

Aug. 1, 1967

E. N. CLARK ET AL

3,333,540

EARTH ANCHOR

Filed Aug. 19, 1965

3 Sheets-Sheet 1

Fig. 1

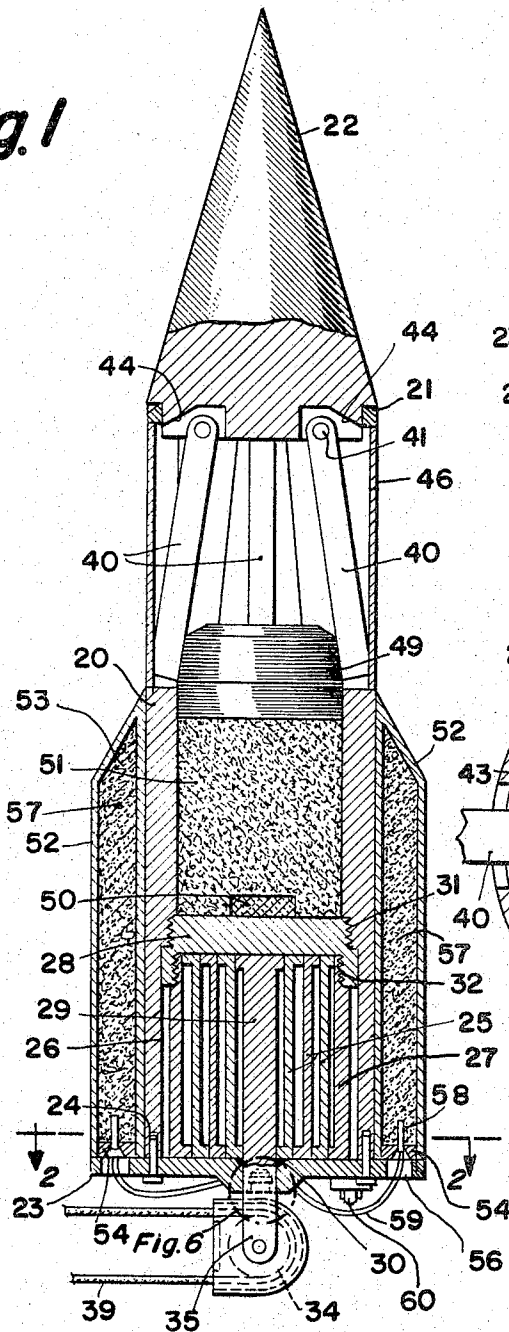


Fig. 2

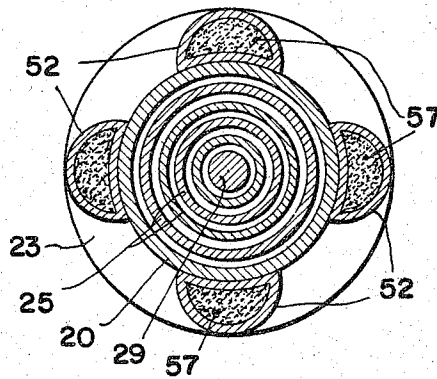
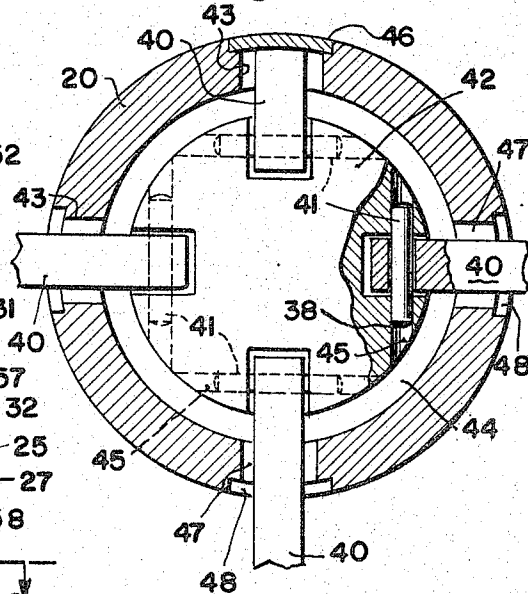


