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(54) **TIE DOWN STAKE**

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(57) **ABSTRACT**

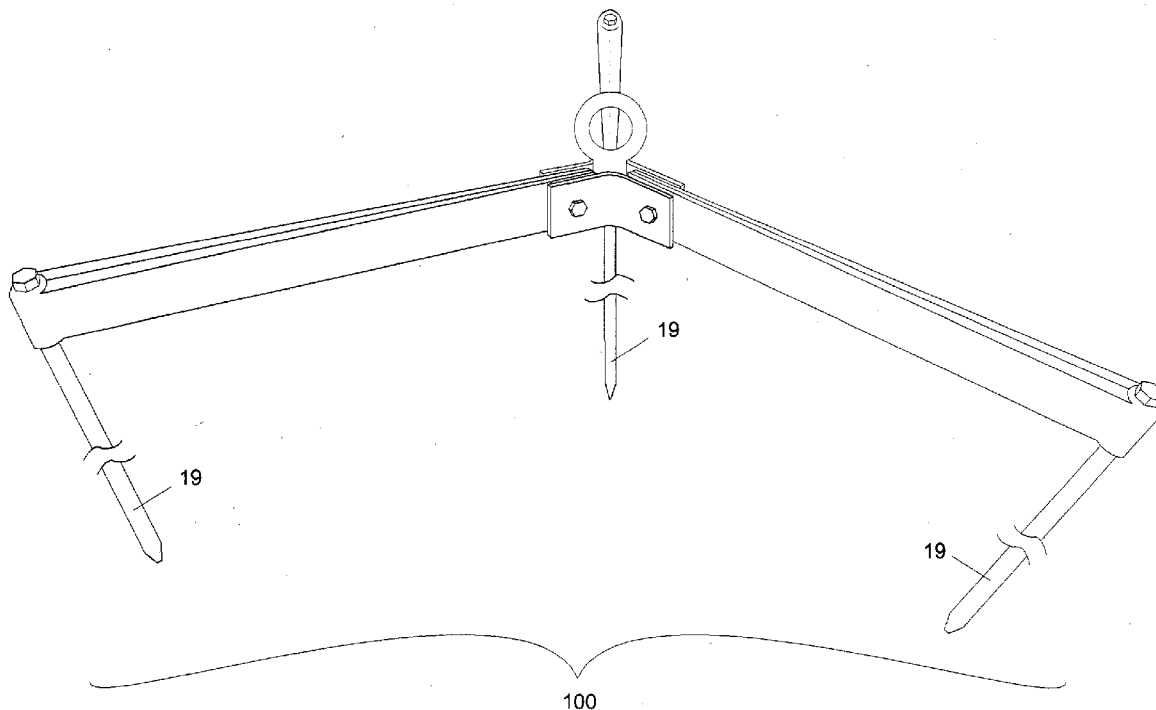
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A tie down stake for anchoring small aircraft or other objects to the ground in any soil conditions and which consists of a central hub with an eyelet and arms which extend away from the hub. At the opposite end of each arm consist of holes that serve as stake guides for directing a plurality of anchoring rods at a fixed angle downward and inward into the ground. Thus joined by the arms and hub, the anchoring rods cooperate together to form a secure earth anchor. Also disclosed is a rod extraction tool.

