June 3, 1941. J. C. SCOTT 2,243,886

AIRPLANE MOORING ANCHOR

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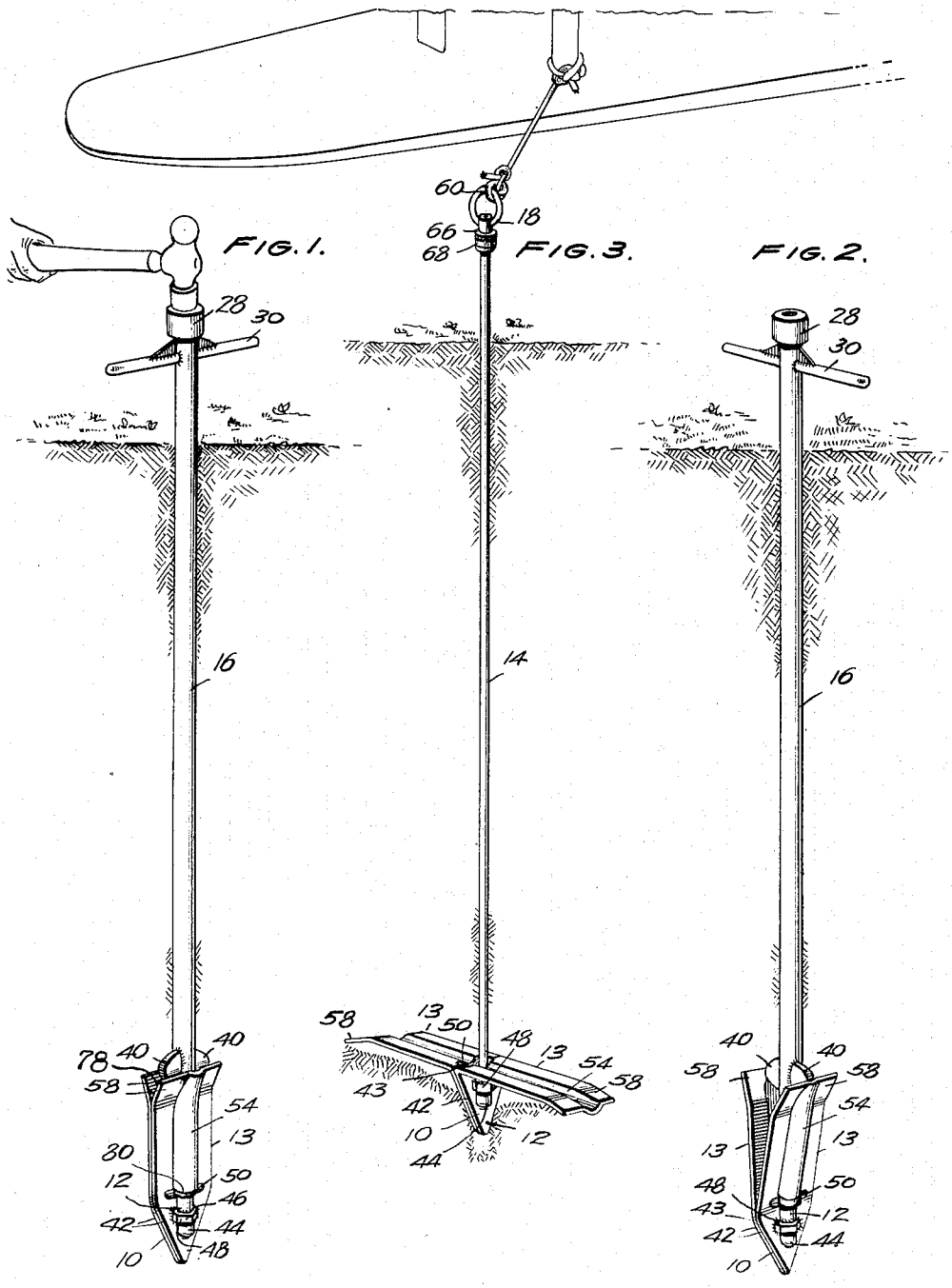


FIG. 1. FIG. 3. FIG. 2.

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FIG. 4.

