

[54] GROUND ANCHOR APPARATUS

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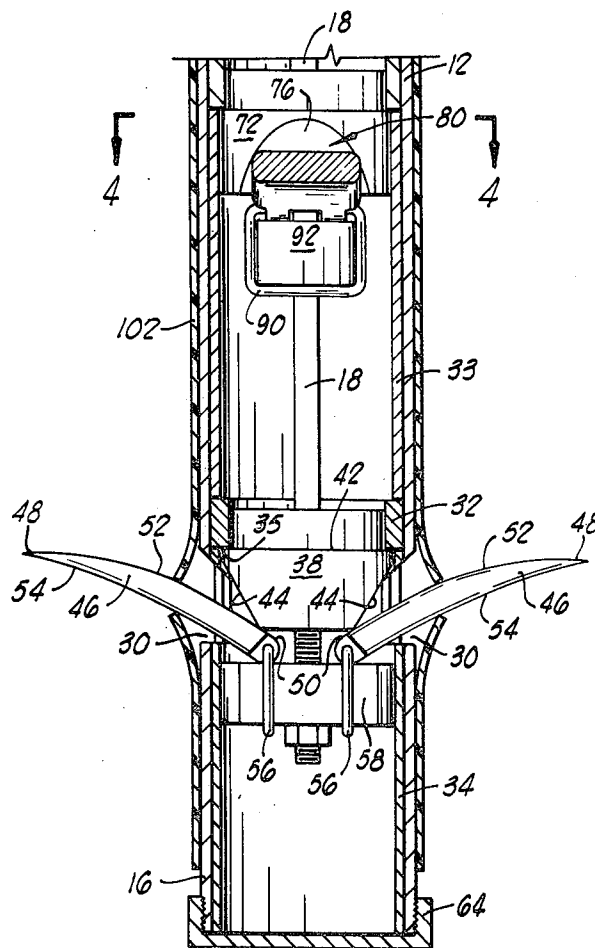
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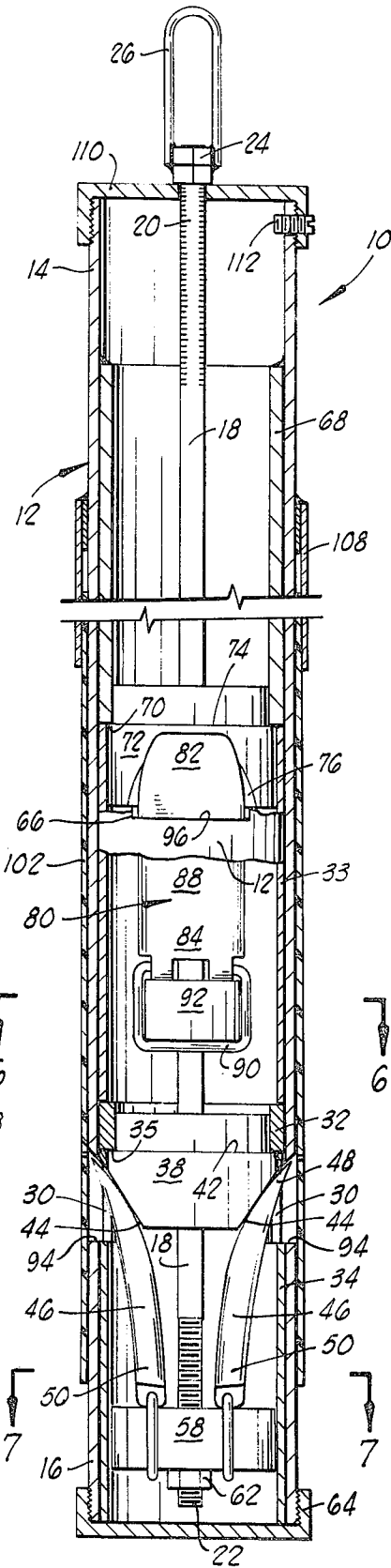
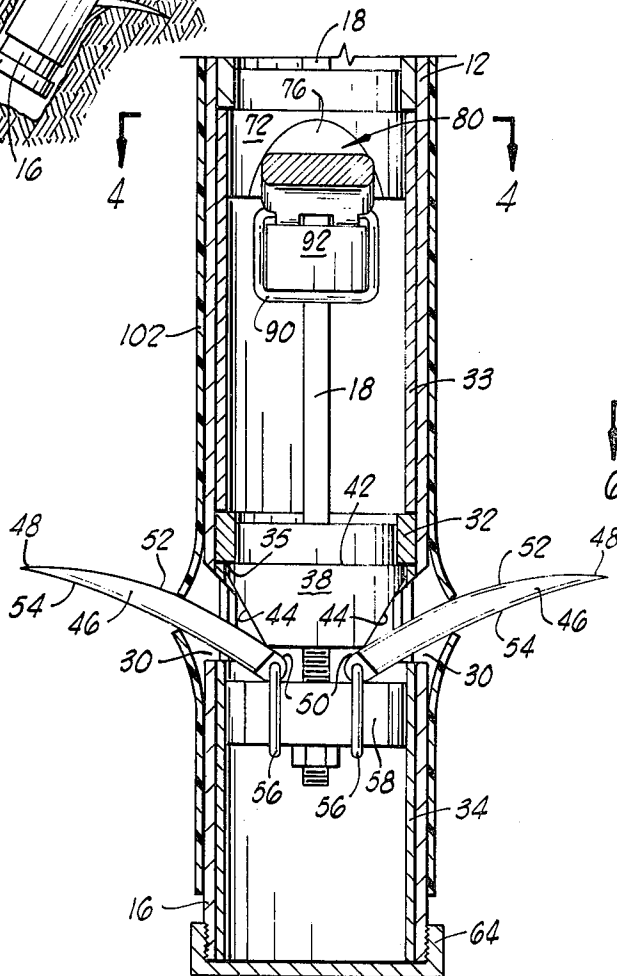
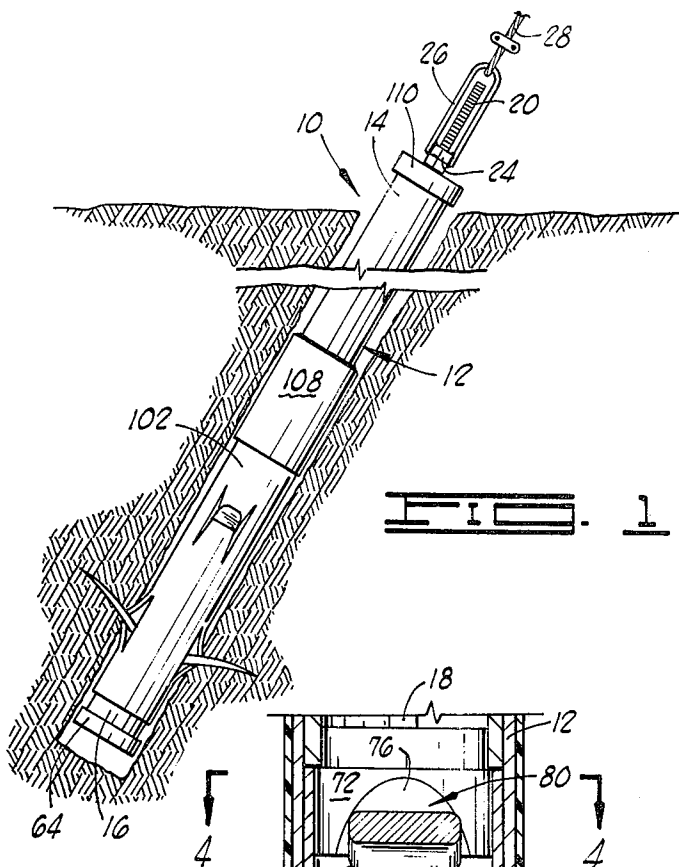
