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Daniel

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[54] **APPARATUS FOR ANCHORING A STRUCTURE TO EARTH MATTER**

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[52] **U.S. Cl.** **52/157,** 52/158, 52/165, 256/32

[51] **Int. Cl.** **E02d 5/80**

[58] **Field of Search**.....52/102, 155, 156, 157, 159, 52/165, 684, 685, 158; 256/19, 32

[56] **References Cited**

UNITED STATES PATENTS

168,097	9/1875	Latcher	52/156
632,966	9/1899	Mullenix	52/156
575,374	1/1897	Reck	52/156
625,724	5/1899	Alker	52/156
903,944	11/1908	Anderson	52/156
427,815	5/1890	Wolf	52/155
1,936,147	11/1933	Young	52/684
3,393,897	7/1968	Wright	256/32

FOREIGN PATENTS OR APPLICATIONS

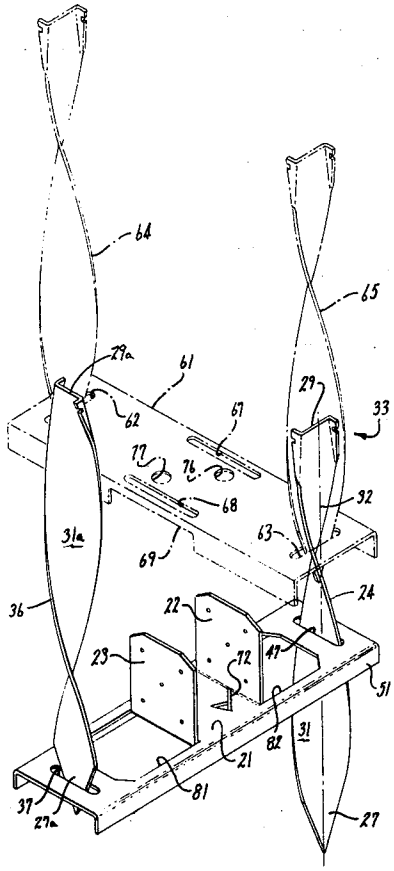
80,147	3/1894	Germany	52/157

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[57] **ABSTRACT**

Apparatus for anchoring a structure, such as a fence, to earth matter is disclosed. The apparatus includes a base member formed with a structure supporting portion and at least one elongated stake, preferably a metallic strip, having a twist or helical surface which engages the earth matter. The stake is preferably formed with means to lock it against the rotation relative to the base and against axial displacement of the base away from the earth matter and stake. The use of two helical strip-like stakes driven into slots in the base and the use of a second super-imposed base member are disclosed.