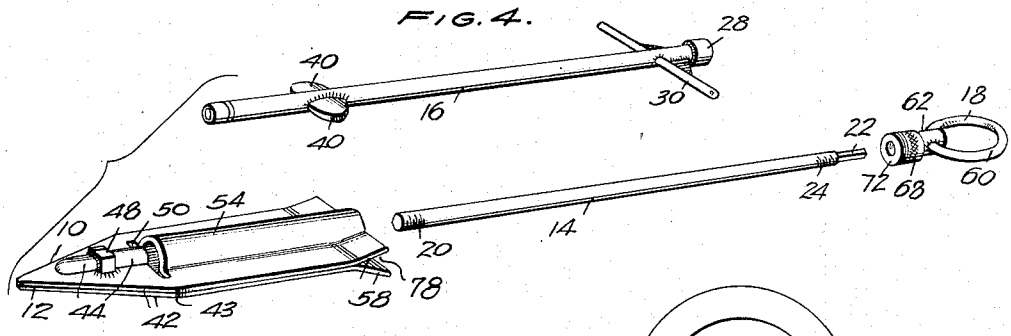


FIG. 5.

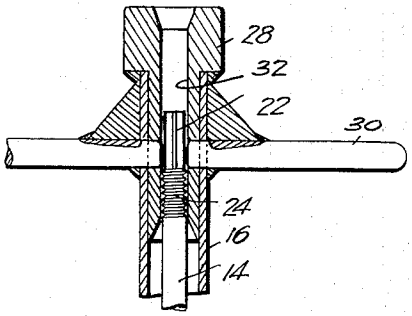
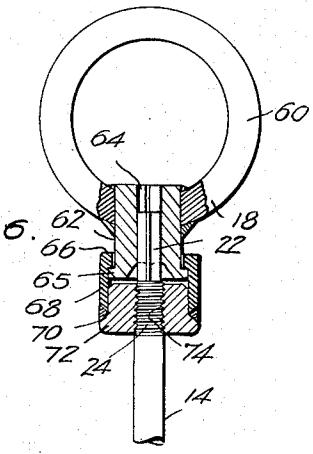


FIG. 6.



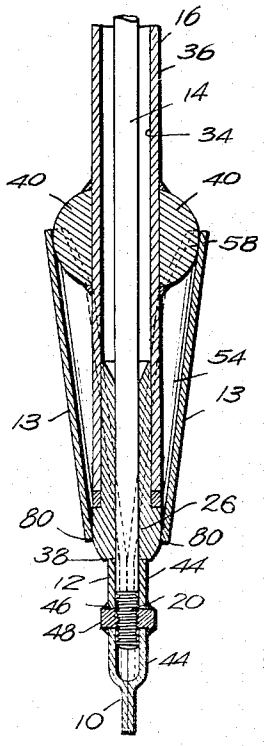


FIG. 7.

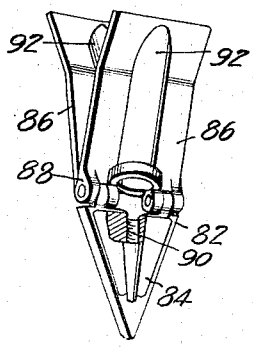
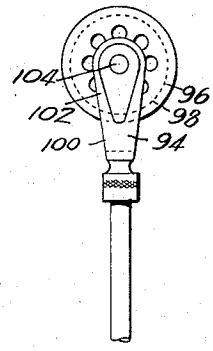


FIG. 8.



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AIRPLANE MOORING ANCHOR

Joseph C. Scott, Dayton, Ohio

Application December 2, 1938, Serial No. 243,604

6 Claims. (Cl. 189—92)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

My invention relates to anchoring devices for airplanes and the like.

In the event of forced landings of aircraft, the pilot often finds it necessary to leave the craft while he seeks aid. Because of the requirement of open fields for landing, the locale of the ship is usually in open terrain with no natural or artificial obstructions to which it might be anchored or locked. In order to protect the ship during his absence from destruction due to winds and forces of nature, or from too easy maneuvering by curious strangers, it is necessary to provide a portable mooring apparatus which is capable of being securely anchored in the earth with a minimum of equipment and effort.

I am aware that devices of this nature are known in the art, but the devices heretofore used are not positive in their action, are especially not positive acting under certain ground conditions, and do not provide the most efficient anchoring capacity per unit of weight.