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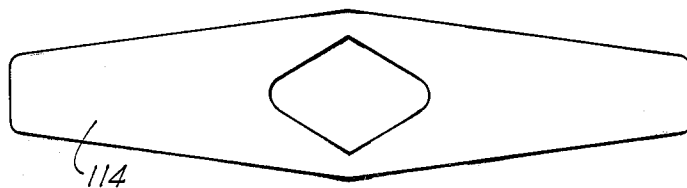
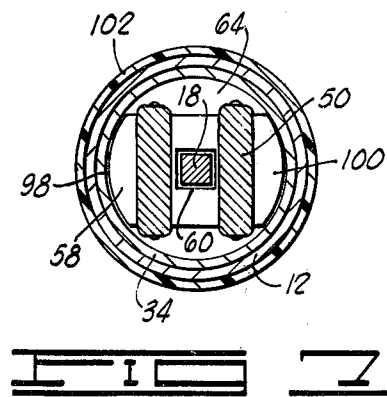
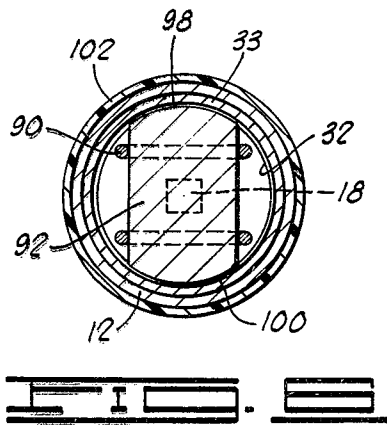
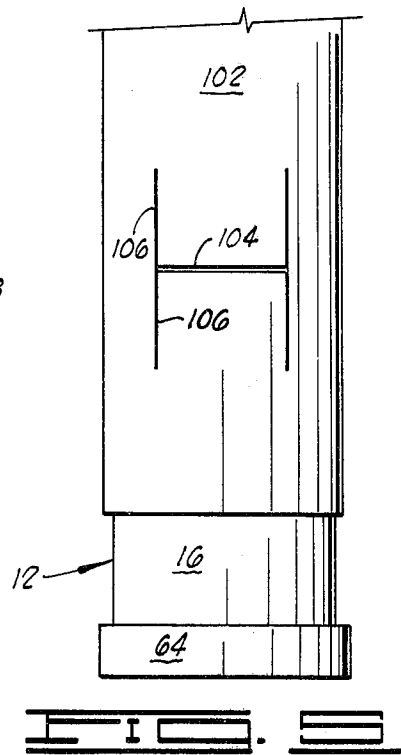
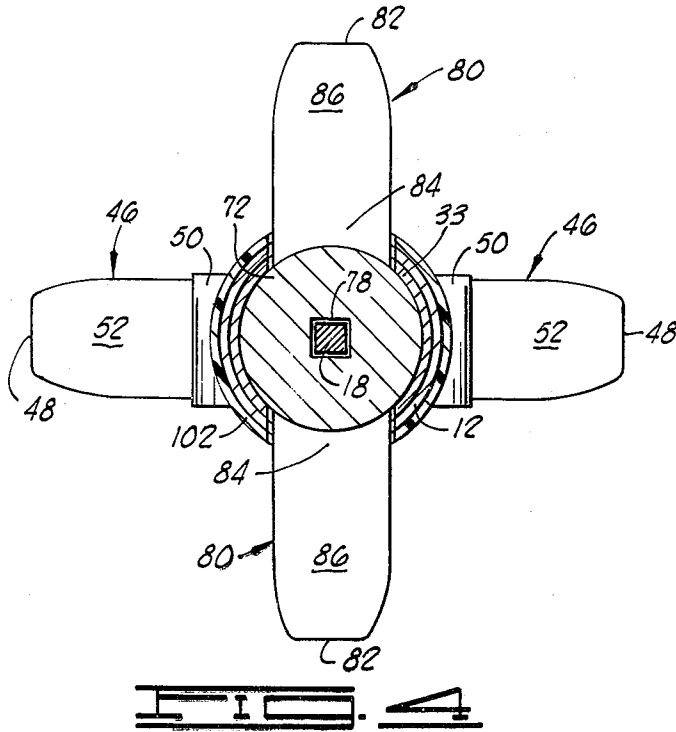
[57] ABSTRACT