5 Claims, 8 Drawing Figures



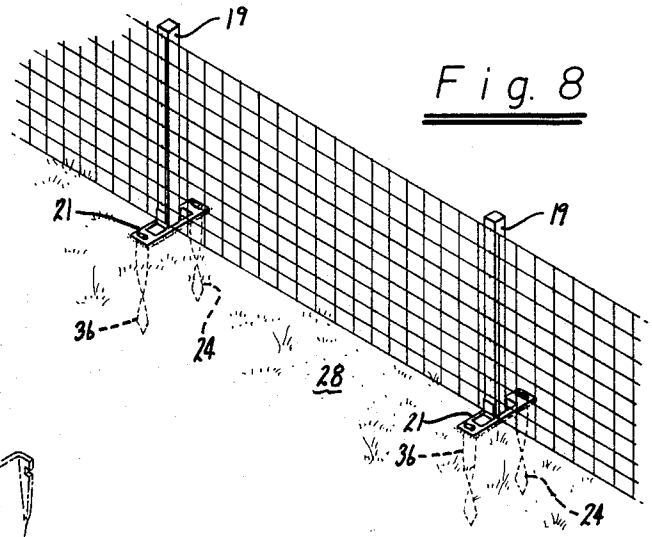


Fig. 8

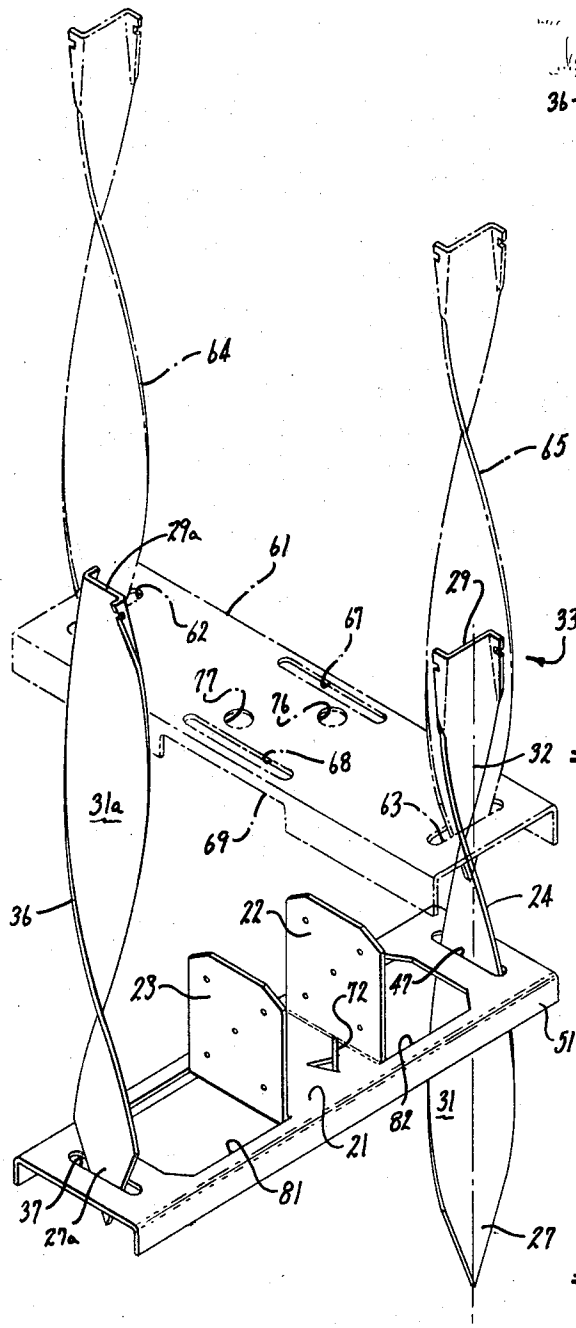


Fig. 1

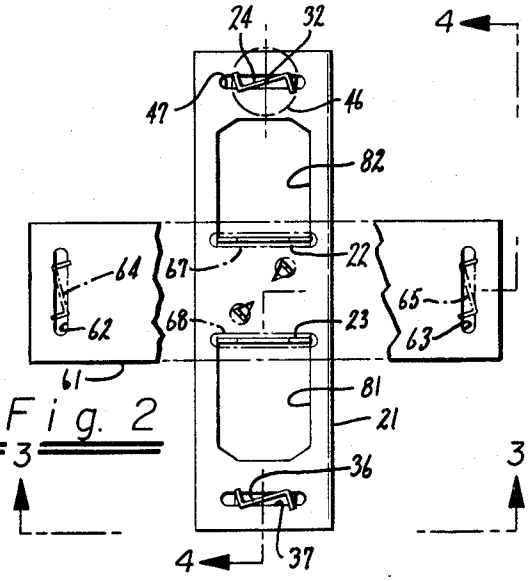