Publication Classification

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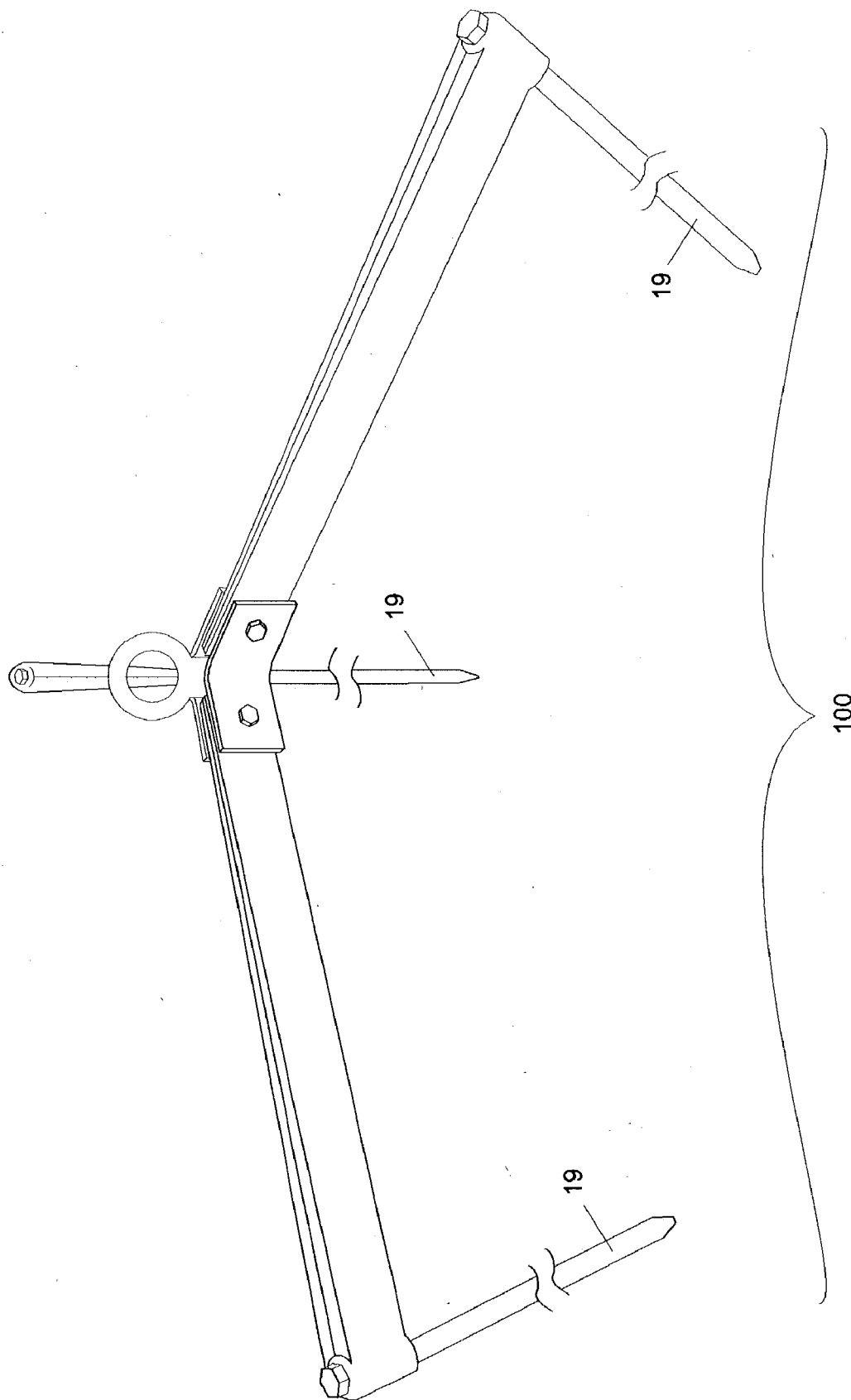