An improved ground anchor apparatus which includes an elongated tubular housing having a pair of oppositely facing slots disposed in the sides thereof. An elongated shaft is positioned axially within the housing and a cam block is secured therein adjacent the first pair of slots. The cam block includes an axial opening through which the shaft is slidably disposed and a pair of oppositely facing cam surfaces are provided on a lower portion thereof. A first pair of oppositely facing flukes are disposed within the housing below the cam block positioned to contact the cam surfaces of the cam block and extend through the slots in the housing upon the upward movement thereof. Means for movably connecting the flukes to the shaft are provided so that when the shaft is moved axially upward within the housing, the flukes are each caused to contact one of the cam surfaces of the cam block and extend through the slots upwardly and radially outwardly from the housing.

23 Claims, 8 Drawing Figures







GROUND ANCHOR APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to a ground anchor apparatus, and more particularly, but not by way of limitation, to an improved ground anchor apparatus having two or more flukes which can be selectively extended or retracted therefrom.

2. Description of the Prior Art

Many various ground anchor apparatus have been developed and used heretofore which include extendible flukes or prongs. After inserting such an anchor apparatus into the ground the flukes or prongs are extended into undisturbed earth adjacent the apparatus so that the resulting anchor can resist forces tending to pull it out of the ground. While these prior extendible fluke and prong anchor apparatus have been generally successful in achieving a good anchor once installed, extending the flukes or prongs when installing the apparatus is often difficult, and when it is desired to remove the apparatus from the ground, the flukes or prongs thereof either cannot be retracted or are difficult and time-consuming to retract. Further, such prior apparatus often become clogged with dirt whereby the flukes or prongs become jammed and cannot be retracted. In using the anchor apparatus to anchor mobile homes, trailers, campers and the like which are moved from place to place with regularity, the difficulty in installing and removing the apparatus from the ground becomes an acute problem.

By the present invention, an improved ground anchor apparatus is provided which is particularly suitable for temporarily anchoring trailer houses and the like in that the apparatus includes flukes which can quickly and easily be extended or retracted, the apparatus will not readily become filled with or clogged with dirt, and the apparatus can be quickly and easily assembled and disassembled for cleaning and maintenance.

SUMMARY OF THE INVENTION

The present invention relates to a ground anchor apparatus comprising an elongated tubular housing having a first pair of oppositely facing slots disposed in the sides thereof and an elongated shaft positioned axially within the housing. A first cam block is secured within the housing above the first pair of slots which includes an axial opening through which the shaft is slidably disposed and a pair of oppositely facing cam surfaces on a lower portion thereof. A first pair of oppositely facing flukes are disposed within the housing below the cam block positioned to contact the cam surface thereof and extend through the first pair of slots upon the upward movement of the flukes. Means are provided for movably connecting the flukes to the shaft so that when the shaft is moved axially upward within the housing, the flukes are caused to contact the cam surfaces of the cam block and extend radially outwardly from the housing through the slots.

It is, therefore, a general object of the present invention to provide an improved ground anchor apparatus.

A further object of the present invention is the provision of a ground anchor apparatus including flukes which can be readily and easily extended into undisturbed ground surrounding the apparatus and retracted therefrom.

Another object of the present invention is the provision of a ground anchor apparatus which can be simply and easily installed and removed from the ground and which will not readily clog with dirt or corrode.