Fig. 2

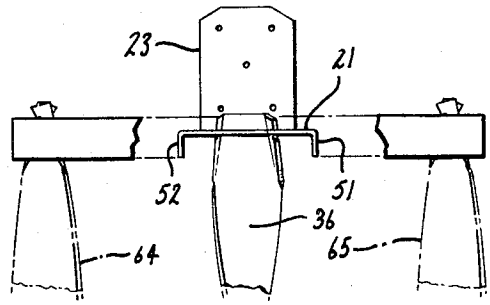


Fig. 3

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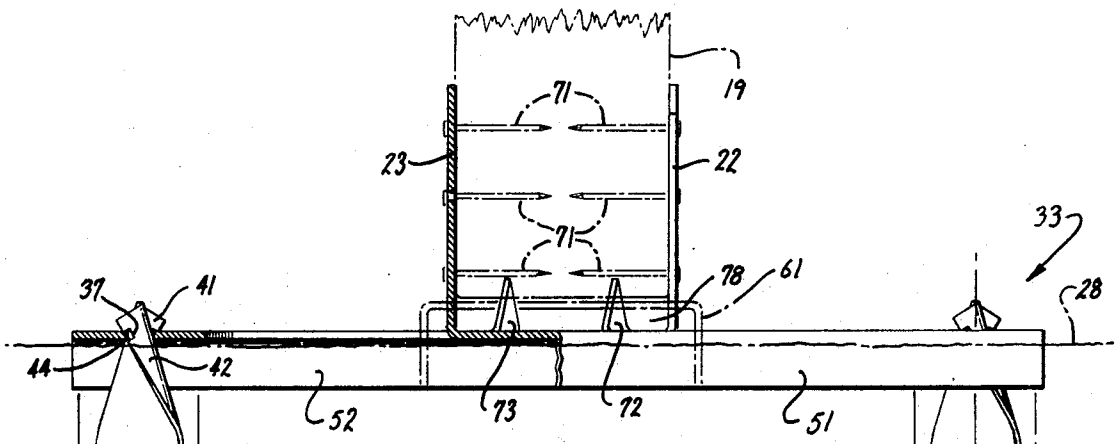


