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ANCHOR APPARATUS

Filed March 31, 1960

FIG. 1.

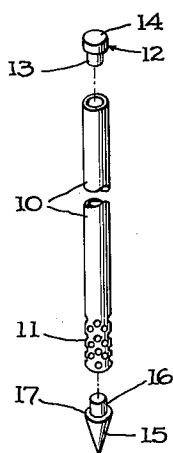


FIG. 3.

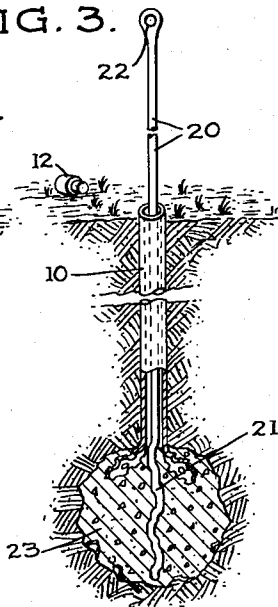


FIG. 2.

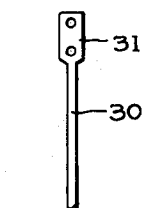
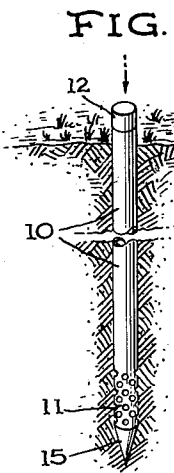


FIG. 4.

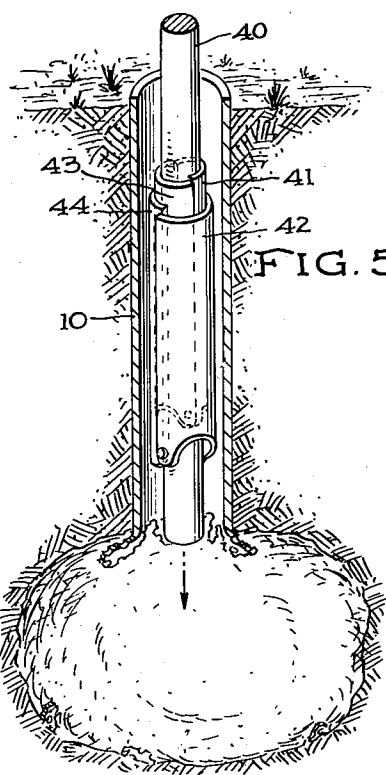


FIG. 5.

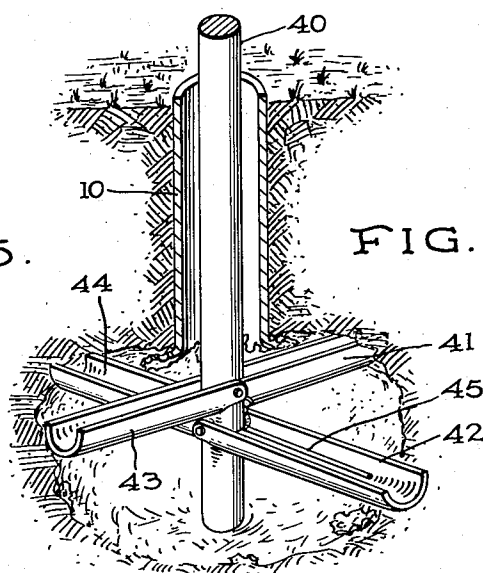


FIG. 6.

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ANCHOR APPARATUS

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The present invention relates to anchor apparatus and has particular reference to an improved ground anchor driver and rod which may be placed in the ground without the preliminary preparation involved in digging a hole in the earth.

Means for anchoring wires and supporting the weight of such above ground structures as signs, mail boxes, posts and a variety of other structures, are quite necessary and widely used.

A simpler and less expensive way of inserting these ground anchors is very desirable when the extensive use that is made of this type of apparatus is considered.