Yet a further object of the present invention is the provision of an improved ground anchor apparatus which can be readily and easily assembled and disassembled for cleaning, repair and/or maintenance.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the apparatus of the present invention shown installed in the ground with the flukes thereof extended;

FIG. 2 is a side elevational view of the apparatus taken in cross-section with the flukes retracted;

FIG. 3 is a partial sectional view of the apparatus with the flukes extended;

FIG. 4 is a sectional view taken along line 4—4 of FIG. 3;

FIG. 5 is a partial elevational view of the apparatus with the flukes retracted;

FIG. 6 is a sectional view taken along line 6—6 of FIG. 2;

FIG. 7 is a sectional view taken along line 7—7 of FIG. 2; and

FIG. 8 is a plan view of a wrench which can be usefully employed in setting the ground anchor apparatus of the invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings, and particularly to FIGS. 1 through 3, the apparatus of the present invention is illustrated and generally designated by the numeral 10. The apparatus 10 includes an elongated tubular housing 12 having an upper end 14 and a lower end 16. An elongated shaft 18 having threaded upper and lower ends 20 and 22 respectively is axially disposed within the housing 12. A nut 24 which includes a link 26 welded thereto is threaded onto the upper end 20 of shaft 18. As will be understood, in use of the apparatus 10, the link 26 is connected to a rope of cable 28 (FIG. 1).

The housing 12 includes a first pair of oppositely facing slots 30 disposed in opposite sides thereof. A lock ring 32 is held within the housing 12 by an upper internal sleeve 33 and a lower internal sleeve 34. The lock ring 32 has a smaller inside diameter than the sleeves 33 and 34 so as to present an exposed, downwardly facing annular shoulder 35. The lock ring 32 may be attached within the housing 12 in any suitable manner, but it is preferred that the lock ring 32 and the sleeves 33 and 34 be removable through the bottom of the housing 12 in order to facilitate the assembly and disassembly of the apparatus 10 as will be described further hereinbelow. Preferably, the housing 12 and lock ring 32 are cylindrical with the lock ring 32 being removably positioned within the housing 12 by means of the sleeves 33 and 34.

Positioned below the lock ring 32 within the housing 12 is a first cam block 38 which is also preferably generally cylindrical in shape and includes an axial opening therein through which the shaft 18 is slidably disposed. The shaft 18 and the opening 40 in the cam block 38 are square in cross-section with the opening 40 being slightly larger than the shaft 18 to allow free vertical movement of the shaft 18 therethrough, but preventing relative rotation between the cam block 38 and shaft 18. The cam block 38 includes an annular relief around

the top portion thereof for centering the cam block 38 in the housing 12 within the lock ring 32 and providing an upwardly facing shoulder 42 which matingly engages the downwardly facing shoulder 35 of the lock ring 32, thereby preventing upward movement of the cam block 38 within the housing 12.

The lock ring 32 and cam block 38 are conveniently formed of two-piece construction so that the cam block 38 can be readily removed and replaced without the necessity of unthreading or otherwise removing the lock ring 32 from the inside of the housing 12. However, the lock ring 32 and cam block 38 may be formed as an integral part removably positioned within the housing 12.

The cam block 38 further includes a pair of oppositely facing cam surfaces 44 on the lower portion thereof. The cam surfaces 44 are preferably flat diagonal surfaces formed on opposite sides of the cam block 38 as shown in FIGS. 2 and 3. However, the lower portion of the cam block 38 may be formed in the shape of an inverted cone to provide the required oppositely facing diagonal cam surfaces thereon.

A first pair of oppositely facing flukes 46 is disposed within the housing 12 below the cam block 38. Each of the flukes 46 includes an upper sharpened end 48 and a lower end 50. Preferably, the flukes 46 are of an arcuate configuration and include a convex upper surface 52 and a concave lower surface 54.

The flukes 46 are positioned within the housing 12 so that the sharpened ends 48 are adjacent the slots 30 and the upper convex surfaces 52 thereof are adjacent the cam surfaces 44 of the cam block 38. Referring specifically to FIG. 2, the flukes 46 are illustrated disposed within the housing 12 in the retracted position. In this position, the upper ends 48 of the flukes 46 extend upwardly and outwardly and terminate within the slots 30. As shown in FIGS. 2, 3 and 7, the lower ends 50 of the flukes 46 are rotatably attached to a pair of link members 56 which are slidably disposed around opposite ends of a generally rectangular block 58. The block 58 includes a square axial opening 60 disposed therein through which the lower end 22 of the shaft 18 extends, and a conventional nut 62 is threaded on the shaft 18 for maintaining the block 58 in the illustrated position. The inside dimensions of the link members 56 are slightly larger than the transverse dimension of the block 58 so that the link members can slide thereon and can be easily removed therefrom when the block 58 is removed from the housing 12. The opposite ends of the block 58 are, however, preferably rounded to fit snugly in the cylindrical housing 12 and thus assure retention of the link members 56 when the anchor is assembled as shown. The lower end 16 of the housing 12 includes a cover 64 threadably or otherwise removably attached thereto.