Fig. 4

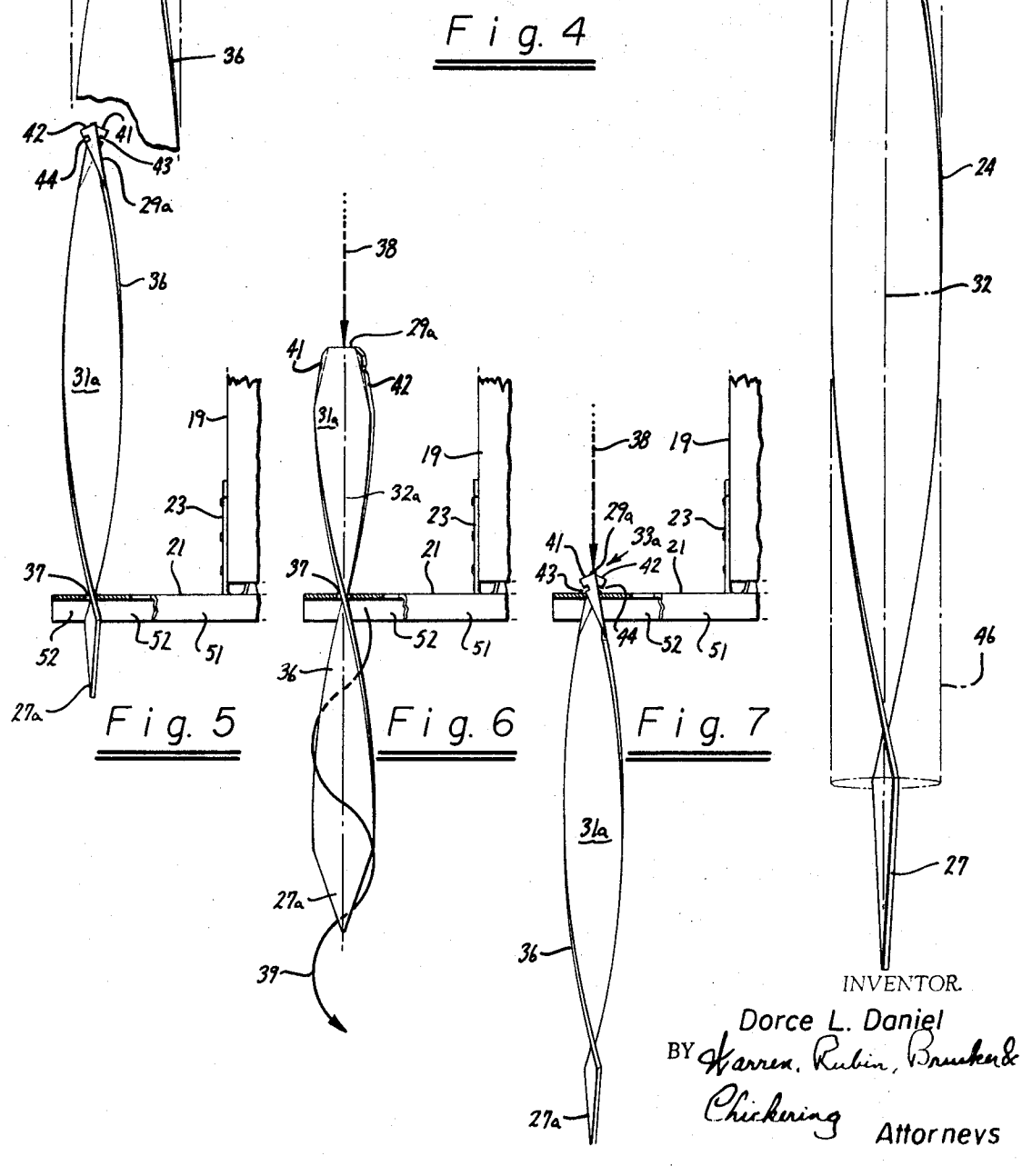


Fig. 5

Fig. 6

Fig. 7

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APPARATUS FOR ANCHORING A STRUCTURE TO EARTH MATTER

BACKGROUND OF THE INVENTION

There are a variety of different situations in which it is desirable to anchor, either permanently or temporarily, a structure to the ground on which it is supported. Perhaps one of the most commonly occurring situations is the construction of a fence or similar barrier. Additionally, poles, equipment, and shelters, to name a few, may be temporarily or permanently secured to the ground or earth matter.

Present practice in the installation of fencing is particularly illustrative of the types of problems which are encountered in securing structures to the ground. Typically, a series of post holes are dug for receipt of the main upright fence posts. The posts may then be placed in he holes and the dirt filled in around the post. This has the disadvantage of causing a gradual decay of the post and weakening of the fence. It is preferable, therefore, to place the post in the hole and surround the post with concrete. After the concrete has set, the portion of the fence between the posts can be secured to the posts. This process, while effective, often involves substantial labor and time before the fence can be erected. Additionally, this type of installation is not readily adaptable for use in temporarily anchoring the fence to the ground.

Another approach which has been employed in securing various structures to the ground has been the use of stakes. Such stakes are usually driven into the ground adjacent the structure to be anchored and secured to that structure directly or indirectly so as to anchor the structure to the ground. While the use of stakes results in certain advantages over the use of post holes, structures which have been secured by stakes have been found to be anchored with substantially less strength than the more standard use of post holes. Thus, the prior anchoring structures which employ stakes have commonly encountered problems with the stakes pulling out of the ground and the anchorage becoming weakened or failing.

Accordingly, it is an object of the present invention to provide an apparatus and method for anchoring a structure to earth matter which may be easily and rapidly installed by relatively unskilled personnel.

It is another object of the present invention to provide an apparatus and method for anchoring a structure to earth matter which affords a positive strong anchoring force which will not diminish substantially over extended period of use.

It is another object of the present invention to provide an apparatus and method for anchoring a structure to earth matter which is suitable for use as a temporary as well as a permanent anchor.

It is still a further object of the present invention to provide an apparatus and method for anchoring a structure to earth matter which is easy to manufacture, durable, and provides a support which resists corrosion of the structure anchored.

SUMMARY OF THE INVENTION

The anchoring apparatus of the present invention is comprised, briefly, of a base member formed with a structure supporting portion and an elongated stake formed to be driven into earth matter and including a longitudinally extending surface projecting laterally of the longitudinal axis of the stake to resist rotation of the stake about that axis. The surface is further formed as a helical surface to resist removal of the stake axially without rotation thereof. Additionally, securement means, preferably a slot in the base and widened end of the stake, is provided and formed to secure the stake to the base member against rotation of the stake and axial displacement of the base away from the stake and the ground. Ground engaging means may be employed to prevent rotation of the base about the stake.