Fig. 1

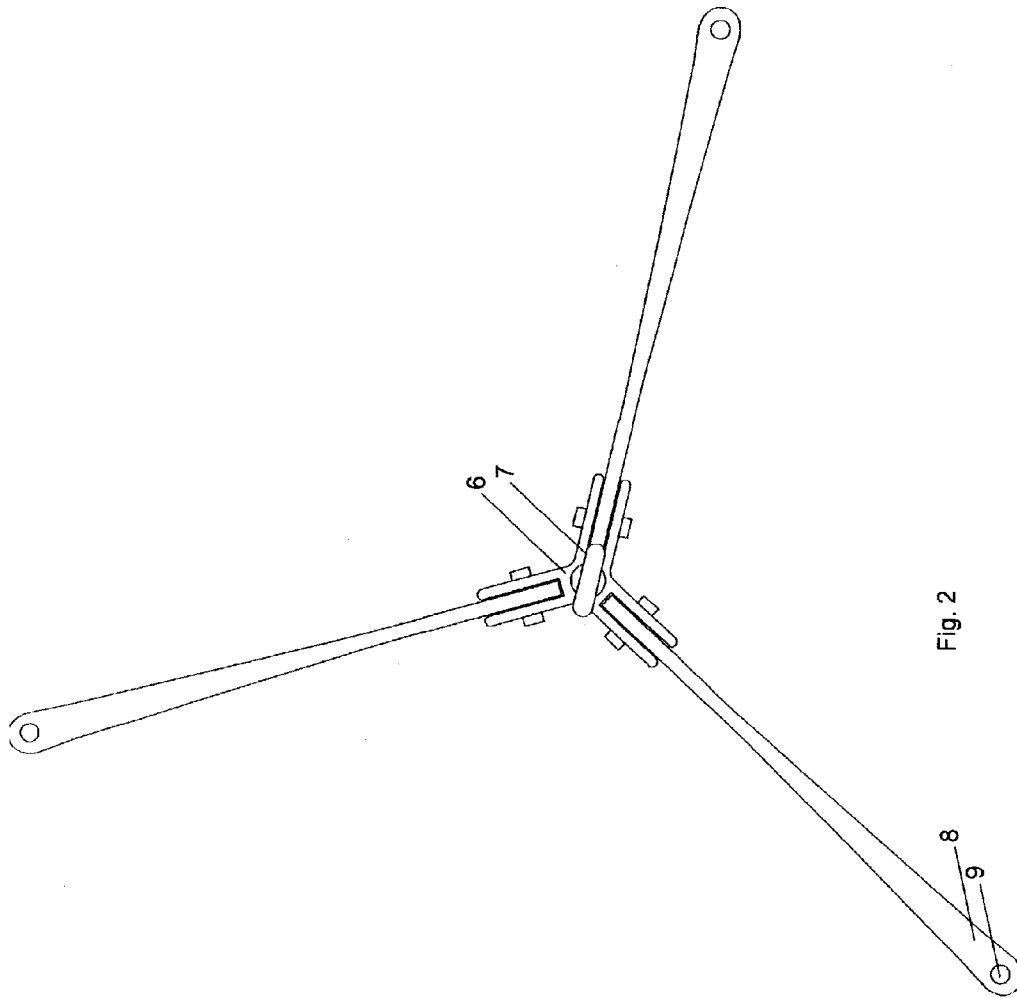


Fig. 2

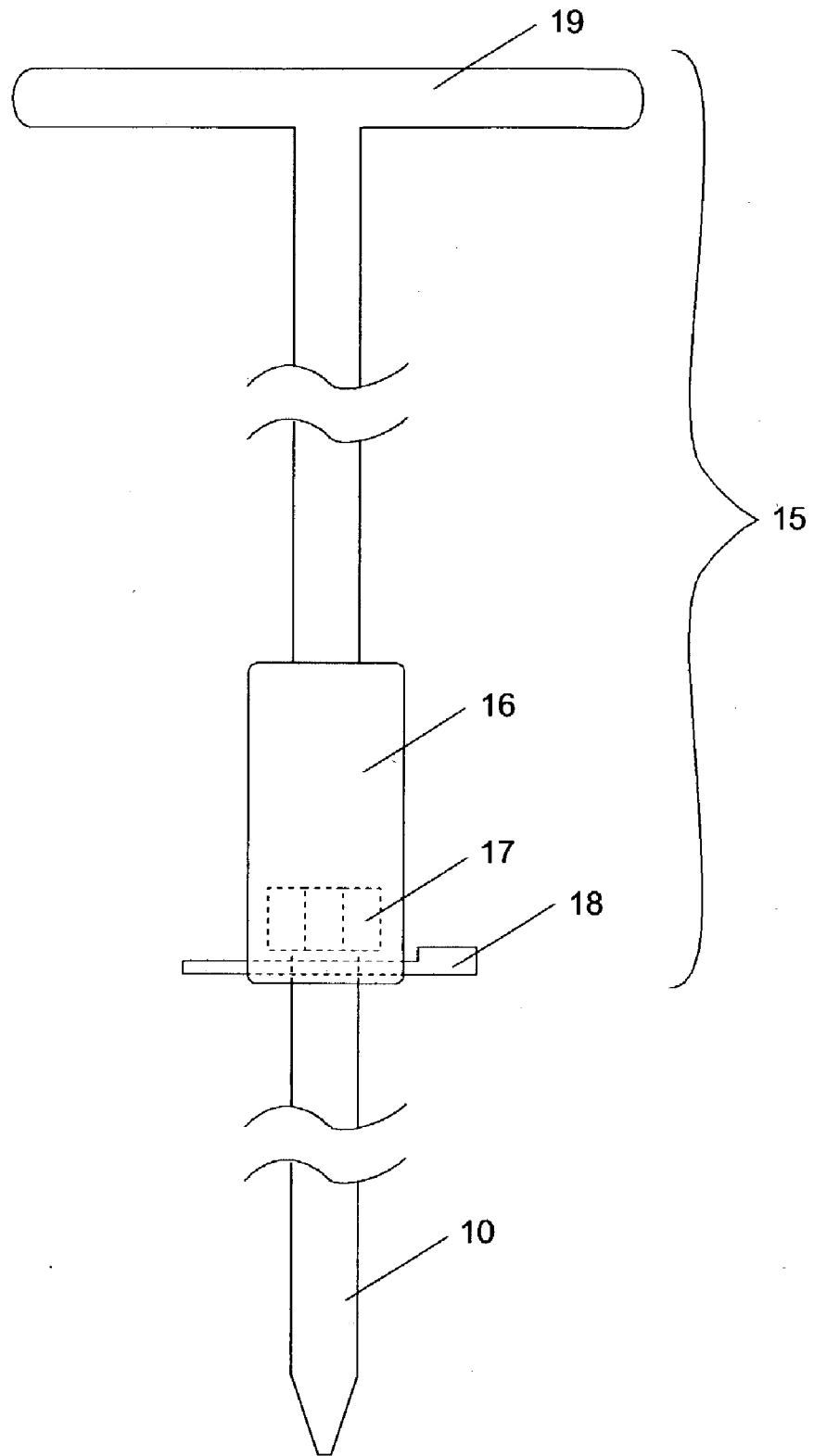
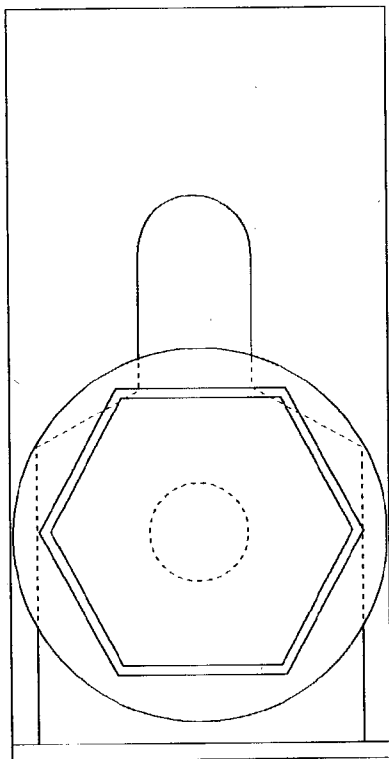


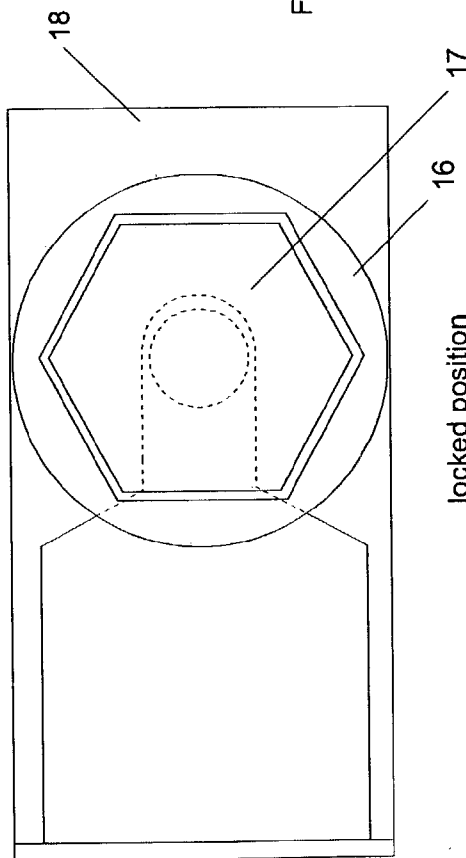
Fig. 3

Fig. 4



unlocked position

Fig. 5



locked position

TIE DOWN STAKE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is related to application Ser. No. 09/734,604, filed Sep. 20, 1991, now U.S. Pat. No. 5,243,795.

