTUATED TELESCOPIC LIFTING MECHANISM

Filed June 6, 1968

2 Sheets-Sheet 1



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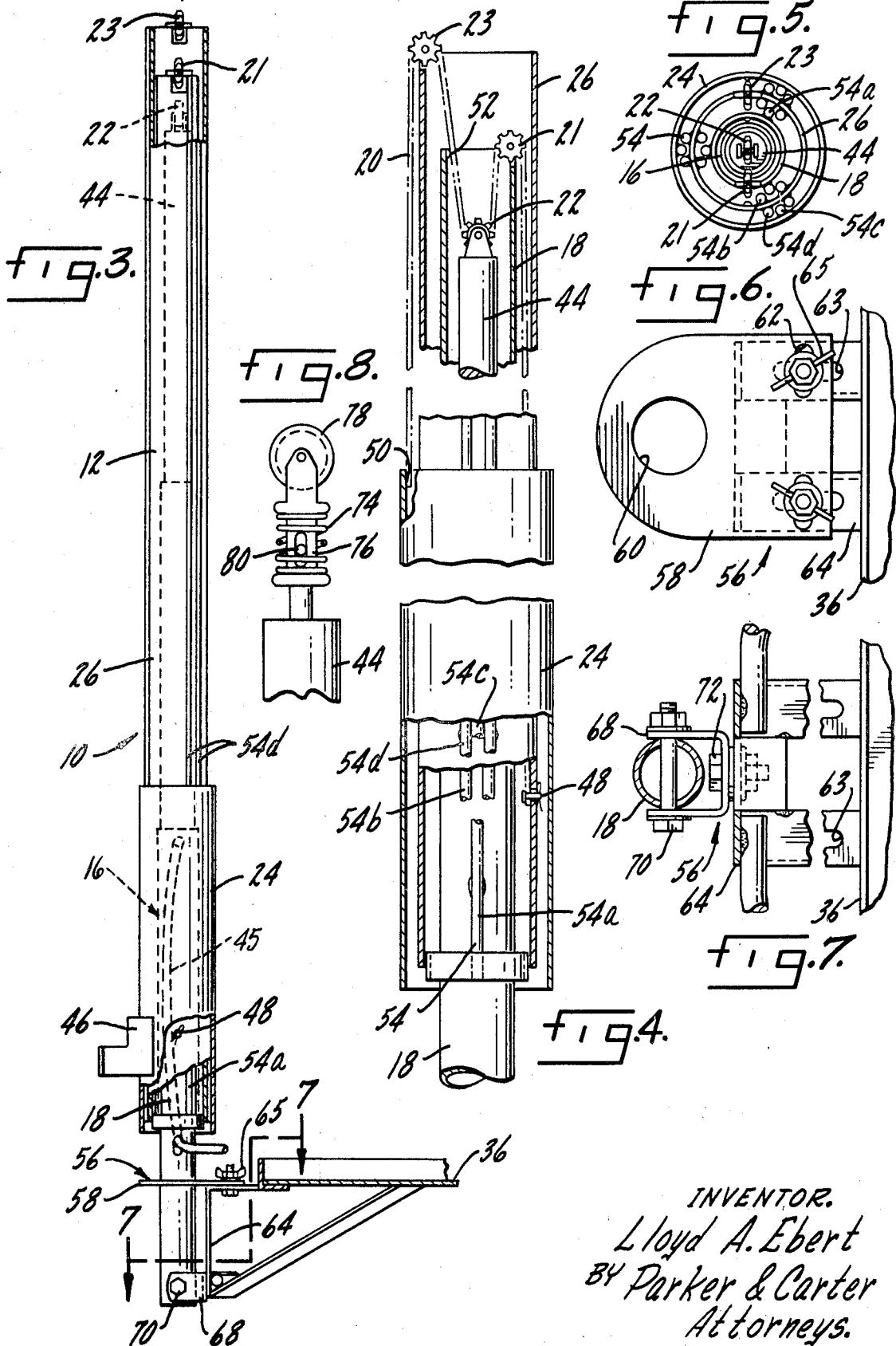
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1

2

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FLUID ACTUATED TELESCOPIC LIFTING MECHANISM

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12 Claims

ABSTRACT OF THE DISCLOSURE

A lifting mechanism having an adjustable and collapsible mast adapted for lifting a power-driven hammer or the like, structurally including a telescopic piston vertically disposed in a cylinder and driven by fluid pressure. A movable inner sleeve telescopes over the cylinder and a movable outer sleeve, supporting the power-driven hammer or the like, telescopes over the movable inner sleeve. A cable means, fixed at opposite ends to the inner and outer sleeves and fixed intermediately to the cylinder, passes around a pulley means connected to the piston thereby transmitting a lifting motion from the reciprocating piston to the movable inner and outer sleeves.