A plurality of metallic strip-like stakes driven through slots in the base member is preferred and a second perpendicularly oriented and superimposed base member may be employed. The stakes may include wedging ears with notches to lock them with respect to the base member. The method of anchoring a structure to earth matter is comprised of positioning a base over the earth matter, driving a helical stake into the earth matter, preferably through slots in the base, and securing the stake to the base against rotation and relative axial displacement.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top perspective view of apparatus for securing a structure to earth matter constructed in accordance with the present invention and illustrating in phantom an optional additional anchoring structure.

FIG. 2 is a top plan view of the anchoring apparatus of FIG. 1.

FIG. 3 is an end elevational view taken along the plane of line 3—3 of FIG. 2.

FIG. 4 is an enlarged side elevational view, partially in cross-section, taken along the plane of line 4—4 in FIG. 2.

FIG. 5 is a fragmentary side elevational view of one end of the anchoring apparatus showing the stake inserted for driving into earth matter.

FIG. 6 is a fragmentary side elevational view of one end of the anchoring apparatus showing the stake driven partially into earth matter.

FIG. 7 is a fragmentary side elevational view of one end of the anchoring apparatus showing the stake driven almost fully into the earth matter.

FIG. 8 is a top perspective view of a fence anchored with the apparatus of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1 through 4, inclusive, the anchoring apparatus of the present invention can be seen to be comprised of a base member 21 formed with a structure supporting portion, here shown as flanges 22 and 23, for securement of structure 19 (shown in phantom in FIG. 4) thereto. The anchoring apparatus further includes an elongated stake 24 having a first end 27, which is formed with a point in order that it may be driven into earth matter 28 (shown in FIGS. 4 and 8), and a second end 29, which is preferably generally perpendicular to the body of the stake, in order that it may be impacted by a driving tool, such as a hammer. Stake 24 includes at least one longitudinally extending surface 31 which projects radially of longitudinal axis 32 of the stake to provide an area resisting rotation of the stake about axis 32. Surface 31 further is

formed as a helical surface to provide an area which resists removal of the stake from the earth matter in an axial direction without the rotation of the stake. Finally, the apparatus further includes securement means, generally designated **33**, formed to secure end **29** to base member **21** against rotation of stake **24** relative to the base member after driving the stake into the earth matter adjacent the base member and further to secure the base member to the stake against displacement axially of base **21** in direction away from the earth matter and the stake.

Referring now to FIGS. **5**, **6** and **7**, the function of the radially projecting helical surface and securement means of the apparatus of the present invention can be more clearly understood. The stake in FIGS. **5**, **6** and **7** is stake **36** at an opposite end of base member **21** from stake **24**. Stake **36** is illustrated as being formed exactly in the same manner as stake **24**, and accordingly, the corresponding parts have been given the corresponding numbers with the addition of a letter designation *a* indicating that they are a part of stake **36**. In FIG. **5** stake **36** has pointed end **27***a* just barely driven into the ground through a slot or opening **37** in base member **21**. As stake **36** is driven deeper into the ground, in the direction shown by arrow **38** in FIG. **6**, helical surface **31***a* causes the stake to rotate about axis **32***a* as it is axially downwardly displaced. Thus, stake **36** follows the path of arrow **39** and is, in effect, screwed into the ground by helical surface **31***a* as it is driven downwardly. In FIG. **7**, stake **36** is driven until end **29***a* is adjacent base member **21**.

In order to secure base **21** to stake **36**, securement means **33***a* is preferably formed as a slot **37** in the base member and a laterally projecting element secured to the stake, in this case a pair of ears **41** and **42** providing shoulders which engage base member **21** adjacent slot **37**. As will be seen from the figures, it is preferably that ears **41** and **42** are formed with notches **43** and **44**, which will engage the base member adjacent slot **37** upon driving the stake downwardly from the position in FIG. **7** until it reaches the position shown in FIG. **4**, whereupon the notches lock the stake to the base member.