Accordingly, the present invention is directed to an apparatus which may be inserted in the earth without prior digging and the accompanying loosening of the ground which would tend to weaken the holding power of the ground and thus lessen its ability to support an anchoring apparatus.

Basically, the invention provides a novel and improved means of producing a cavity to hold a ground anchor by sinking a hollow steel tube into the ground and thereafter lowering the anchor into place through this hollow tube.

Accordingly, the present invention is directed to the use of a hollow tube utilizing an explosive charge in its base to produce the required cavity for containing the ground anchor against the forces tending to free it from the earth.

Furthermore, this invention discloses several examples of different types of ground anchors that can be used as part of this novel device.

Other objects and advantages inherent in the invention will become apparent from the following description, reference being had to the accompanying drawings, of which:

FIG. 1 shows the driving tube and its component parts used for insertion of a ground anchor in the earth;

FIG. 2 shows the driving tube in position after being hammered into the ground;

FIG. 3 shows one type of anchor inserted through the driving tube and ready for use;

FIG. 4 shows a different head for a similar type of anchor;

FIG. 5 shows an expandable type of anchor being inserted through the driving tube; and

FIG. 6 shows this same type of anchor in its expanded position in the earth.

Referring first to FIGS. 1 and 2, there is illustrated a hollow driving tube 10, preferably of steel in order to have a maximum structural strength, with its lower end 11 perforated with many small holes. A driver 12 is a solid piece of steel with lower end 13 shaped to fit down into the upper end of hollow tube 10 and a flat end 14 shaped thusly to receive the blows of a hammer or other similar acting device. This allows tube 10 to be driven into the earth without battering the tube. When tube 10 has been inserted in the ground to the required depth, driver 12 is then easily removed. A driving point 15 of solid steel has one end 16 with a small enough diameter to enable it to fit into the bottom end of hollow tube 10 and an outer circumferential section 17 with a diameter the same or greater than the outside diameter of tube 10, thereby enabling the downward force applied to driver 12 to be transmitted along the sides of hollow tube 10 to

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driving point 15 and thereby facilitate the driving of tube 10 into the ground.

Anchor rod 20, shown in FIG. 3, which is one of the types of anchor rods which may be used with this type of driving tube, has a ridged undulated end 21. This type end 21 of anchor rod 20 is found most useful when it is planned to use concrete 23 for additional strength of anchorage in the earth at the base of rod 20. The eye loop 22 on the opposite end of rod 20 may be used for stringing of wire.

FIG. 4 discloses the top part of an anchor rod 30, similar to the type shown in FIG. 3 except that the upper end 31 of anchor rod 30 is adapted for attachment of a steel rod or tube. Most other types of anchor rod tops are adaptable for use here although only two examples are shown.

In use, hollow driving tube 10 with driver 12 inserted at its top and driving point 15 inserted at perforated end 11 is driven into the earth. After the required depth is reached, depending upon driver tube and anchor rod length, and the amount of strength of anchorage needed, driver 12 is removed. An explosive charge (not shown) is then lowered down through hollow tube 10 into the perforated end 11. The explosive charge is then detonated and the resulting explosion forces out driving point 15 and creates a large cavity at the base of the driving tube 10. The perforated section 11 either allows for the escape of some of the explosive force and gases through the holes therein, thereby diverting explosive power from the open top and expelling it where it will accomplish the most work, or if made more fragile, section 11 will shatter outward as shown in FIGS. 3, 5, and 6. A mixture of concrete 23 is then poured down through driving tube 10 into the cavity formed at its base. This concrete mixture 23 is poured and tamped down until it completely fills the cavity. Either anchor rod 20 of FIG. 3 or its modified form, anchor rod 30 of FIG. 4, is then pushed down through driving tube 10 into the concrete mixture 23 at its base. The concrete mixture 23 is then allowed to set and hold the ridged, undulated end 21 of anchor rod 20 or anchor rod 30. An anchor wire is then attached to anchor rod eye loop 22 or a metal tube can be attached to end 31 for attachment of some above ground structure, such as a post.