Fig. 4



INVENTORS
ERIC N. CLARK
IRVING L. KINTISH
THOMAS M. ROACH

BY *Harry M. Saragovitz*
Edward J. Kelly, Herbert R. B. S. Duff
ATTORNEYS

Aug. 1, 1967

E. N. CLARK ET AL

3,333,540

EARTH ANCHOR

Filed Aug. 19, 1965

3 Sheets-Sheet 2

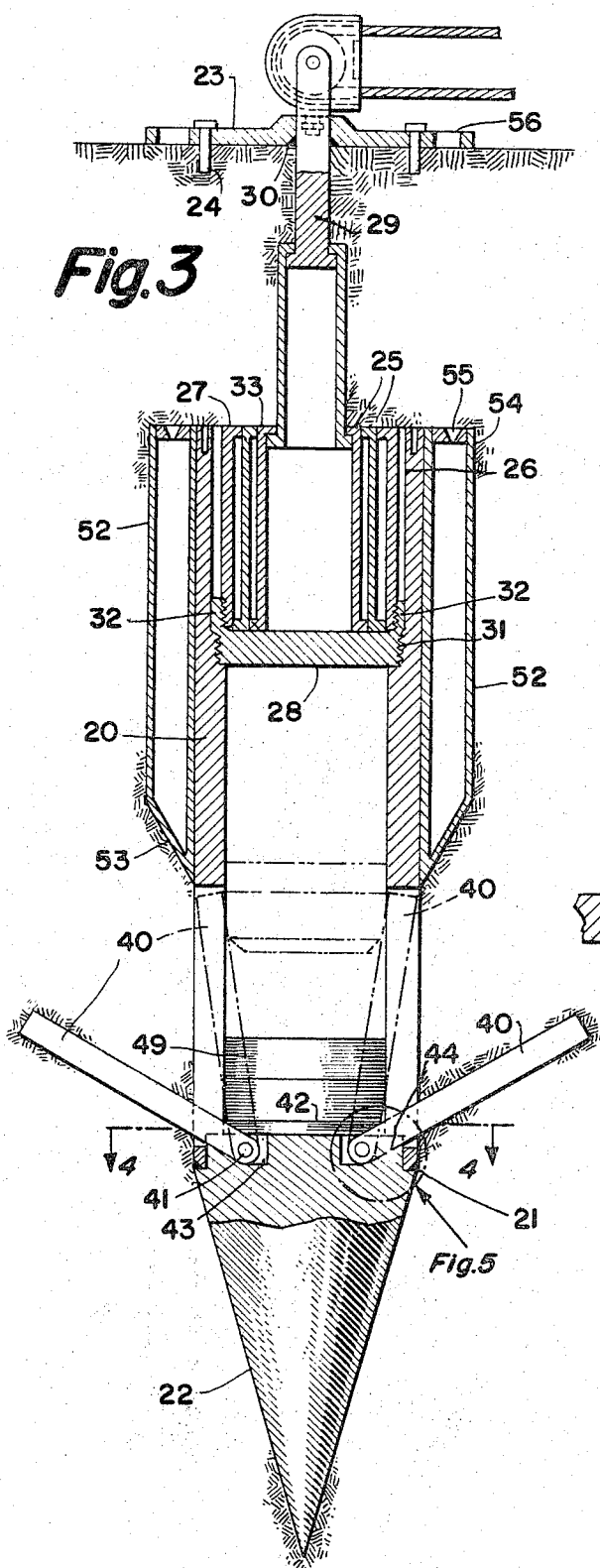


Fig. 5

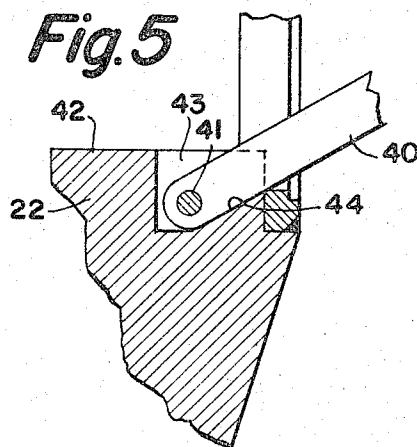
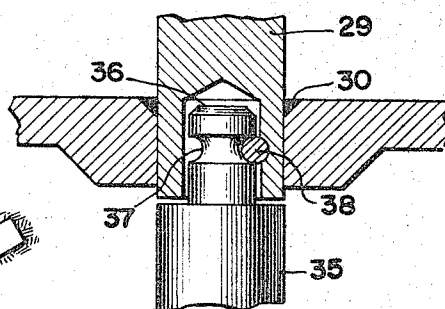