FIELD OF THE INVENTION

[0002] One or more aspects of the present invention relate generally to tie-down stakes and more specifically to tie-down stakes used to secure stored aircraft.

BACKGROUND OF THE INVENTION

[0003] Small aircraft, when they are not in use and stored on the ground, should be securely tied down to prevent their being moved or damaged in a high wind. Sometimes commercial airports provide permanent tie down which are secured to the ground. More frequently, though, an aircraft owner must provide his own tie down device. This is especially true when landing an aircraft at a remote landing field far from an airport.

[0004] The most common type of portable tie down anchor used by most small craft pilots is an auger-type stake that screws into the ground. These devices suffer from a number of drawbacks, most notably that they are difficult to deploy and they do not always hold securely. Auger-type stakes are frequently difficult to screw into the ground and are nearly impossible to use in hard or rocky soil. Furthermore, in soft, sandy or muddy soil auger-type stakes do not always provide a secure hold since they only engage an area of the ground as large as the diameter of the auger itself. Another disadvantage to auger-type tie down stakes is that they tend to pick up large amounts of dirt when they are removed from the ground, and their complicated geometry makes them difficult to clean.

[0005] Therefore, what is needed is a tie-down stake that is simple to deploy and provides superior tie-down performance.

SUMMARY OF THE INVENTION

[0006] The object of the present invention is to overcome the drawbacks of the tie down devices in current usage. The primary objective is to provide a tie down stake which is easy to deploy while providing a secure hold in any kind of soil conditions. Other objectives of the invention are to provide a tie down stake which is easy to remove, lightweight, portable, compact, and easy to clean. To accomplish these objectives the tie down stake of the present invention uses a central hub working in concert with arms with holes that act as stake guides to direct a plurality of anchoring rods at a fixed angle downward and inward. Thus joined by the hub, the rods work cooperatively to engage a large area of the ground forming an earth anchor with exceptional pullout resistance even in soft, sandy or muddy soil. At the same time the tie down stake is easy to use because the straight rods are easily driven into the ground even in hard or rocky soil.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 illustrates a side view of the tie down stake in the deployed position.

[0008] FIG. 2 illustrates a top view of the tie down stake in the deployed position.

[0009] FIG. 3 illustrates the rod extraction tool assembly being used to remove the tie down stake from the ground.

[0010] FIG. 4 illustrates how the extraction tool opens to release the rod head.

[0011] FIG. 5 illustrates how the extraction tool closes to engage the rod head.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] The present invention relates to a tie down stake 100, more particularly, to a tie down stake 100 that serves as a secure earth anchor for tying down small aircraft.

[0013] Although this tie down stake 100 was designed particularly for securing small aircraft to the ground, the inventor envisions many other uses for it wherever a secure ground anchor is needed. Some of the uses envisioned are as a tent stake, as a tether stake for pets or livestock, as an anchor for temporary structures or mobile homes, as a land anchor for boats and land vehicles or as a winching anchor for off road vehicles equipped with winches, and other similar uses.

[0014] FIG. 1 illustrates a side view of the tie down stake in the deployed position. Major components of the tie down stake 100 include a central hub 6, with securing ring 7, a plurality of arms 8, connected to hub 6, and a plurality of anchoring rods 10, connected to arms 8. In the preferred embodiment, a tie down stake includes three anchoring rods 10, though it will easily be seen that a plurality of anchoring rods 10 may be used to advantage without departing from the spirit of the invention.

[0015] The hub 6, should be made of a strong lightweight material. Acceptable materials for a hub include polymers such as acetyl, nylon, polycarbonate or metals such as aluminum. In the preferred embodiment the hub 6 generally has extensions from the center to connect the arms 8, and is triangular in shape. But it may be made in any shape convenient to the use and manufacture of the tie down stake 100.

[0016] Hub 6, has an eyelet 7, extending from the body of the hub 6, for attachment of a rope, cable, chain or other attachment device. An eyelet 7 may be selected from a plurality of different attachment devices such as an eyebolt, as illustrated in FIG. 1, or it may be formed integrally with the body of hub 6, extending from the top or side of a hub 6.