Referring now to FIGS. 2 through 4, and as shown best in FIG. 4, the housing 12 includes a second pair of oppositely facing slots 66 disposed therein which are identical to the first pair of slots 30 except that the slots 66 are rotated 90° around the axis of the housing 12 from the slots 30. An upper sleeve 68 is rigidly attached within the housing 12 above the slots 66. The sleeve 68 can be formed as an integral part of the housing 12, or it can be secured therein in a conventional manner. The sleeve 68 includes a downwardly facing shoulder 70, which, in the preferred form of the present invention, is annular in shape. A second cam block 72 identical to the cam block 38 is disposed in the housing 12

below the sleeve 68 adjacent the slots 66. The cam block 72 includes an annular recess around the upper portion thereof for centering the cam block 72 within the housing, and for providing an upwardly facing shoulder 74 which matingly engages the downwardly facing shoulder 70 of the sleeve 68, thereby preventing upward movement of the cam block 72 in the housing 12. A pair of oppositely facing cam surfaces 76 are provided on the lower portion of the cam block 72, which in the preferred form, are flat oppositely facing diagonal surfaces. A square axial opening 78 is provided in the cam block 72 through which the square shaft 18 is slidably disposed.

A second pair of flukes 80, identical to the flukes 46, are disposed within the housing 12 below the cam block 72 and each includes an upper sharpened end 82 and a lower end 84. Like the flukes 46, the flukes 80 are of arcuate configuration and include an upper convex surface 86 and a lower concave surface 88. When in the retracted position as shown in FIG. 2, the upper convex surfaces 86 of the flukes 80 are adjacent the cam surfaces 76 of the cam block 72. The lower ends 84 of the flukes 80 are rotatably attached to link members 90 which are in turn slidably disposed over opposite ends of a generally rectangular block 92 which is made solid with the shaft 18. The shape of the block 92 is substantially identical to that of the block 58. The blocks 58 and 92 preferably have a transverse width which is substantially the same as the width of the flukes 80 and 46.

As will be described further, when the shaft 18 is moved axially upward within the housing 12 the flukes 46 and 80 are moved upwardly by the blocks 58 and 92 and are caused to be extended upwardly and outwardly through the slots 30 and 66 from the housing 12 as shown in FIG. 3. The slots 30 and 66 are formed in the housing 12 so that upwardly facing surfaces 94 and 96, respectively, are provided which contact the lower concave surfaces 54 and 88 of the flukes 46 and 80 respectively when the flukes are in the extended position. When the shaft 18 and flukes are moved axially downward within the housing 12, the upwardly facing surfaces 94 and 96 of the slots 30 and 66 bear on the downwardly facing surfaces 54 and 88 of the flukes causing the flukes to be retracted into the housing 12.

The flukes 46 and 80 and the blocks 58 and 92 are positioned on the shaft 18 in line with the slots 30 and 66 respectively, i.e., the block 92 and flukes 80 are rotated 90° relative to the block 58 and flukes 46. The blocks 58 and 92 are identical in shape, and as best shown in FIGS. 6 and 7, are formed so that the ends 98 and 100 thereof respectively fit closely to the inside surfaces of the housing 12. As previously mentioned, in the preferred form of the invention wherein the housing 12 is cylindrical in shape, the ends 98 and 100 of the blocks 58 and 92 are curved to fit closely against the inside curved sides of the housing 12. The close fit of the ends 98 and 100 of the blocks 58 and 92 prevents the link members 56 and 90 from sliding off the blocks when the apparatus 10 is assembled.

A dirt cover 102 is slidably disposed over the outside of the housing 12. The dirt cover 102 is preferably formed of a flexible material, such as plastic, and includes horizontal slits 104 positioned to lie adjacent each of the slots 30 and 66 disposed in the housing 12. Preferably, and as best shown in FIG. 5, the dirt cover 102 also includes vertical slits 106 which intersect the ends of the slits 104 so that when the flukes 46 and 80

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are extended through the slots 30 and 66 of the housing 12 and through the slits 104 of the dirt cover 102, portions above and below the slits 104 defined by the slits 106 are free to move slightly outwardly.

The extension and retraction of the flukes 46 and 80 causes the dirt cover 102 to move vertically upwardly and downwardly slightly with respect to the housing 12. In order to prevent the dirt cover 102 from jamming due to dirt or corrosion, an upper protection sleeve 108 is provided which overlaps the top portion of the dirt cover 102. The sleeve 108 prevents dirt from working in between the dirt cover 102 and the housing 12. A top cap 110, which has a square axial opening therein to accommodate the shaft 18, is threadedly attached to the top end 14 of the housing 12. A set screw 112 is passed through the top cap into a registration opening in the housing 12. This registration opening is located in the housing so that when the set screw is extended thereinto, the shaft 18 is squared up to align the flukes 46 and 80 with the slots 30 and 66 in the housing 12.

OPERATION

In operation, the apparatus 10 is placed in a preformed bore in the ground which can be vertical or slanted as shown in FIG. 1. The shaft 18 of the apparatus 10 is moved axially upward with respect to the housing 12 by rotating the nut 24 using a wrench 114 of the type, for example, shown in FIG. 8, while holding the housing 12 stationary. The relative upward movement of the shaft 18, the blocks 58 and 92 and the ends 50 and 84 of the flukes 46 and 80, with respect to the housing 12 causes the surfaces 52 and 86 of the flukes 46 and 80 to slidably contact the cam surfaces 44 and 76 of the cam blocks 38 and 72 respectively whereby the flukes 46 and 80 are caused to move upwardly and outwardly through the slots 30 and 66, through the slits 104 of the dirt cover 102, and into the undisturbed earth surrounding the apparatus 10. Because of the arcuate shape of the flukes 46 and 80 and the upward and radially outward movement thereof with respect to the housing 12, the path formed by the leading edge of the flukes through the earth is followed by the rearward portions of the flukes. This feature facilitates the easy extension and retraction of the flukes into and from the ground surrounding the apparatus in that upward or downward forces are not exerted on the flukes by the ground as they are moved therethrough. Once the flukes 46 and 80 have been extended, the installation of the apparatus 10 in the ground is completed and a firm anchor achieved. An anchoring cable 28 to a mobile home, for example, can be secured to the link 26 welded to the nut 24.