Fig. 6



INVENTORS
ERIC N. CLARK
IRVING L. KINTISH
THOMAS M. ROACH

BY *Harry M. Saragovitz,*
Edward J. Kelly, Herbert Earl
& S. Dubroff ATTORNEYS

Aug. 1, 1967

E. N. CLARK ET AL

3,333,540

EARTH ANCHOR

Filed Aug. 19, 1965

3 Sheets-Sheet 3

Fig. 7

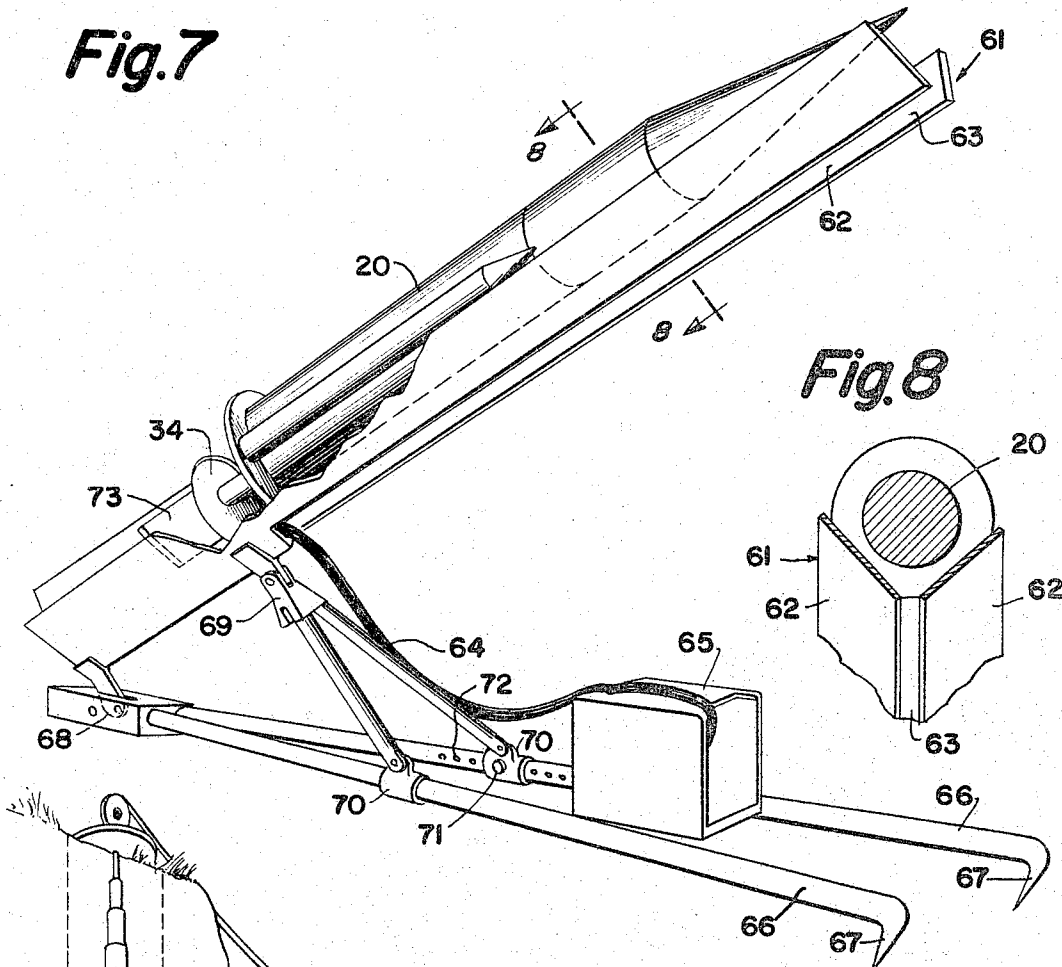


Fig. 8

Fig.9

INVENTORS
ERIC N. CLARK
IRVING L. KINTISH
THOMAS M. ROACH
BY *Harry M. Schaefer*
and J. Kelly, Herbert B. ...
ATTORNEYS

1

3,333,540

EARTH ANCHOR

Eric N. Clark, Sparta, Irving L. Kintish, Rockaway, and Thomas M. Roach, Denville, N.J., assignors to the United States of America as represented by the Secretary of the Army

Filed Aug. 19, 1965, Ser. No. 481,146

4 Claims. (Cl. 102-62)

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

This invention pertains to an earth anchor, and more particularly to a propellant actuated earth anchor.

Heretofore, earth anchors have been employed which were generally of two types. One type was the harpoon type which was fired from a gun and consisted of a shaft with anchor prongs thereon, with the prongs gripping the earth when the harpoon shaft embedded itself into the earth. The other type of earth anchor was of the grappling-hook type which has a shaft, carrying hooks or anchors so that when the shaft hits the surface of the earth without penetrating therein, the grappling hooks or anchor would dig into the earth, or snag behind roots, rocks, and the like when tension was placed upon a cable attached to the shaft.

It is an object of the present invention to provide a propellant actuated earth anchor which may be either fired by a rocket, or placed manually into the ground by digging a hole therein and positioning the earth anchor into said hole, whereby upon actuation of the anchor propellant charge, said anchor propellant will urge the anchor arms into the earth below the surface thereof.

A further object of the invention is to provide a propellant actuated earth anchor for quickly obtaining a securing point for a cable or the like.