The anchoring action of the apparatus of the present invention results by reason of the securement of stake **36** relative to the base member against rotation and axial displacement of the base member away from the stake and ground. Loading forces on structure **19** will be transmitted as forces which are resisted by the entire length of the stake, as would be the case for a standard stake. These loading forces tend to pull stakes **24** and **36** out of the ground. When a round or flat non-helical stake is provided, the only force resisting the tendency to pull the base member out of the ground is the friction force along the surfaces of the stake which engage the ground. This friction force is often inadequate and particularly unsatisfactory when repeated cycling of loads on the structure **19** are encountered.

In the present invention, helical surface **31***a* is locked against rotation by ears **41** and **42** and slot **37**. Upward forces on base **21** tend to cause the stake to be rotated about axis **32***a* in a direction reversed to that indicated by arrow **39**. Slot **37**, however, prevents rotation of the stake relative to the base, and accordingly, the stake is not free to rotate and immediately engages the earth matter with the twisted or helical surface below the ground level providing a substantial area resisting upward displacement of the anchorage. In order to pull the stake from the ground, therefore, the entire cylinder **46** of earth matter must be pulled up with the stake. The stake of the present invention can, however, be removed very easily if the upward force is placed only on the stake and not on the base member. In this condition, for example, by engaging the end **29***a* of stake **36**, the stake is free to rotate when it is being pulled away from the slot, as long as the slot is maintained at ground level, since the stake will simply unscrew from the earth matter in which it has been driven. Thus, while the slot prevents unscrewing of the stake from the ground upon attempted displacement of base **21** and the stake away from the ground, displacement of end **27***a* toward base member **21** results in an unscrewing of the stake in slot **37**, which is effected by displacing the stake axially as it rotates at a rate equal to the rate of twist of the helical surface **31***a*.

In FIG. **7**, the stake is not locked to the base and could be pulled out of the ground by engaging the stake and pulling it upwardly while allowing it to rotate. Thus, the stake may be driven to the position shown in FIG. **7** to effect a relatively temporary anchoring of structure **19** to the earth matter. The anchor can then be removed by engaging the stake, instead of the base **21**, and pulling the stake upwardly and unscrewing it along a path opposite to that shown in FIG. **6**. This rotating or unscrewing action will not occur, however, when uplifting forces originate in the structure **19**, and accordingly, the anchor is very effective, notwithstanding the fact that the notches have not engaged base **21**. For more permanent structures, the stake can be driven down until notches **43** and **44** engage the base member as shown in FIG. **4**. Once the stakes are driven to this position, a tool would be required to pry the notches back away from the stakes to allow the stake to be pulled up and rotated for removal of the anchor. Accordingly, the anchor is more permanent and positive in its interlocking of the stake and base members. Additionally, in some installations erosion of the ground adjacent base **21** may take place, and notches **43** and **44** will prevent the base from dropping downwardly as ground erodes. The structure will remain firmly anchored, however, since the stakes normally will be driven into the ground to a much deeper depth than expected erosion.

As will be understood, if base member **21** and structure **19** are free to rotate about axis **32** relative to the ground, upward force on the structure and base member would merely result in an unscrewing of the stake from the ground while the structure and base member rotate about axis **32***a*. When a fence is the structure to be anchored, as shown in FIG. **8**, structure **19** is confined against rotation about axis **32***a* by being tied to an adjacent fence post by intermediate fencing. In some applications, however, the structure secured may not be constrained against rotation about axis **32***a* and it is preferable to provide ground engaging means, such as U-shaped downwardly depending legs **51** and **52** of base member **21** which engage the ground **28** and prevent rotation about axis **32***a*. The U-shaped channel also provides increased strength for the base. Alternatively, or additionally, the ground engaging means may

be provided by the use of two stakes such as stakes **24** and **36**. As will be readily appreciated, the relatively spaced apart stakes **24** and **36** also prevent rotation of base **21** about either of the central axes **32** or **32***a* causing the upward force to be resisted by the cylinder of earth above the twisted or helical surfaces **31** and **31***a*.