[0017] FIG. 2 illustrates a top view of the tie down stake in the deployed position. Attached to a hub 6 are arms 8. At the opposite ends of the arms 8 are three holes 9, equal in number to the number of anchoring rods 10, and slightly larger in diameter than anchoring rod 10 itself. The holes 9, at the end of each arm 8 are formed at an angle to direct the rods 10, downward and inward in use. The tie down stake 100 assembly has been found to be most effective when the arm holes 9, are formed along a line that is offset and inward to the vertical axis of the hub 6, so that the anchoring rods 10 approximate a downward direction as is apparent from the side view in FIG. 1. The advantage of this arrangement

is that the anchoring rods **10**, do not interfere with the eyelet **7**, or with one another when they are inserted or withdrawn.

[0018] Anchoring rod **10**, is elongate in shape and may be formed as with a sharpened end **19** for penetrating the ground and blunt end **17** for receiving an external force from hammer or other object. Rod **10**, may be made of steel, stainless steel, titanium or any other material strong enough to withstand being repeatedly driven into hard or rocky soil. Anchoring rod **10**, may be circular in cross section or made in any other cross section that is convenient for their manufacture. Proximate the blunt end **17**, a rod **10**, include a head means **11**, that allows a rod **10**, to be gripped for withdrawal by the rod removal tool assembly **15** illustrated in FIG. 3 described below. The head means **11**, may be a hexagonal bolt shape or it may be any other geometry that allows it to be gripped for easy removal. Other possible geometries envisioned for the head means **11**, include a flattened head like a nail, an L-shaped bend, a T shape, a hook or a loop. Anchoring rod **10**, is configured to have a length adapted to provide secure holding force for the application intended. For example, anchoring rods **10** about twelve inches in length have been found to provide adequate holding force for tying down small aircraft, though rods of a few inches to a few feet may be used in other applications.

[0019] As illustrated in FIG. 3, auxiliary components of a tie down stake **100** assembly include a rod extraction tool assembly **15**. A rod extraction tool assembly **15**, in the preferred embodiment, comprises a standard hex socket **16**, with an inside diameter slightly larger than a rod hex head **17**, that has a slide bar **18**, attached to it to engage the head means of a rod much like a bayonet connector for easy withdrawal of a rod **10**, from the ground. The operator is able to engage the extraction tool assembly **15**, using the T handle **19**.

[0020] The extraction tool assembly **15** employs a slide bar **18** that is able to freely slide back and forth perpendicular to the socket **16**. The slide bar **18** has two positions. The release or open position, and the latched position. In the released position the slide bar **18**, is open and the rod **10** is able to drop out of the rod extraction tool assembly **15**, with ease. Conversely, in the latched position the slide bar **18**, slips under the rod head **17**, and prevents the rod head **17**, from dropping out of the socket **16**. Thus, an operator can remove the rod **10**, from the ground by using a pulling and twisting motion with their hand.

[0021] FIG. 4 illustrates how the extraction tool opens to release the rod head **17**. In the released position the rod head **17** has nothing to prevent it from disengaging from the socket **16**.

[0022] FIG. 5 illustrates how the extraction tool slide bar **18** closes to engage the rod head **17**. In the closed or latched position the narrow slot in the slide bar **18** is moved under the rod head **17**. This position locks the rod head **17** into the socket **16** and is now prevented from dropping out of the socket **16**.

[0023] Operation of the Tie Down Stake

[0024] INSERTION—The tie down stake **100** is deployed by placing the hub **6** and arms **8** horizontal to the ground in the desired location; then the anchor rods **10** are inserted through the holes **9** at the end of the arms **8** and pushed into the ground or pounded in with a hammer or other object if

required. The anchor rods **10** need not be driven all the way in to provide a secure hold. Once the tie down stake **100** is secured to the ground, one end of a rope, cable, chain, or other attachment device may be attached to the eyelet.

[0025] REMOVAL—To remove the tie down stake **100** from the ground the rod removal tool is slipped over the end of the rod heads one at a time. The head means **11** is engaged by the slot in the extraction tool assembly **15**. Then the anchor rods **10** are removed from the ground with a twisting and pulling action by the operator. The parts of the tie down stake can easily be cleaned and stowed in a tote bag for later use.