A further object of the invention is to provide at a remote point, a propellant actuated earth anchor which may be launched by a rocket type launcher and including a ranging device which presets the angle of the launcher for establishing the desired trajectory of the earth anchor to said remote point.

This invention contemplates a means for securing an anchor in the ground by utilizing a supporting structure which anchor has several foldable anchor arms carried substantially longitudinally within a housing when in an inoperative condition. The anchor arms, at the lower ends of each, are pivoted to the supporting structure. The earth anchor may be inserted into a hole previously dug in the ground, or may be fired from a rocket launcher so that it strikes point first, and buries itself deeply into the ground so that the anchor arms will be below the surface of the earth. Upon discharge of a propellant for anchor arm-setting, a piston is driven downwardly against the anchor arms so that the downward force of the piston forces the anchor arms into a substantially radial position so that the arms may be forced into the earth. A telescoping pole has a retarding flange on one end thereof with the other end secured to the body of the earth anchor. The flange is connected to the earth anchor by shear pins which connect said flange temporarily in position to the earth anchor so that it is retained affixed thereto while in flight. When the earth anchor penetrates into the ground sufficiently, the retarding flange engages the surface of the earth, and separates the flange from the body at the shear pins, whereby the earth anchor may continue to penetrate into the earth. The free end of the telescopic member which projects through the retarding flange, above the ground, has a 360° horizontal rotatable pulley mount. A continuous cable carried by the earth anchor when in flight is used to couple the launcher to a remote point, such as across a ravine or gully.

