

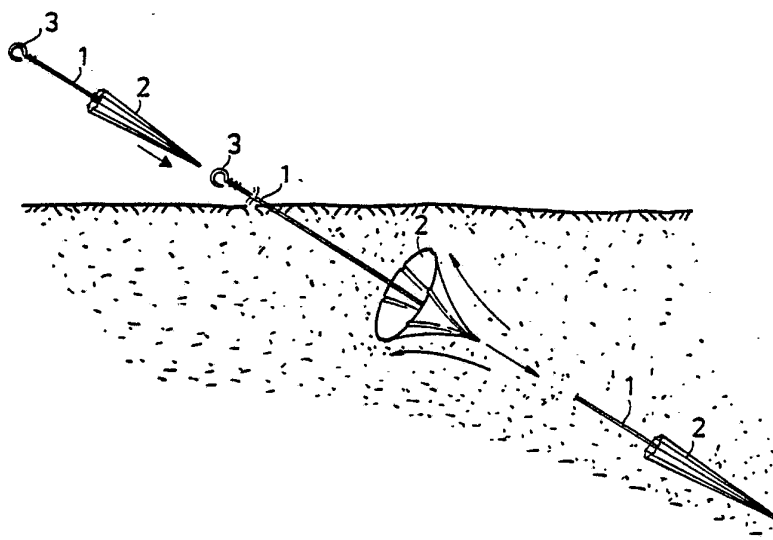


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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**(54) Title:** ANCHORING MEANS, AND METHOD TO ACCOMPLISH ANCHORING**(57) Abstract**

Anchoring means of a type known as 'earth anchors', intended to facilitate anchoring against tensile forces below a ground surface or a bottom surface. The anchoring means includes at least one conical expandable tubular member (2), arranged attached at the end portion having a smaller cross-section area against a central and embraced rod or axle-shaped part (1), the end portion of said rod or axle-shaped part (1) against which the conical tubular member (2) is attached being arranged to serve as a first and preferably pointed part, arranged to facilitate penetration



down through a ground or bottom surface. The opposed end portion of said rod or axle-shaped part (1) is arranged to facilitate attachment of a second member, such as a wire, tie-rod or similar, which second member is intended to be anchored by the anchoring means. The anchoring means is attached by pressing same down through a ground surface or bottom surface, thereafter by means of a pulling action being returned towards said surface, simultaneously expanding the conical tubular member (2) by means of surrounding material entering into same. Said return movement is performed for such a distance, that achieved expansion results in accomplishment of desired attachment or anchoring properties.

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Anchoring means, and method to accomplish anchoring

For a number of purposes, there is a need to accomplishing attachment against tensile forces, adjacently below a ground surface, as well as a sea bottom or similar. Such points of attachment can be used for various types of tie-rods or wires, intended to take up tensile forces. Examples of such anchoring means, also known as "earth anchors", are previously known. As an example of a previously known type of such anchoring means can be mentioned an expandable and substantially tubular member, which surrounds a threaded shaft, on which an expansion means is arranged. A substantially cylindrical hole is taken up, extending downwardly from a ground surface, and the tubular member is thereafter inserted down into the hole. By a displacement movement of the expansion means along the surrounded shaft in direction towards the ground plane, the tubular member is thereafter expanded outwardly, beginning from the lower portion, until it takes up the configuration of a substantially conical member, having the larger end portion directed away from the ground surface.

A considerable disadvantage with previously known types of "earth anchors" is, that they require a hole to be taken up as a first operation, before they can be moved down below a ground surface. The method in which same thereafter is expanded is a further timeconsuming operation, and resulting properties of attachment are also related to the extent of the expansion performed.

The object of the present invention is to disclose an anchoring means for above stated purpose, and a method to accomplish anchoring by means of the anchoring means, which facilitate rapid and simple application, and also extremely good attachment properties, and thus good holding ability against applied tensile forces. These features are also present in fairly loose layers of soil, which previously have caused major problems from anchoring point of view. Anchoring can also be accomplished at a number points separated from each other in direction downwards from the surface at which anchoring is desired, while maintaining same rapid and simple application operation.

The main and characteristic features of the device according to the



present invention are disclosed in the following main claim, but further characteristic features, as well as characteristic features relating to the method for accomplishing anchoring, are disclosed in associated sub-claims.

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An example of an embodiment of an anchoring means according to the present invention is more fully described below with reference to the accompanying drawings, in which:-

10 Fig. 1 shows a perspective view of an embodiment of an anchoring means according to the invention, showing the anchoring means before application, in a second position after application, and in a final and intermediately located position.

15 Fig. 2 shows a perspective view of the anchoring means disclosed in Fig. 1, utilized for attachment of a supporting tie-rod for a telephone pole or similar.