At times it is not desirable to fill with concrete the cavity formed by the detonation of the explosive charge at the base of driver rod 10. In such cases, an anchor rod with a different base structure is conveniently used. A type of anchor, such as anchor rod 40 with its upper end formed either as eye loop 22 or end 31 and its bottom end, as shown in FIGS. 5 and 6, may be used. FIG. 5 shows this modified form of anchor rod 40 in a closed position as it is being inserted through driver tube 10 into the cavity in the earth formed at the base of tube 10. Arms 41, 42, 43 and 44 in FIG. 5 are shown as folded up along the side of anchor rod 40 but upon leaving the end of driver tube 10, and entering the cavity below, a spring action 45 which has been built into the hinged arms 41, 42, 43 and 44 causes these arms to extend outward in a position perpendicular to the long axis of anchor rod 40, as shown in FIG. 6. In this position any force tending to pull the anchor rod 40 back up toward the surface is opposed, thereby providing firm anchorage without the use of a concrete mixture or any similar substance.

It will thus be apparent that this anchor apparatus can be used more expeditiously than present anchoring equipment now in use with an elimination of the time and expense involved in digging the necessary holes for insertion of anchor rods.

Furthermore, it should be noted that any type of anchor rod capable of passing its ground inserted end through a driver tube may be used in this invention. Nor

is there any size limitation placed on the driver tube, since it may just as well be driven by hand hammers as well as massive pile driving equipment.

It will be obvious to those skilled in the art that various changes may be made without departing from the spirit of the invention and, therefore, the invention is not limited to what is shown in the drawings and described in the specification, but only as indicated in the appended claims.

I claim:

1. A method of positioning an anchor rod in the ground comprising lowering a hollow tube with a loose fitting plug attachment inserted in its lower end into the ground, inserting an explosive charge into the bottom of said hollow tube through its top end, detonating the explosive charge thereby forming a cavity below the end of said hollow tube and lowering an anchor rod through said hollow tube so that the lower end of said anchor rod reaches into the cavity formed during said detonating of the explosive charge whereby said anchor rod is enabled to maintain firm anchorage in the earth.

2. A method of positioning an anchor rod in the ground comprising lowering a hollow tube with a pointed loose fitting plug attachment inserted in its lower end into the ground, inserting an explosive charge into the bottom of said hollow tube through its top end, detonating the explosive charge thereby blowing out said plug attachment and forming a cavity below the end of said hollow tube, lowering an expandable anchor rod through said hollow tube so that the lower end of the expandable anchor rod reaches into the cavity formed during said detonating of the explosive charge, and releasing the expandable part of the anchor rod to its expanded position whereby said anchor rod is enabled to maintain firm anchorage in the earth.

3. A method of positioning an anchor rod in the ground comprising lowering a hollow tube with a loose fitting plug attachment inserted in its lower end into the ground, inserting an explosive charge into the bottom of said hollow tube through its top end, detonating the explosive charge thereby blowing out said plug attachment and forming a cavity below the end of said hollow tube, pouring a concrete mixture into said hollow tube, lowering an anchor rod through said hollow tube partially into the concrete mixture so that the lower end of said anchor rod reaches into the cavity formed during said detonating of the explosive charge and containing the concrete mixture, and allowing the concrete mixture to set whereby said anchor rod is enabled to maintain firm anchorage in the concrete base in the earth.

4. A method of positioning an anchor rod in the ground comprising inserting a fitted flat-head plug in the end of a hollow tube with a pointed loose fitting plug attachment inserted in its opposite end, hammering on said flat-headed plug thereby forcing said pointed plug attachment and said hollow tube into the ground, removing said flat-headed plug from said hollow tube thereby opening that end of said hollow tube, inserting an explosive charge into the bottom of said hollow tube through its open end, detonating the explosive charge thereby forming a cavity below the end of said hollow tube, and lowering an anchor rod through said hollow tube so that the lower end of said anchor rod reaches into the cavity formed during said detonating of the explosive charge whereby said anchor rod is enabled to maintain firm anchorage in the earth.