It is an object of my invention to provide a novel earth anchoring device to meet the above-named deficiencies.

It is a further object of my invention to provide an earth anchoring device with means for insuring positive operation thereof.

It is still a further object of my invention to provide a novel anchoring device having a greatly improved holding capacity with little or no increase in weight.

It is a still further object of my invention to provide a novel mooring eye which will also serve as a tool for disassembling the retaining means from said anchor.

Further advantages and objects of my invention will be readily apparent from the following description and accompanying drawings, wherein like reference characters refer to like parts throughout the several views:

Fig. 1 is a perspective view, showing the anchor in driving assembly;

Fig. 2 is a similar view, showing the driving tube in the assembled spreading position;

Fig. 3 is a similar view, showing the anchor, with the driving tube removed, in the operative position, attached to an airplane;

Fig. 4 is an exploded view, showing the parts comprising the apparatus;

Fig. 5 is a section view of the anchor rod and driving tube in assembled spreading relation;

Fig. 6 is a view of the mooring eye with parts in section;

Fig. 7 shows another embodiment for the anchor element of my invention; and

Fig. 8 shows another embodiment for the mooring eye.

Referring to the drawings, it will be seen that the anchoring apparatus, shown in Figs. 1 to 6 inclusive, comprises, as illustrated, a detachable, arrow-head or wedge-shaped anchoring root element 10, having a piercing portion 12 and a deflectable portion 13, a retaining means in the form of an anchor rod or shaft 14, driving and spreading means in the form of a tube 16, and a detachable mooring eye element 18. The parts of the anchor are preferably made detachable in order to permit convenient packing in a kit and to reduce the amount of necessarily expandible material to a minimum. The driving tube 16 forms no part of the anchor per se, but is an expedient part for accomplishing the anchorage.

The anchor rod 14 is of sufficient length to extend into the ground from two to three feet, and is threaded at its bottom end 20 and provided with a polygonal portion 22 at its upper end. Adjacent to the polygonal portion are threads 24.

The driving tube 16 is slightly longer than the anchor rod 14 and is constructed of light-weight but strong material with a reinforced portion 26 at the bottom and a reinforced driving head 28 at the top. Also provided at the top is a rigid transverse handle 30. The inside diameter 32 of the driving tube, at both the reinforced top and bottom, is of sufficient size to loosely receive the anchor rod 14. Because of the interior reinforcings at the top and bottom, the inside diameter 34 of the intermediate portion 36 of the driving tube is slightly larger than the diameter at the ends of the tube. There are provided on the driving tube 16, a short distance from the bottom end 38, two lobes or wedging elements 40 diametrically arranged for a purpose hereinafter described.

The anchoring root element 10, for use with lighter type aircraft, is preferably made of two stamped complemental sections 42, rigidly secured together at the triangular piercing portion 12 as by spot welding, leaving the deflectable portions 13 free for angular rotation about the edge 43 of the connected areas 12, which edge constitutes the axis of deflection. The stamped sections 42 are so formed that when joined together they provide a small cylinder portion 44 within the triangular piercing portion 12 of the anchoring root element of sufficient diameter to receive

the anchor rod 14, a cut-out portion 46 intermediate of the ends of the cylinder 44 of small diameter, in which is fastened, as by welding, a nut 48, with threads complementary to the threads 20 on the anchor rod, a second cut-out portion 50 substantially coincident with the base 43 of the piercing portion 12, and a second cylindrical portion 54 disposed longitudinally of the upper portion 13 of the anchoring root element 10 and in concentric relation with the cylinder 44 and of larger diameter sufficient to receive the driving tube. The upper ends 58 of the sections 42 of the anchoring root element are flared outwardly for purposes hereinafter described.

The mooring eye 18, as illustrated in Fig. 6, consists of a ring 60 made integral, as by welding, with a stem portion 62. The stem portion contains a polygonal socket 64, adapted to receive the polygonal end 22 of the anchor rod 12, and is made with a radial flange 65 at the end external of the ring to provide an abutment for an inwardly extending radial flange 66 on a knurled collar 68, to the open end 70 of which collar is welded, or otherwise intimately secured, a nut 72 with threads 74 complementary to the threads 24 on the anchor rod. The knurled collar is assembled on the stem portion 62 before the ring 60 is permanently attached. It is thus seen that the combined knurled collar nut 68—72 is a permanently secured, rotatable, part of the mooring eye 18.