2

The foregoing and other objects and advantages of the invention will appear more fully hereinafter from a consideration of the detailed description which follows, taken together with the accompanying drawings wherein the embodiment of the invention is illustrated.

In the drawings:

FIG. 1 is a vertical cross-sectional view, partially broken away, showing a rocket-type earth anchor prior to launching.

FIG. 2 is a sectional view taken along lines 2—2 of FIG. 1 showing 4 propelling rocket charges mounted on the outside of the device.

FIG. 3 is a view of the invention after the device has penetrated the earth and anchor bars have been positioned by a propellant-actuated piston, and with a telescopic element partially extended to disclose a retarding flange retained on the surface of the earth for maintaining a cable pulley in operative position.

FIG. 4 is a sectional view taken along lines 4—4 of FIG. 3, partially broken away, showing three of the four anchor bars in operative position, and a slot cover indicated for one anchor bar only as illustrative of the inoperative condition.

FIG. 5 is an enlarged view of the area embraced within the circle 5 of FIG. 3.

FIG. 6 is an enlarged view of the area embraced within circle 6 of FIG. 1 showing the rotatable arrangement of the pulley stud and its complementary retarding flange.

FIG. 7 is a perspective view of the launcher properly in place and set for a horizontal range of 75 feet.

FIG. 8 is a sectional view taken along lines 8—8 of FIG. 7 showing the rocket of the invention on a launcher.

FIG. 9 is a view showing the earth anchor after it has been fired from the launcher with a load being supported on the earth anchor cable.

Referring to the drawings, and more particularly to FIGS. 1 and 3, and including particularly portions thereof shown in FIGS. 2, 4, 5, and 6, there is shown an earth anchor adapted for rocket propulsion to project the earth anchor from one position to a remote position.

The rocket-type earth anchor has a body tube 20 secured by a weld 21 to a pointed penetrating head 22. The opposite end of the body tube is removably affixed to a retarding flange 23 by shear pins 24, of which there are two shown in FIGS. 1 and 3.

A group of telescoping pole sections 25, forming a telescoping pole 26, has a pole section of largest diameter referred to as the first pole section 27, which is attached to the central portion of a body tube support plate 28, and a last pole section 29, which is of smallest diameter, and is welded 30 to the inside surface of the retarding flange.

The pole support plate 28 is circular and has threads 31 on the outer edge which threadedly connects said plate to the body tube 20. The first pole section, or largest diameter pole section 27, is threadedly connected from a bottom annular flange (FIG. 3), radiates outwardly, and is secured by threads 32 to the pole support plate 28.

An upper flange 33 (FIG. 3) extends inwardly on the upper portion of the first pole section 27. The several pole sections, between the first pole section and the last, or smaller pole section, are slidably engageable by their adjacent inwardly and outwardly extending flanges, in a well-known manner.

Concerning the telescopic pole, FIG. 1 shows said pole sections all compressed internally of the body tube of the earth anchor, with the retarding flange on the bottom thereof, while in FIG. 3 the telescopic pole is partially extended after the earth anchor is affixed in place in the earth, and the retarding flange separated from the body tube by engaging the surface of the earth after the shear

pins have been disconnected from the body portion of said earth anchor.

It is emphasized that FIG. 1 shows the rocket-type earth anchor in an inoperative position, as it is placed in the launcher for firing, while FIG. 3 shows the rocket-type earth anchor in an opposite position to that shown in FIG. 1, which opposite position of FIG. 3 shows the device in an operative position after the anchor bars have been actuated to their substantially radial or operative position.

FIG. 6, which is positioned as shown in FIG. 1, shows the last pole section welded to the retarding flange.

The swivel pulley 34 of FIG. 1 is mounted on a pulley yoke 35 which has a pulley stud 36 fitted into a complementary opening in the free end of the last pole section 29. The pulley stud has an annular groove 37 formed thereon and is engaged by a locking pin 38 which has a complementary hole drilled through the retarding flange to receive said pin 38. Said locking pin and groove arrangement permits the swivel pulley 34 to rotate 360° so that the pulley may swing in any operative position depending on the direction of tension of the pulley cable 39, but the stud is locked by the pin from longitudinal movement.