When it is desired to remove the apparatus 10 from the ground, the shaft 18 is moved downwardly with respect to the housing 12 by exerting downward pressure on the link 26 attached to the shaft 18 after threading the nut 24 outwardly on the shaft 18 and while maintaining the housing 12 in a stationary position. The resulting axial downward movement of the shaft 18 within the housing 12 causes the flukes 46 and 80 to move downwardly and radially inwardly with respect to the housing 12. That is, as the bottom ends 50 and 84 of the flukes 46 and 80 are moved downwardly by the movement of the shaft 18, the blocks 58 and 92 and the links 56 and 90, the surfaces 94 and 96 of the slots 30 and 66 slidably contact the downwardly facing surfaces 54 and 88 of the flukes 46 and 80 causing the flukes to

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be retracted into the housing 12 along substantially the same path as followed by the flukes when extended.

As will be understood, the axial upward and downward movement of the shaft 18 brings about the movement of the blocks 58 and 92 attached thereto as well as the link members 56 and 90 attached to the blocks and the bottom ends 50 and 84 of the flukes 46 and 80 respectively. As the blocks 58 and 92 move, the ends of the flukes 46 and 80 are free to move inwardly or outwardly with respect to the top surfaces of the blocks 58 and 92 due to the free sliding movement of the links 56 and 90 thereon and are free to rotate with respect to the links 56 and 90, all of which allows the flukes to follow the desired unitary path when extended and retracted.

Because the inside of the housing 12 is substantially closed by the bottom and top covers 64 and 110 and the dirt cover 102, the apparatus 10 remains relatively free of dirt during its use which facilitates the easy operation thereof.

Assembly and Disassembly

In disassembling the apparatus 10, the bottom cover 64 is removed from the housing 12 and the nut 62 is removed from the bottom threaded end 22 of the shaft 18. This allows the block 58 to be removed from the shaft 18 which in turn brings about the removal of the flukes 46 from the housing 12. The cam block 38 is next removed from the housing 12 by sliding it downwardly over the lower portion of the shaft 18. The internal sleeve 33 is removed from the inside of the housing 12, and this allows the lock ring 32 to be slid out of the housing 12. Once the lock ring 32 has been removed, the nut 24 threadedly attached to the top end 20 of the shaft 18 is removed and the shaft 18, the block 92 attached thereto, the flukes 80 and the cam block 72 are all readily removed as a unit by withdrawing the shaft 18 from the housing 12 through the lower end 16 thereof.

Once disassembled, the various parts of the apparatus 10 such as the flukes or cam blocks can readily be replaced or cleaned. The apparatus is assembled by repeating the procedure described above in reverse.

The ground anchor apparatus of the present invention, therefore, is well adapted to carry out the objects and attain the ends and advantages mentioned as well as those inherent therein. While presently preferred embodiments of the invention have been given herein for the purpose of disclosure, numerous changes in the details of construction and arrangement of parts can be made which will readily suggest themselves to those skilled in the art and which are encompassed within the spirit of this invention and the scope of the appended claims.

What is claimed is:

1. A ground anchor apparatus which comprises: an elongated tubular housing having a first pair of oppositely facing slots disposed in the opposite sides thereof, and having an upper end and a lower end; an elongated rigid shaft positioned axially within said housing; a first cam block positioned within, and bearing slidably against, said housing adjacent said first pair of slots, said first cam block including an axial opening through which said shaft is slidably disposed, and a pair of oppositely facing cam surfaces on the lower portion thereof;

a first pair of oppositely facing flukes disposed within said housing below said cam block and on diametrically opposite sides of said elongated rigid shaft, said flukes being positioned to contact said cam surfaces of said cam block and to extend through said first pair of slots in said housing upon the upward movement of said flukes; and

means movably connecting said flukes to said shaft so that when said shaft is moved axially upward within said housing, said flukes are moved upwardly into sliding contact with said cam surfaces of said cam block thereby extending said flukes upwardly and outwardly from said housing through said first pair of slots, said means for movably connecting said flukes to said shaft including peripheral portions bearing against the inside of said housing and a central portion receiving and connected to said shaft, whereby said shaft is supported in a central position in said housing by said connecting means.

2. The apparatus of claim 1 which is further characterized to include:

said first pair of slots each including an upwardly facing surface for engaging said first pair of flukes when said flukes are extended radially outwardly from said housing so that when said shaft is moved axially downwardly within said housing said flukes are moved into sliding contact with said upwardly facing surfaces of said slots thereby causing said flukes to be retracted into said housing.