5. A method of positioning an anchor rod in the ground comprising inserting a fitted flat-headed plug in the end of a hollow tube with a pointed loose fitting plug attachment inserted in its opposite end, hammering on said flat-headed plug thereby forcing said pointed plug attachment and said hollow tube into the ground, removing said flat-headed plug from said hollow tube thereby opening that end of said hollow tube, inserting an explosive charge into the bottom of said hollow tube through its open end, detonating the explosive charge thereby blowing out said plug attachment and forming a cavity below the end of

said hollow tube, pouring a concrete mixture into said hollow tube, tamping said concrete mixture to pack it into the cavity, lowering an anchor rod through said hollow tube into the concrete mixture so that the lower end of said anchor rod reaches into the cavity formed during said detonating of the explosive charge and containing the concrete mixture, and allowing the concrete mixture to set whereby said anchor rod is enabled to maintain firm anchorage in the concrete base in the earth.

6. A method of positioning an anchor rod in the ground comprising inserting a fitted flat-headed plug in the end of a hollow tube with a pointed loose fitting plug attachment inserted in its opposite end, hammering on said flat-headed plug thereby forcing said pointed plug attachment and said hollow tube into the ground, removing said flat-headed plug from said hollow tube thereby opening that end of said hollow tube, inserting an explosive charge into the bottom of said hollow tube through its open end, detonating the explosive charge thereby blowing out said plug attachment and forming a cavity below the end of said hollow tube, lowering an expandable anchor rod through said hollow tube so that the lower end of the expandable anchor rod reaches into the cavity formed during said detonating of the explosive charge, releasing the expandable part of the anchor rod to its expanded position, and exerting an upward force on the anchor rod thereby forcing the expanded section firmly against the upper part of the cavity in the earth whereby said anchor rod is enabled to maintain firm anchorage with no further movement.

7. Ground anchoring apparatus comprising a hollow tube adapted to receive a removable plug on its upper end when said hollow tube is being positioned in the ground, a jagged, shattered, perforated, and radially expanded section at the lower end of said hollow tube as is produced by firing an explosive charge in a perforated section, an anchor rod extending through said hollow tube, and a hinged arm on one end of said anchor rod whereby said hinged arm assumes an expanded position thereby resisting any force tending to pull said anchor rod out of the ground.

8. Ground anchoring apparatus comprising a hollow tube, a jagged, shattered, perforated, and radially expanded section at one end of said hollow tube, an anchor rod extending out of both ends of said hollow tube, a plurality of hinged arms on one end of said anchor rod whereby said hinged arms assume an expanded position preventing withdrawal of said anchor rod through said hollow tube.

9. Ground anchoring apparatus for the support of a structure comprising a hollow tube, a jagged, shattered, perforated, and radially expanded end on the lower section of said hollow tube, and an anchor rod extending through said hollow tube.

10. The ground anchoring apparatus of claim 9 further characterized by said anchor rod having an expandable section.

11. Ground anchoring apparatus for the support of a structure comprising a hollow tube, a jagged, shattered, perforated, and radially expanded end on the lower section of said hollow tube, and an anchor rod extending through said hollow tube, one end of said anchor rod having means to attach to the structure to be supported and the other end of said anchor rod having means to prevent its withdrawal through said hollow tube.

12. Ground anchoring apparatus for the support of a structure comprising a hollow tube adapted to receive a removable driver plug on its upper end when said hollow tube is being positioned in the ground, a jagged, shattered, perforated, and radially expanded end on the lower section of said hollow tube, and an anchor rod extending through said hollow tube, one end of said anchor rod having means to attach to the structure to be sup-

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