I preferably weld all rigidly connected parts in order to achieve great strength with minimum weight of construction.

My anchoring device is used as follows: First, the lower end 20 of the rod 14 is threaded into the nut 48 in the anchoring root element 10 and then the driving tube 16 is mounted on the anchor rod with the lobes 40 in the plane of the anchor point. It will be noted that the bottom 38 of the driving tube abuts the triangular piercing point 12 at the cut-out portion 50 adjoining the base edge 43. The anchoring root element 10 is then, through the medium of the driving tube, driven into the ground to the desired depth by means of a hammer or suitable tool as shown in Fig. 1. If found desirable, the ground may first be broken by a suitable pointed tool to prepare an initial opening to receive the anchoring root element. After the anchoring root element has been driven in the ground to the desired distance, the driving tube 16 is raised slightly to raise the lobes 40 out of the V-slot 78 at the flared ends 58 of the driving point, turned on its axis 90°, and again driven downward, thus causing the lobes, acting as a wedge, to start the spreading of the upper ends 58 of the two portions 13 of the anchoring root element, causing the sections to bend about 43 as a fulcrum (Fig. 2). The grooves in the portions 13, provided by the cylindrical portion 54, serve to receive the lobes 40 in this spreading operation, and thereby prevent inadvertent turning of the driving tube 16 during this step of the operation. The driving tube 16 is then removed and the mooring eye 18 is threaded onto the upper end 24 of the anchor rod by means of the knurled collar nut 68—72. An upward pull is given to the anchoring rod to complete the spreading of the deflectable portions 13 of the anchoring root element. Easy bending of the portions 13 of the anchor element at 43 is assured by virtue of the reduction of the cross-section of the metal because of the cut-out portion 50. The engagement with the earth of the flared ends 58 of the upper portions 13 causes the deflectable portions 13 to bend or rotate about the axis of deflection 43 from the position attained after the incipient rotation effected by the lobes of the driving tube to a position approximately normal to the driving rod, with the flat-plate areas being positively transverse of said rod. The portions 13 of the anchor element are prevented from making more than a 90° angle bend by the contacting of the lower edge 80 of the cylindrical portion 54 at right angles with the cylinder 44. The arrangement of the piercing portion 12 of the anchoring root element in rigid relation with the anchor rod 14 and the provision of the single predetermined axis of deflection 43 for the deflectable portions 13 insure positive angular rotation of the deflectable portions 13 about the single predetermined axis of rotation 43 and prevent tilting about any other axis. The airplane or other article is then fastened to the ring with a suitable fastening means as shown in Fig. 3.

When the airplane is ready to be moved, the anchor rod 14 is salvaged from the anchoring device by unscrewing the rod from the anchoring root element 10 by turning the ring 60 of the mooring eye 18, leaving the element 10 in the ground. The mooring eye is effective for this purpose because of the engagement of the polygonal socket 64 with the polygonal portion 22 of the anchor rod.

Positive action of my anchoring device is assured by the provision of the spreading means consisting of the wedge elements 40 provided on the driving tube 16. This is important for either hard or soft ground. In harder ground, the spreading means will give the portions 13 of the anchoring root element initial impetus to catch into the ground and prevent their withdrawal in the same channel in which they were driven into the ground. In soft ground, the spreading means is again effective to increase the transverse area of the anchor presented to the earth in a plane parallel to the surface, thereby increasing the resistance to upward pull and providing sufficient anchorage to create sufficient internal forces to complete the opening of the anchoring root element. From the construction of the anchoring root element 10, it is to be observed that, should the ground on one side of the point be harder than on the other side, because of the presence of stone or other foreign object, the portion 13 of the opposite section 42 of the anchoring element will nevertheless perform its function.