[0026] While the foregoing describes exemplary embodiment(s) in accordance with one or more aspects of the present invention, other and further embodiment(s) in accordance with the one or more aspects of the present invention may be devised without departing from the scope thereof, which is determined by the claim(s) that follow and equivalents thereof. Claim(s) listing steps do not imply any order of the steps.

I claim:

1. A tie down stake comprising:

a plurality of elongate anchoring rods, each of said rods having a first end and a second end, said first end being sharpened to penetrate the ground and said second end being blunt to receive the blows of a hammer, said second end having a head means by which to grip said rods such as a bolt head,

and a central hub, said hub having an upper surface and a ground-contacting lower surface, said hub having an eyelet attached thereto and said hub having a plurality of extensions, said extensions connecting said arms, each of said arms having a first end and a second end, said first end being attached to the hub, said second end having holes being formed at an angle such that when said ground-contacting lower surface of said hub and arms placed on the ground and said rods are inserted through said arm holes, said holes being slightly larger in diameter than said rods, said rods are directed downward and inward into the ground thereby cooperating to form a secure, temporary earth anchor.

2. A tie down stake as in claim 1 wherein said solid central hub is made of a polymer, metal, or other appropriate material.

3. A tie down stake as in claim 1 wherein said solid central hub connecting the three arms contains three of said holes at the end of each arm, and wherein there are three of said anchoring rods.

4. A tie down stake as in claim 1 wherein said head means of said elongate anchoring rods comprised of a blunt end of said rods in order to receive the blows of a hammer.

5. A tie down stake as in claim 1 wherein said rods are made of a material selected from the group consisting of metal such as titanium, steel, and/or stainless steel alloy.

6. A tie down stake as in claim 1 further comprising a rod extraction tool, said rod extraction tool having a handle and a gripping means for gripping said head means of said rods and applying torsion and tensile force to said rods to aid in extracting said rods from the ground.

7. A tie down stake comprising:

three elongate metal anchoring rods, each of said rods having a first end and a second end, said first end being sharpened to penetrate the ground and said second end being blunt to receive the blows of a hammer, said second end having a hexagonal shaped head by which to grip said rods, and a solid central hub made of a polymer, aluminum or steel, said hub having an upper surface and a ground-contacting lower surface, said hub having an eyelet attached thereto and having three small extensions with which to attach said arms extending away from hub, said holes on opposite ends of arms being slightly larger in diameter than said rods, and said holes being formed at an angle such that when said ground-contacting lower surface of said hub and arms are placed on the ground and said rods are inserted through said holes, said rods are directed downward and inward into the ground thereby cooperating to form a secure, temporary earth anchor.

8. The tie down stake of claim 7, wherein said solid central hub is of sufficient rigidity that when said lower surface of said hub is placed on the ground and said arms and rods are inserted through said holes, said hub, said arms, and said rods cooperate as an essentially rigid unit to resist dislodgement of the tie down stake from the ground when a force is exerted on said eyelet.

9. A earth ground anchor, comprising:

a plurality of elongate anchoring rods, each of said rods having a insertion end and a contact end, said insertion end configured to penetrate earth ground and said contact end configured to receive external force thereon, and a central hub having a plurality of exten-

sions, said extensions connecting a plurality of arms, each of said arms having a first end and a second end, said first end being attached to said hub, said second end extending horizontally from said hub, said second end having holes therein, said holes are positioned at an angle such that when said earth ground anchor is placed in a earth ground attachment position, said insertion end of said rods are positioned for angular penetration into said earth ground, wherein when said rods are inserted into said earth ground, said rods and hub cooperatively form an anchor that resists extraction therefrom.

10. The anchor of claim 9, wherein said second end comprises a head means by which to grip said rods.

11. The anchor of claim 9, wherein said hub comprises an upper surface and a ground-contacting lower surface.

12. The anchor of claim 9, wherein said holes comprises a diameter adapted to allow insertion of said rods there-through.

13. The anchor of claim 9, wherein said hub comprises an attachment means for attaching a cord thereto.

14. The anchor of claim 13, wherein said attachment means is an eyelet.

15. A rod extraction tool, comprising a T handle as a means for operator to grip connecting extraction tool, a socket and a perpendicular slide bar with which to grip rod head. Slide bar is either in the open or closed position. The open position allowing the release of rod head from said socket, and closed position to prevent rod head from being released from said socket:

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