20 Fig. 3 shows a perspective view corresponding to Fig. 1, and with the anchoring means slightly modified.

With reference to Fig. 1, an embodiment is shown of an anchoring means according to the present invention, above a ground surface and prior to application. Said means includes a centrally located rod or axle 1, which in direction from a first end portion adjacent to the ground surface is embraced by a conical tubular member 2, preferably formed by a tubular member having longitudinally extending embossments, the cross-sectional configuration of which is continuously varied with regard to width and/or depth, in order to create said conical shape. The part of the conical tubular member 2 located adjacent to the first end portion is arranged attached to said portion. The other end portion of the centrally located shaft or axle 1 is shown arranged with an eye-shaped part 3, intended to facilitate attachment of a tie-rod or similar.

35 The above described anchoring means is pressed down from the position shown above the ground surface to the position shown at the largest distance from the ground surface, and to facilitate application of pressure down to this depth, an extension member (not shown) is



advantageously used, attached to the eye-shaped attachment part 3. The anchoring means located below the ground surface is thereafter made subject to a tensile force in direction towards the ground surface, whereby it is displaced to the intermediately located position shown in the figure. During said displacement movement, as a result of material entering into the larger end portion of the conical tubular member 2, the conical tubular member 2 is expanded into a configuration having larger conicity, and said expansion continues during the return movement towards the ground surface until anchoring is accomplished. In an extreme returned position, the conical tubular member 2 is returned to a position, in which the larger portion adjacent to the ground surface no longer includes any surrounding corrugations, and the retaining properties against applied tensile forces are hereby extremely good.

Such a final position is shown in Fig. 2, in which the anchoring means is utilized for attachment of a tie-rod for a telephone pole 4, or a similar supporting structure. Even though it is not shown in the figure, the pole 4 is intended to be joined with the rod or the axle 1 by means of a wire or similar.

Fig. 3 shows a modification of previously shown and described embodiment of an anchoring means according to the present invention, and includes several conical tubular member 2, 2', 2'', located embracing each other with a successively increased length. Such an embodiment facilitates use of thinner material for the conical tubular members 2, 2', 2'', and makes it also possible to decide the resistance against expansion as required for each case of application. Certain penetration of material between successively following conical tubular members 2, 2', 2'' can also be expected during the return displacement movement towards the ground surface, whereby "barbs" interacting with surrounding material are achieved, which further improve the holding properties of the anchoring means for certain applications.

Apart from the embodiments shown and described, a further embodiment can also be mentioned, in which a number of embodiments, either as disclosed in Fig. 1 or 3, are joined together, in order to accomplish anchoring at several from each other separated points below a ground surface.



It is easily understood, that anchoring means according to the present invention fairly easy can be pressed down through a ground surface, a bottom surface or similar, and that said operation does not require any substantial force application. Furthermore, such a downwardly displaced anchoring means can also fairly easy be moved back in direction towards the surface which same has penetrated, without use of any expensive and complicated equipment. By exposing such a downwardly displaced anchoring means to a tensile force exceeding required and expected attachment force, safety is obtained against any further significant movement of the anchoring means in direction towards the ground surface during use.

It should be emphasized, that the end portion of the rod or axle 1 directed towards the ground surface obviously can be arranged in a way different from an eye-shaped part 3, and that said end portion thus can be arranged with a screw thread or in any other way, intended to facilitate attachment of an extension member, as well as the element to be anchored. The eye-shaped part 3 is thus only intended to serve as an example of one type of attachment, even though other previously known methods of attachment can be used.

The present invention can thus be modified in a number of different ways, while maintaining the characteristic features of the invention, which in conclusion can be stated as pressing an "umbrella-shaped" part, or several successively following such parts, down through a ground surface or a bottom surface, thereafter displacing the part or parts pressed down in a movement opposed to the direction of penetration, in order to accomplish a conical expansion of the part or parts pressed down, thereby causing anchoring.

The embodiments shown and described are thus only intended to serve as examples of embodiments within the scope of the inventive thought and the following claims.

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C L A I M S

1. Anchoring means, intended to be pressed down through a ground surface or a bottom surface, after expansion being arranged to facilitate attachment against tensile forces, characterised in, that it includes at least one expandable conical tubular member (2), arranged surrounding a centrally extending rod or axle-shaped part (1) and attached against same with the end portion having a smaller cross-sectional area, the end portion attached to the rod or axle-shaped part (1) being arranged to serve as a first and preferably pointed portion for penetration of the ground or bottom surface during application of force against the rod or axle-shaped part (1), the opposed end portion of the expandable conical tubular member (2) being arranged to serve as an inlet opening for surrounding ground or bottom material during application of an opposed force in relation to the direction of penetration against the rod or axle-shaped part (1), whereby the entering material results in expansion of the conical tubular member (2) to a larger conicity defining a conical wall, separating entered ground or bottom material from surrounding ground or bottom material.