The embodiment of the anchoring root element 82 for an anchor shown in Fig. 7 is similar in principle to the previously described anchoring root element 10, but is designed to be useful for anchoring devices of greater capacity. This point is formed as illustrated with a solid triangular piercing portion 84 and two separate flat-plate flaps 86 hingedly connected to the triangular point at 88. The solid triangular piercing point 84 is tapped centrally thereof to provide an internally threaded tube 90 to receive the anchoring rod 14 and the flaps are formed with complementary central grooves 92 so as to form a tube of a diameter to receive the driving tube 16 when they are held together in driving position. The operation of this anchor is similar to that of the previously described point.

The embodiment for a mooring eye 94 shown in Fig. 8 is similar to the mooring eye shown in

Fig. 6 in its construction for engagement with and attachment to the anchor rod, but it differs in that, in lieu of the rigid ring 60 of Fig. 6, there is now provided a rotatable pulley 96 with a circumferential groove 98 for receiving an endless cable or rope (not shown) adapted to be fastened to the airplane or other object to be secured. The base or stem 100 of this type of mooring eye is formed into a fork 102 for receiving a journal 104 on which is mounted the pulley 96. This mooring eye is preferably used in connection with the anchor element 82 shown in Fig. 7 for use in anchoring relatively large loads and has the advantage of reducing the shearing force on the cable due to the effectiveness of the pulley in equalizing the forces set up in the cable under strain.

It is to be understood that my invention is not limited to the forms which are shown and described, but that various changes may be made without departing from the spirit thereof and the scope of the appended claims.

I claim:

1. An anchoring device comprising, in combination, a root anchoring element having a piercing portion and having a plurality of deflectable portions integral therewith and extending upwardly and outwardly therefrom, relatively rigid retaining means detachably connected in fixed relation to said anchoring element, a driving element slidably mounted on said retaining means and in abutting engagement with said piercing portion of said anchoring element for driving the same into the ground and camming means carried by said driving member and adapted to cooperate with said deflectable portions for causing an incipient deflection of the same, said deflectable portions being bendable about an axis in a plane transverse to the longitudinal axis of said piercing portion upon partial outward displacement of the anchoring element while in the earth.

2. In combination, an earth anchoring root element, a relatively rigid retaining element readily detachably rotatably connected at one end to said anchoring root element, and mooring means detachably connected to the other end of said retaining element, said detachable mooring means and said retaining element having complemental portions for interlocking against relative rotation to enable the rotation of said retaining element by said mooring means whereby disengagement of said retaining element from said anchoring element may be effected.

3. An earth anchoring device comprising, in combination, a piercing element and a retaining element connected to said piercing element at a point intermediate the ends of said piercing element, said piercing element being formed of a pair of members, each of said members having a lower piercing portion and an upper deflectable portion, said piercing portions being integrally connected together and said deflectable portions being shaped to complementally provide a socket for receiving a driving member and to provide, when deflected away from each other, abutments at their lower edges for limiting the angular displacement thereof to a predetermined value upon partial outward displacement of said piercing element from the earth.

4. As an article of manufacture, an earth anchoring root element formed of a pair of members rigidly joined in complemental arrangement at their lower ends to provide a piercing portion and being separate at their upper ends to provide deflectable portions, each of said members having a transverse cut intermediate the edges thereof and between said piercing portion and said deflectable portion, the upper portions of said members being shaped to complementally provide a socket for receiving a driving member and to provide abutments at their lower edges for limiting the angular displacement thereof to a predetermined value.

5. An earth anchoring device comprising, in combination, a piercing element and a retaining element connected to said piercing element at a point intermediate the ends of said piercing element, said piercing element being formed of a pair of members, each of said members having a lower piercing portion and an upper deflectable portion, said members being integrally connected together at the piercing portions and said deflectable portions being separate, each of said members having a transverse cut intermediate the edges thereof and substantially at the upper boundary of said piercing portion, said deflectable portions being shaped to complementally provide a socket for receiving a driving member, a portion of said transverse cut serving to provide at the top of said piercing portion an abutment for engagement by said driving member and to facilitate bending of said deflectable portions.

6. In combination, an earth anchoring element, a relatively rigid retaining element detachably threadedly connected at one end thereof to said anchoring element, and mooring means detachably threadedly connected to the other end of said retaining element, said detachable mooring means and said retaining element having complemental portions for interlocking against relative rotation to enable the rotation of said retaining element by said mooring means whereby disengagement of said retaining element from said anchoring element may be effected.

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