SUMMARY OF THE INVENTION

This invention relates to improvements in a lifting mechanism and more particularly, to improvements in a lifting mechanism including an adjustable and collapsible mast for supporting a power-driven hammer or the like.

Accordingly, a primary object of this invention is an improved lifting mechanism that is adjustable, economical, safe, and easy to operate.

A further object is an improved lifting mechanism including a collapsible mast that provides adequate vertical clearance under the hammer or similar object.

Another object is a lifting mechanism that is adjustable vertically so that it may be at right angles to the ground to compensate for uneven terrain.

Another object is an improved lifting mechanism wherein the hammer or similar object may be raised and lowered by an operator who remains at ground level at all time.

Another object is a versatile lifting mechanism which may be adapted to drive ground rods, fence posts, highway delineators, water well sand points, stakes, pipes, or the like to a desired depth.

Another object is a lifting mechanism which requires a minimum amount of maintenance and reduces the number of men necessary to operate the mechanism.

Other objects and advantages will be apparent from the ensuing specification and drawings for this invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated by the accompanying drawings wherein:

FIG. 1 is a perspective view showing the lifting mechanism in use;

FIG. 2 is a perspective view of the lifting mechanism showing the adjustable mast in a tilted position;

FIG. 3 is an enlarged partial section view of the lifting mechanism with parts broken away for clarity;

FIG. 4 is an enlarged partial section view of the mast with parts broken away for clarity;

FIG. 5 is an enlarged top view of the mast;

FIG. 6 is an enlarged top plan view of the mechanism for vertically adjusting the mast;

FIG. 7 is an enlarged section view taken along line 7—7 of FIG. 3, and

FIG. 8 is an enlarged partial side view of a modification for the pulley means connected to the piston.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings in more detail it will be seen that the lifting mechanism 10 includes an adjustable and collapsible mast 12 adapted for lifting a power-driven hammer 14 or the like. The downward motion of a telescopic piston 16 in a vertically disposed cylinder 18 transmits a lifting motion through cable means 20 and pulley means 21, 22 and 23 to the movable inner and outer sleeves of the mast. As shown in the figures the movable outer sleeve 24 supports and carries the power-driven hammer and telescopes over the movable inner sleeve 26 which telescopes over the cylinder.

FIGS. 1 and 2 show the lifting mechanism 10 in use wherein the adjustable and collapsible mast 12 lifts the power-driven hammer 14 to a desired height for driving a ground rod 28. However, it is important to note that the lifting mechanism is adapted to lift a variety of objects or devices and is not restricted to merely lifting a power-driven hammer. The movable outer sleeve 24 which supports and carries the power-driven hammer may instead support lifting tongs, lifting magnets or a grab bucket or the like.

The power-driven hammer 14 shown in FIGS. 1 and 2 is electric, however, it may be a gas or air driven hammer. A plurality of adapters which fit into a yoke 30 in the head of the hammer make it possible to drive a variety of objects such as the ground rod shown or fence posts, highway delineators, water well sand points, stakes or pipes.

The hammer may be driven by an engine 32 and generator 34 mounted on a mobile platform 36. The engine may also drive a hydraulic or similar fluid pressure unit 38 which raises and lowers the piston 16 in the vertically disposed cylinder 18. The engine and generator including a fluid pressure unit are carried on the mobile platform 36 which may be a trailer or the bed of a truck.

FIG. 1 shows the hammer 14 in a vertically raised position. The weight of the fluid pressure unit 38 plus the weight of the engine 32 and generator 34 keep the mechanism from tipping. A jack 42 at the front of the platform 36 helps support the platform and also facilitates adjustment for uneven terrain.

FIG. 2 shows the adjustable mast 12 in an inclined position. The inclined position of the mast is adapted to correct for uneven terrain and allows the mast 12 to be at substantially right angles to the ground, which is the desired position when driving objects into the ground.