The rocket propellant earth anchor bar as shown dotted in the inoperative position of FIG. 3, includes a multiplicity of anchor bars 40 which are individually mounted on pins 41. A boss 42 formed on the head 22 has four anchor bar slots 43 equi-distantly spaced from one another and merge with an annular inclined shoulder 44 which forms limiting means for the anchor bars 40 when in an operative position as shown in FIG. 5.

The pins 40 having the anchor bars mounted thereon are positioned in bar pin holes 45 (FIG. 4) through the portion of the boss indicated in the drawings. In FIG. 3 it will be seen that the anchor bars in the inoperative position, shown dotted, are within the confines of the slot cover 46 shown in cross section in FIG. 4. The bar slots 47 formed in the body tube 20, one being formed for each anchor bar, has a recess 48 to receive its respective slot cover. The slot cover may be made of plastic and adhered to its slot cover recess 48 in any suitable manner. However, the slot cover may be made of any suitable material such as metal and may be affixed to its respective slot cover recess.

In FIG. 3, the piston 49 is shown dotted in its inoperative position, and in full lines in FIG. 1. A delay impact fuze 50 is secured to one surface of the pole support plate 28 and is in engagement with the anchor bar or piston propellant 51 which fills the entire area bounded by the piston 49, the inner surface of the body tube 20, the fuze 50, and the pole support plate 28. The delay impact fuze is of a conventional military type so that when the rocket head 22 strikes the ground, the delay impact fuze, will, with a short-time delay, be actuated, and ignite the anchor bar propellant 51 which forces the piston 49 downwardly as shown in FIG. 3 solid lines to engage all four of the anchor bars and drive them from the position shown dotted to that shown solid.

It will be apparent that all the covers of the anchor bar slots are in position when the rocket is in the inoperative position. Upon actuation of the piston downwardly, the four anchor bars engage and shatter their four respective plastic slot covers.

The rocket has four rocket propellant chambers or tubes 52 equi-distantly spaced about the earth anchor and with each chamber sealed at one end 53 and with the opposite end of each tube terminating in a partial closure 54 having a rocket nozzle 55. Each rocket nozzle 55 is aligned with a complementary rocket nozzle 56 formed in the retarding flange.

Each rocket chamber or tube 52 is filled with a rocket propellant 57. Each rocket propellant tube has an electrical squib 58 disposed therein and connected by wires 59 to a terminal block 60 for squib leads and battery con-

nections which are used in a switch circuit not shown. Upon energization of the squib leads by the battery (not shown), all four squibs will ignite resulting in simultaneous ignition of the rocket propellant in the four chambers or tubes which dispatches the rocket at the prescribed angle determined by the setting of the launcher 61, shown in FIG. 7.

In FIGS. 7 and 8 there is shown the launcher 61 having a launching platform 62 formed by two flat plates secured together at 90° from each other and leaving a slot 63 therebetween to permit a continuous cable 64 to slide therethrough when the cable is connected to the pulley in the cable launcher and feeding back to the cable box 65.

The launcher has base bars 66 angularly connected together and with prongs 67 bent downwardly at one end thereof to be pushed into the earth for holding the launcher steady during firing.

A base pivot 68 pivotally connects the lower end of the launching platform to the base bars. A means for elevating the launching platform to the proper angle for firing the rocket on a desired trajectory is formed by a bracket pivoted at 69 with one end connected to the launching platform and the other end connected by feet 70 which are slidable on the base bars. Numerals indicating the distance in feet such as 50, 75, and 100 feet are marked as one of the base bars. This marking indicates approximately the horizontal distance from the launcher to the desired point of impact of the rocket as range. The angle of the launching platform is fixed by positioning the set screws 71 in their respective set screw indents 72 and securing same on the base bars for the desired range. A flash plate and stop 73 engages and controls the positioning of one end of the rocket earth anchor on the launching platform. The retarding flange 23 may be seen in position on the launcher.