In order to provide the helical surface of the stake of the present invention, it is preferably to form the stake as a metallic strip, such as steel, having a generally rectangular cross-section with the relatively wide surfaces **31** defining the long sides of the rectangular cross-section and providing the helical ground engaging surface which locks the stake against rotation and resists axial removal from the ground without rotation. Slots **37** and **47** are dimensioned for receipt of the strip-like stake and the sliding advancement of the stake from the pointed end to the second end on which the projecting elements or ears **41** and **42** extend and engage base **21** adjacent slots **37** and **47**.

In order to increase the stability of the anchorage of the present invention, it is preferable that slots **37** and **47** are formed in base **21** in relatively parallel relation and substantially perpendicular to the longitudinal axis of the base. As so formed, ears **41** and **42** engage base member **21** on either side of the longitudinal axis of the elongated base and tend to prevent tipping or rotation of the base about the longitudinal axis. This tendency can further be resisted by the use of a second base member, a will be more fully set forth hereinafter. As will be understood, however, it is also possible that the slots extend parallel to the longitudinal axis of the base, particularly if the structure anchored is not subjected to substantial forces which will tend to cause base **21** to be displaced angularly about the longitudinal axis of the base.

In order to insure a positive setting of the stakes in the ground, it is preferable that the ears or shoulders **41** and **42** taper outwardly from the body of the stake (best seen in FIG. **4**) causing the stake to tend to wedge the base downwardly into the earth matter, with depending legs **51** and **52** being driven into the ground. Additionally, the ears are preferably formed, as shown in the drawings, as an integral part of the stake and extend perpendicularly of the body in oppositely facing directions with the taper of the ears being in the direction of twist or skew of helical surface **31**. Further, the taper os preferably at a greater rate of skew or twist than the helical surface which tends to cause a final acceleration of the twist of the stakes upon locking of the same to base **21** by means of the notched ears. The increase in the rate of twist by means of the tapered and oppositely facing ears **41** and **42** causes the stakes to be rotated about their longitudinal axes to take up any slack which might exist upon driving the stakes down through the earth matter.

In certain applications the structure to be anchored to the earth matter may be subjected to relatively high forces exerted in several directions and having components transverse to the base. In these applications, it is advantageous to provide a second base member oriented in a direction substantially perpendicular to the first base member in order to help support loads which are generally perpendicular to the longitudinal axis of the first base member. The use of such a second base member is shown in FIGS. **1**, **2**, **3** and **4**, partially in phantom, wherein second base member **61** is formed with slots **62** and **63** which slots receive stakes **64** and **65**. The second base member is further formed for mounting on the first base member in superimposed and substantially perpendicular relation thereto and accordingly has flange receiving slots **67** and **68** which allow the structure supporting flanges **22** and **23** to extend therethrough. Additionally, if the second base member is formed as an inverted U-shaped member, as shown in the drawings, a recess or notch **69** in each of the depending legs of the second member must be provided in order to span the first U-shaped member. After superimposition of the second member over the first member, the structure **19** may be placed down in flanges **22** and **23** and secured to the same by fasteners such as nails **71** if the structure is a wooden fence post. Additionally, it is preferable to form the first base member **21** with upstanding structure engaging prongs **72** and **73** which engage the bottom side of the fence post or structure **19** to help positively secure to the base and further to position the structure at a spaced distance above the base and ground. In the case of fencing and other types of structures, it is highly advantageous to hold the structure up off the ground. Thus, deterioration of the structure by reason of contact with the ground is minimized. When a second base member **61** is employed, openings **76** and **77** in the second base member should be provided to allow prongs **72** and **73** to extend therethrough and engage structure **19**. As will be seen in FIG. **4**, the combination of the prongs and the second base member create a space **78** which allows circulation of air underneath the structure helping to insure its long life. It should be noted that the forces on structure **19** are transmitted through flanges **22** and **23** to base member **21** and from there to base member **61** when the first and second base members are formed as two separate elements.