FIGS. 3 and 4 show the lifting mechanism 10 in more detail. The piston 16 is attached to a piston rod 44 in the vertically disposed cylinder 18 and is moved up and down in a conventional manner by a compressed fluid delivered through a hydraulic line 45 shown in FIGS. 1, 2 and 3. The movable sleeve 24 may have a bracket 46 for supporting the power-driven hammer or the like.

The cable means 20 is fixed at 48 to the inner sleeve 26 and at 50 to the outer sleeve 24. The cable means is also preferably fixed intermediate its ends to the cylinder 18 as at 52. The cable means 20 passes around a pulley means connected to the piston shown at 22. In addition the cable means preferably passes around pulley means located at the top of the cylinder and at the top of the movable inner sleeve shown respectively at 21 and 23.

This arrangement of parts and members transmits a lifting motion from the downward moving piston 16 to the movable inner sleeve 26 and movable outer sleeve 24 thereby lifting the hammer or similar object to a desired height. It should be pointed out that a single downward movement of the piston 16 raises both the inner and outer sleeves to their fullest extension as shown in FIG. 1.

3

In addition it should be noted that the distance between the pulley means 21 on the cylinder 18 and the end of the cable means fixed at 48 is greater than the distance the movable inner sleeve rises during downward movement of the piston. Also the distance between the pulley means 23 on the movable inner sleeve 26 and the end of the cable means fixed at 50 is greater than the distance the movable inner sleeve rises during downward movement of the piston.

It should further be noted that the cable means 20 is shown in FIGS. 3 and 4 as a chain while the pulley means 21, 22 and 23 are shown as sprockets. However, the cable means may be a belt or rope or similar cable means and the pulley means may be a grooved wheel or sheave or the like.

The axial movement of the inner sleeve 26 along the cylinder 18 and the axial movement of the outer sleeve 24 along the inner sleeve 26 are preferably guided by a plurality of guide rods 54 shown in FIGS. 4 and 5. As best shown in FIG. 5 three guide rods 54a are placed axially along the outside diameter of the cylinder 18 at approximately 120° apart. Each of these rods 54a fit between and are in working engagement with a plurality of guide rods 54b placed axially along the inside diameter of the inner sleeve 26. When the downward moving piston 16 causes the inner sleeve 26 to move up the cylinder 18 the guide rods keep the inner sleeve in proper alignment.

In a like manner the axial movement of the outer sleeve 24 along the inner sleeve 26 may be guided by 3 guide rods 54c placed axially along the inside diameter of the outer sleeve. Each of these rods 54c are in working engagement or working contact with three pairs of adjacently placed guide rods 54d on the outside diameter of the inner sleeve 26 thereby keeping the movable outer sleeve 24 in proper alignment.

FIG. 3 includes a side view of the mechanism 56 for vertically adjusting the mast 12. FIG. 6 is a top view of this mechanism. The mechanism 56 includes an adjustable plate 58 having an aperture 60 for receiving the base of the cylinder 18. A pair of elongated slots 62 in the plate 58 and a pair of elongated slots 63 in a bracket 64 receive appropriate fasteners 65 and allow for horizontal adjustment of the plate. The plate 58 is attached to the frame of the mobile platform 36 by the bracket 64 which also supports a channel-shaped member 68 depending from the bottom of the bracket.

The channel-shaped member 68 is best shown in FIG. 7 and is pin or bolt connected at 70 to the base of the cylinder allowing for pivotal movement of the mast 12 about the axis of the pin or bolt 70. An appropriate connection 72, such as a machine bolt, between the channel-shaped member 68 and the bracket 64 allows the channel-shaped member to rotate about the axis of the connecting member 72.

The mechanism 56 for vertically adjusting the mast 12 allows the mast to obtain the inclined position shown in FIG. 2 thereby correcting for uneven terrain and allowing substantially vertical hammer drive.

FIG. 8 shows a modification for this invention wherein a spring 74 is mounted around a pair of depending members 76 supporting a pulley means 78. A pin 80 attaches the depending members 76 to the piston rod 44 and projects beyond the coils of the spring 74. This configuration allows the pulley means 78, such as the grooved wheel shown, to be flexible while reducing the vibration caused by the reciprocating piston 16.