FIG. 8 shows the rocket after it has been fired and the earth anchor has been actuated to secure same in the ground. The cable 64 will be seen coupling the launcher with the pulley 34, while a load 99 is shown riding between the launcher and the anchor across a gully.

From the foregoing it will be seen that the rocket propelled earth anchor is used in conjunction with a launching platform to provide a rocket propelled earth anchor system.

The rocket launcher employs a launching platform utilizing a pair of platform plates with parallel edges spaced apart to force a guide groove for one of the rocket tubes for directionally positioning the rocket relative to the rocket platform. When the rocket is fired from the launching platform, a pulley carried by the earth anchor is attached to a double cable which is fed from a cable box on the launcher. When the earth anchor is in place after being fired from a first location to a second location, a pulley system couples the earth anchor with the launcher for the purpose of transporting a load between the earth anchor and the launcher.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matters contained in the above description or shown in the accompanying drawings shall be interpreted as being illustrative and not in a limiting manner.

We claim:

1. An earth anchor comprising a body tube structure including a forwardly positioned penetrating head having a central longitudinal axis, means secured to said body tube structure for supporting a load, anchor bars pivotally connected to said structure adjacent said penetrating head, means for actuating said anchor bars whereby said anchor bars whereby said anchor bars may be urged into the earth and said load-supporting means may be maintained in a substantially fixed position relative to the earth, said anchor bar actuating means including a cylinder located rearwardly of said penetrating head and coaxial therewith,

5

said cylinder having an inner peripheral wall for receiving a longitudinally slidable piston, a piston within said cylinder, said piston having a rearward peripheral surface portion slidably engaging said inner peripheral wall and a forward inwardly tapered surface portion in camming engagement with said anchor bars, propellant means for urging said piston outwardly of said cylinder against said anchor bars to urge the free ends thereof away from the longitudinal axis of said body tube structure, and fuze means for igniting said piston urging propellant.

2. An earth anchor comprising a body tube structure including a penetrating head, a plurality of telescoping members, one of said members being secured to said body tube structure for supporting a load, said members being normally contained within said body tube structure, anchor bars pivotally carried by said body tube structure, means for actuating said anchor bars whereby said load-supporting means may be maintained in a substantially fixed position relative to the ground, said anchor bar actuating means including a piston positioned for substantially simultaneously engaging said anchor bars, propellant means for urging said piston against said anchor bars to urge the free ends thereof away from the longitudinal axis of said body tube structure, and fuze means for igniting said piston urging propellant means, and a retarding flange secured to one of said telescoping members, said flange having a forward peripheral surface portion adapted to engage the ground surface to maintain the

6

free end of said load supporting means substantially above the surface of the ground.

3. An earth anchor as set forth in claim 2, and wherein means are provided for removably attaching said retarding flange to said body tube structure to hold said retarding flange and said body tube structure in a predetermined position prior to impact of the retarding flange with the surface of the ground.

4. The arrangement as defined in claim 2, including a swivel rotatably mounted on the free end of the rearwardmost projectable member, and a pulley mounted on said swivel for carrying a load supporting cable.

References Cited

UNITED STATES PATENTS

856,791	6/1907	Mingus	102—89
952,805	3/1910	Hall et al.	102—88
1,152,668	9/1915	Sullivan	102—88
2,490,378	12/1949	Mount	89—1 X
2,522,685	9/1950	Mount	89—1 X
2,568,455	9/1951	Lindvall et al.	89—1.819
3,018,752	1/1962	Sorrell	89—1 X
3,158,100	11/1964	Finley	89—1.819 X
3,233,415	2/1966	Thomas.	

SAMUEL W. ENGLE, *Primary Examiner.*