3. The apparatus of claim 2 wherein each of said flukes is of an arcuate configuration having a convex upper surface for contacting one of said cam surfaces of said cam block and a concave lower surface for contacting one of said upwardly facing surfaces of said slots so that upon axial upward movement of said shaft said flukes are moved upwardly and radially outwardly from said housing with the body of the fluke following the point at the leading end thereof and upon axial downward movement of said shaft said flukes are retracted downwardly and radially inwardly into said housing.

4. The apparatus of claim 3 wherein said means for movably connecting said flukes to said shaft includes:

a substantially rectangular block rigidly attached to said shaft;

a pair of link members slidably disposed around opposite ends of said block; and

one end of each of said oppositely facing flukes being rotatably attached to one of said link members.

5. The apparatus of claim 4 which is further characterized to include a cover sealingly attached to the lower end of said housing.

6. The apparatus of claim 5 which is further characterized to include:

said shaft extending above the top of said housing;

a link attached to the upper end of said shaft; and

a cover sealingly attached to the upper end of said housing, said cover having an opening therein through which said shaft is slidably disposed.

7. The apparatus of claim 6 which is further characterized to include:

a lock ring detachably secured within said housing above said first pair of slots, said lock ring including a downwardly facing shoulder; and

said first cam block including an upwardly facing shoulder for matingly contacting said downwardly facing shoulder of said lock ring, thereby preventing the upward movement of said cam block while

allowing downward movement thereof when said apparatus is disassembled.

8. The apparatus of claim 1 which is further characterized to include:

said housing including a second pair of oppositely facing slots disposed therein;

a second cam block secured within said housing adjacent said second pair of slots, said second cam block including an axial opening through which said shaft is slidably disposed and a pair of oppositely facing cam surfaces on a lower portion thereof;

a second pair of oppositely facing flukes disposed within said housing below said second cam block positioned to contact said cam surfaces thereof and extend through said second pair of slots in said housing upon the upward movement thereof; and means for movably connecting said flukes to said shaft attached thereto so that when said shaft is moved axially upward within said housing, said second pair of flukes are moved upwardly into sliding contact with said cam surfaces of said second cam block thereby extending said flukes upwardly and outwardly from said housing through said second pair of slots.

9. The apparatus of claim 8 which is further characterized to include:

said second pair of slots each including an upwardly facing surface for engaging said second pair of flukes when said flukes are extended radially outwardly from said housing so that when said shaft is moved axially downward within said housing said flukes are moved into sliding contact with said upwardly facing surfaces of said slots thereby causing said flukes to be retracted into said housing.

10. The apparatus of claim 9 wherein each of said second pair of flukes is of an arcuate configuration having a convex upper surface for contacting one of said cam surfaces of said second cam block and a concave lower surface for contacting one of said upwardly facing surfaces of said second pair of slots so that upon axial upward movement of said shaft, said second pair of flukes are moved upwardly and radially outwardly from said housing with the body of each of said flukes following the point at the upper end thereof, and upon axial downward movement of said shaft, said second pair of flukes are retracted downwardly and radially inwardly into said housing.

11. The apparatus of claim 10 wherein each of said means for movably connecting each of said pairs of flukes to said shaft includes:

a substantially rectangular block rigidly attached to said shaft;

a pair of link members slidably disposed around said opposite ends of said rectangular block; and

one end of each of said flukes in each of said pairs of oppositely facing flukes being rotatably attached to one of said link members.

12. The apparatus of claim 11 which is further characterized to include a cover sealingly attached to the lower end of said housing.

13. The apparatus of claim 12 which is further characterized to include:

said shaft extending above the top of said housing;

a link attached to the upper end of said shaft; and

a cover sealingly attached to the upper end of said housing, said cover having an opening therein through which said shaft is slidably disposed.

14. The apparatus of claim 13 which is further characterized to include:

- a second sleeve rigidly attached within said housing above said second pair of slots, said second sleeve including a downwardly facing shoulder; and
- said second cam block including an upwardly facing shoulder for matingly contacting said downwardly facing shoulder of said second sleeve thereby preventing upward movement of said cam block.

15. The apparatus of claim 14 which is further characterized to include:

- a dirt cover disposed around the sides of said housing and over said first and second pairs or slots, said dirt cover including first and second pairs of oppositely facing slits disposed therein and positioned to lie adjacent said first and second pairs of oppositely facing slots in said housing.

16. The apparatus of claim 15 wherein said housing and said dirt cover are cylindrical in shape.

17. The apparatus of claim 4 wherein said link members are retained on opposite ends of said block by the restrictive confinement of portions of said housing immediately adjacent the opposite ends of said block.

18. A ground anchor apparatus comprising:

- an elongated tubular housing having at least one slot formed in a side thereof and having an upper end and a lower end;

- an elongated shaft of polygonal cross section extending axially in said tubular housing;

- a cam block removably mounted in said housing adjacent said slot and including an opening through which said shaft is movably extended, and a cam surface on the side of said block nearest the lower end of the tubular housing;

- a block in said housing and attached to said shaft for axial and rotative movement therewith, said block fitting within said housing to afford clearance from said housing on two opposed sides thereof and to extend substantially to said housing at the opposite ends thereof;

- a link member removably disposed around said block for removal therefrom over an end of said block when the block is removed from said housing;

- an arcuate pointed fluke pivotally connected to said link for pivotation about a horizontal axis and positioned to contact and follow said cam surface when said shaft and block are moved axially in said housing; and

- a cover sealingly closing the upper end of said tubular housing and rotatable thereon, said cover having a polygonal opening therein receiving and keyingly engaging said shaft; and

- means for retaining the cover at a position on said housing such that the point of said fluke is aligned with said slot and adjacent said cam surface.