The use, operation and function of this invention are as follows:

The lifting mechanism 10 has been shown lifting a power-driven hammer for driving ground rods or the like to a desired depth. However, as mentioned, this invention may be used to lift a variety of objects and devices.

The use of the lifting mechanism 10 is fast, safe and economical. One or two men may operate the unit, in-

4

cluding moving and setup. In addition the operator remains at ground level at all times. Further, the lifting mechanism may be easily towed behind a passenger vehicle or light truck at reasonable highway speeds.

In operation a single downward movement of the piston 16 raises the collapsible mast 12 to its maximum extension as shown in FIG. 1. The mechanism 56 for vertically adjusting the mast 12 permits the mast to tilt and correct for uneven ground allowing for substantially vertical hammer drive.

In addition it should be pointed out that the lifting mechanism 10 would operate just as efficiently if the cable means 20 consisted of two separate cable members with the ends of the first cable member fixed respectively to the movable inner sleeve 26 and the cylinder 18 and the ends of the second cable member fixed respectively to the movable outer sleeve 24 and the cylinder 18. The first cable member would pass around a pulley means connected to the cylinder 18 and a pulley means connected to the reciprocating piston 16 and the second cable member would pass around a pulley means connected to the movable inner sleeve 26.

I claim:

1. A lifting mechanism having an adjustable and collapsible mast including:

a piston attached to a piston rod and vertically disposed in a cylinder,
a passage for feeding compressed fluid into the cylinder for moving the piston up and down,

a movable inner sleeve telescoping over the cylinder,
a movable outer sleeve telescoping over the movable inner sleeve,

a cable means fixed at one end to the inner sleeve and at the other end to the outer sleeve and fixed intermediately to the cylinder, and

said cable means passes around a pulley means connected to the piston thereby transmitting a lifting motion from the reciprocating piston to the movable inner and outer sleeves.

2. The structure of claim 1 further characterized in that a single downward movement of the piston raises both the inner and outer sleeves to their maximum extension.

3. The structure of claim 1 further characterized in that the cable means passes additionally around a pulley means connected to the cylinder and a pulley means connected to the movable inner sleeve.

4. The structure of claim 3 further characterized in that the cable means is intermediately fixed to the cylinder between the pulley means connected to the piston and the pulley means connected to the movable inner sleeve.

5. The structure of claim 3 further characterized in that the distance between the pulley means on the cylinder and the end of the cable means fixed to the movable inner sleeve is greater than the distance the movable inner sleeve rises during downward movement of the piston.

6. The structure of claim 3 further characterized in that the distance between the pulley on the movable inner sleeve and the end of the cable means fixed to the movable outer sleeve is greater than the distance the inner sleeve rises during downward movement of the piston.

7. The structure of claim 1 further characterized in that the cable means consists of two separate cable members with the ends of the first cable member fixed respectively to the movable inner sleeve and the cylinder and the ends of the second cable member fixed respectively to the movable outer sleeve and the cylinder and further, the first cable member passes around a pulley means connected to the cylinder and a pulley means connected to the reciprocating piston and the second cable member passes around a pulley means connected to the movable inner sleeve.

8. The structure of claim 1 further characterized in that the axial movement of the inner sleeve along the cylinder is guided by a working engagement between a

5

plurality of guide rods extending axially along the outside diameter of the cylinder and a plurality of adjacently positioned guide rods extending axially along the inside diameter of the movable inner sleeve.

9. The structure of claim 1 further characterized in that the axial movement of the outer sleeve along the inner sleeve is guided by a working engagement between a plurality of guide rods extending axially along the outside diameter of the inner sleeve and a plurality of adjacently positioned guide rods extending axially along the inside diameter of the outer sleeve.

10. The structure of claim 1 further characterized by and including a mechanism for vertically adjusting the mast so that it is at substantially right angles to the ground to compensate for uneven terrain.

11. The structure of claim 10 further characterized in that the mechanism for vertically adjusting the mast includes a means for allowing pivotal movement of the mast and further includes a means for supporting the mast in an inclined position.

6

12. The structure of claim 1 further characterized in that the lifting mechanism is carried on a mobile platform containing power driving equipment and further that the movable outer sleeve supports a power-driven hammer for driving ground rods, stakes, posts, or the like to a desired depth.

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