It has been found to be highly advantageous to form the present anchorage apparatus from 3/32-inch to ⅛-inch steel, in which flanges **22** and **23**, slots **37** and **47**, and prongs **72** and **73** are all formed by a punching or stamping operation. Heavier and lighter gauges of steel can be used, depending upon the application contemplated. Additionally, downwardly depending legs **51** and **52** can be readily formed in a stamping operation, allowing the entire base member to be formed of a single, flat rectangular sheet of steel. It should be noted that flanges **22** and **23** can be formed of other shapes to receive other structures. As formed in the drawings from the material comprising base **21**, they leave openings **81** and **82** which do not interfere with the overall strength of the base. Similarly, the stake can be formed of about ⅛-inch steel which is twisted, stamped or pressed to provide helical surface **31**. It is preferable that the helical surface **31** have one complete turn over the length thereof in order that a complete cylinder **46** tends to resist the axial withdrawal of the stake. As will be understood, however, substantial advantage will accrue if helical surface **31** is formed with less or more than one complete turn. Strip-like stakes formed of ⅛-inch steel can be driven into almost any kind of earth matter. As used herein, the expression "earth matter" shall include all types of materials including clay, dirt, gravel, sand, and shall further include other materials to which structures can be anchored. For example, the

strip-like steel stakes of the present invention can be driven through asphalt surfaces to anchor a structure thereto. Thus, "earth matteri" is meant to include plastic and organic materials of various descriptions. Stakes 24 inches long have been found to be suitable for anchoring fences to a variety of soils and soil conditions.

I claim:

1. In an apparatus for anchoring a structure to earth matter including a base member formed with at least one elongated slot dimensioned to receive a stake therethrough and formed with a structure supporting portion for securement of a structure thereto, at least one elongated stake mounted in said slot and having a first end formed to be driven into said earth matter and an opposite second end formed to be impacted by a driving tool, said stake being formed from a strip of flat material having a generally rectangular cross-section and said stake being helically formed over the length thereof, and ground engaging means secured to said base and formed to engage said earth matter at a spaced distance from said stake to prevent rotation of said base about said stake, the improvement comprising:

said second end of said stake being formed with at least one ear extending laterally of the body of said stake to a distance greater than the width of said slot adjacent said ear, said ear tapering outwardly from the body of said stake to a position adjacent said second end to engage and wedge said base member downwardly to said earth matter.

2. Apparatus as defined in claim 1 wherein,

said stake is formed with a pair of oppositely facing, outwardly tapering ears extending from adjacent opposite sides of the body of said stake in the direction of twist of the helically formed stake, said ears tapering outwardly at a greater rate than the rate of twist of said helically formed stake whereby angular engagement of said base member by said stake is achieved in addition to downward wedging of said base member.

3. Apparatus as defined in claim 2 wherein,

said ears are further formed with notches positioned adjacent upper portions of said ears and dimensioned for receipt of said base member adjacent said slot whereby said stake can be driven downwardly until said notches fixedly secure said stake to said base member for angular engagement and downward wedging of said base member.

4. In an apparatus for anchoring a structure to earth matter including a base member formed with a pair of spaced apart elongated slots dimensioned to receive stakes therethrough and formed with a structure supporting portion for securement of a structure thereto, and a pair of elongated helically twisted flat stakes mounted in said slots and having first ends formed to be driven into said earth matter and opposite second ends formed to be impacted by a driving tool and to engage and secure said base member against said earth matter, the improvement comprising:

a second elongated base member formed for mounting on said first base member in superimposed and substantially perpendicular relation thereto, said second base member further being formed with a pair of stake receiving slots at opposite ends thereof and formed with openings for receipt of said structure supporting a portion of said first named base member therethrough; and

a second pair of stakes formed substantially as defined for the first named stakes and formed to be driven through said slots in said second base member to urge said base member against said earth matter for anchoring of said second base member to said earth matter.

5. Apparatus as defined in claim 4, wherein,

said structure supporting a portion of the first named base member is provided by an upstanding flange formed from material constituting part of said base member, and said first named base member is further formed by upstanding structure engaging prongs, said second base member being formed with openings indexed for receipt of said prongs therethrough.

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