19. A ground anchor apparatus as defined in claim 18 and further characterized as including a resilient and flexible dirt cover around the outside of said tubular housing at the location of said slot, said dirt cover including a slit adjacent said slot and yieldable portions on opposite sides of said slit.

20. A ground anchor apparatus which comprises:

- an elongated tubular housing having a first pair of oppositely facing slots disposed in the opposite sides thereof, and having an upper end and a lower end;
- an elongated rigid shaft positioned axially within said housing and extending above the top of said housing, said shaft having a polygonal cross-section;

- a link attached to the upper end of said shaft;

- a cover sealingly attached to the upper end of said housing and having a polygonally shaped opening in said cover receiving the upper portion of said shaft to prevent rotation of said shaft in said cover, whereby the position of said cover on said housing determines the position of said shaft within said housing;

- a cover sealingly attached to the lower end of said housing;

- a first cam block positioned within said housing adjacent said first pair of slots, said first cam block including an axial opening through which said shaft is slidably disposed, and a pair of oppositely facing cam surfaces on the lower portion of said cam block;

- a first pair of oppositely facing flukes disposed within said housing below said cam block positioned to contact said cam surfaces thereof and for extending through said first pair of slots in said housing upon the upward movement of said flukes, each of said flukes have an arcuate configuration and further having a convex upper surface for contacting one of said cam surfaces of said cam block, and a concave lower surface for contacting an upwardly facing surface defining the lower side of each of said slots in said first pair of slots; and

- a substantially rectangular block rigidly attached to said shaft;

- a pair of link members slidably disposed around opposite ends of said block; and,

- one end of each of said oppositely facing flukes being rotatably attached to one of said link members whereby upon upward movement of said shaft, said flukes are moved upwardly and radially outwardly from said housing with the body of the fluke following the point at the leading end thereof, and upon axial downward movement of said shaft said flukes are retracted downwardly and radially inwardly into said housing.

21. The apparatus of claim 20 and further characterized as including means for fixing the rotational position of said cover on said housing to align said link members and flukes with said oppositely facing slots in said housing.

22. A ground anchor apparatus comprising:

- an elongated tubular housing having a first pair of oppositely facing slots disposed in the opposite sides thereof and equidistantly from the ends of said housing;

- an elongated, rigid tubular shaft extending axially in said housing and having a length greater than said housing;

- a cam block removably positioned within, and bearing slidably against, said housing adjacent said first pair of slots, said cam block including an axial opening through which said shaft is slidably disposed, and having a pair of oppositely facing cam surfaces on the lower portion thereof;

- a first pair of oppositely facing flukes disposed within said housing below said cam block positioned to contact said cam surfaces thereof, and extend through said first pair of slots in said housing upon the upward movement of said flukes; and

- a rigid block rigidly attached to said shaft for axial movement therewith in said housing, said block having two arcuate edges at opposite sides thereof slidably registering with, and contacting, the inter-

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nal wall of said tubular housing, and further having two opposite, parallel edges on opposite sides of said block and on opposite sides of said shaft extending between said arcuate edges; and

a pair of link members slidably disposed around said rigid block for sliding movement along the parallel edges thereof, and for removal from said rigid block by sliding movement past the arcuate edges of said rigid block when the rigid block is slid out of said housing, each of said link members having a portion above said rigid block and between said rigid block and said cam block rotatably attached to one end of one of said oppositely facing flukes.

23. A ground anchor apparatus which comprises:

an elongated tubular housing having a pair of oppositely facing slots disposed in the opposite sides thereof, and having an upper end and a lower end; an elongated rigid shaft positioned axially within said housing, and having a length greater than the length of said housing;

a first cam block positioned within, and bearing slidably against, said housing adjacent said first pair of slots, said first cam block including an axial opening therethrough through which said shaft is slidably disposed, and having a pair of oppositely facing cam surfaces on the lower portion thereof;

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a first pair of oppositely facing flukes disposed within said housing below said cam block positioned to contact the cam surfaces thereof, and to extend through said first pair of slots in said housing when said flukes are moved upwardly and biased radially outwardly with respect to said housing by contact of said flukes with said cam surfaces;

means movably and detachably connecting said flukes to said shaft so that when said shaft has moved axially upwardly within said housing, said flukes are moved upwardly into sliding contact with said cam surfaces of said cam block to thereby be extended through said first pair of slots to the outer side of said housing; and

a flexible and resilient dirt cover disposed around the outside of said housing at the location of said pair of slots therein, said dirt cover including a pair of oppositely facing slits disposed in substantial radial alignment with said slots, and said dirt cover being yieldable in elastic deformation in response to the projection of said flukes through the slits therein to continuously bear against said flukes and afford a dirt seal against dirt infiltrating through said slots into the interior of said housing.

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