2. Anchoring means according to claim 1, characterised in, the expandable conical tubular member (2) comprises of a mainly cylindrical tubular member, formed into a conical shape by means of surrounding and preferably longitudinally extending embossments with varied cross-section.

3. Anchoring means according to any of claims 1 and 2, characterised in, that the expandable conical tubular member (2) comprises of a number of each other surrounding conical tubular members (2, 2', 2''), arranged with successively falling lengths in relation to each other in direction away from the point of attachment against the centrally extending rod or axle-shaped part (1).

4. Anchoring means according to any of claims 1 - 3, characterised in, that a number of expandable conical tubular members (2) are arranged attached with their smaller end portions at from each other separated locations along the centrally extending rod or axle-



shaped part (1).

5. Anchoring means according to any of claims 1 - 4, c h a r a c -  
t e r i s e d i n, that the rod or axle-shaped part (1), by the end  
5 portion against which an expandable conical tubular member (2, 2', 2'')  
is attached, extends outwardly from said attachment point by means of a  
substantially pointed part.

6. A method to attach an anchoring means as disclosed in any of  
10 claims 1 - 5, c h a r a c t e r i s e d i n, that the anchoring means  
as a first step is pressed down through a ground surface or a bottom  
surface, that the anchoring means as a second step by means of a pulling  
action is returned in direction towards said ground surface or bottom  
15 surface, simultaneously expanding included conical tubular members (2,  
2', 2'') into an enlarged conicity by means of surrounding material  
entering into same, said return movement being performed with a tensile  
force which substantially corresponds to, or exceeds, expected and  
desired attachment force against tensile forces for the anchoring means.

20 7. A method according to claim 6, c h a r a c t e r i s e d i n,  
that the return movement, caused by means of a pulling action of the  
anchoring means in direction towards the ground surface or the bottom  
surface, is maintained until a position is obtained in which the larger  
end portion of the expandable conical tubular member (2, 2', 2'') no  
25 longer includes any area reducing embossments.

8. A method according to any of claims 6 and 7, c h a r a c t e -  
r i s e d i n, that the rod or axle-shaped part (1) of the anchoring  
means in connection with the downwardly directed penetrating movement is  
30 joined to one or a number of extension rods or extension axles, and that  
one or a number of such joined extension rods or extension axles are  
removed when the anchoring means by an opposed and return displacement  
movement has been returned to a position inter-acting with surrounding  
material.

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Fig. 1

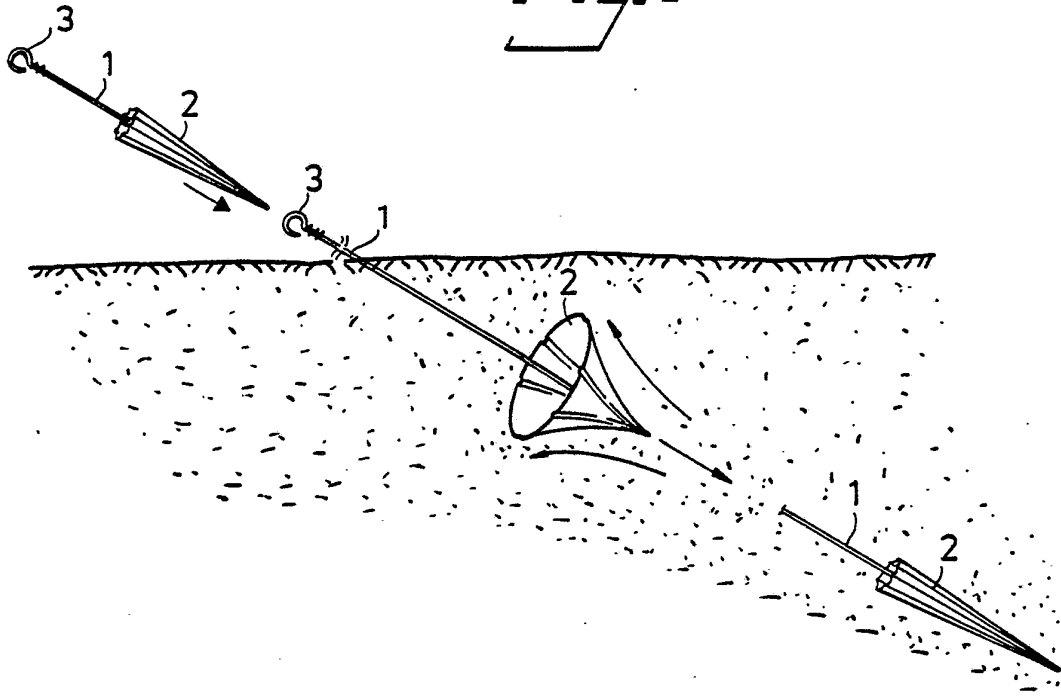


Fig. 2

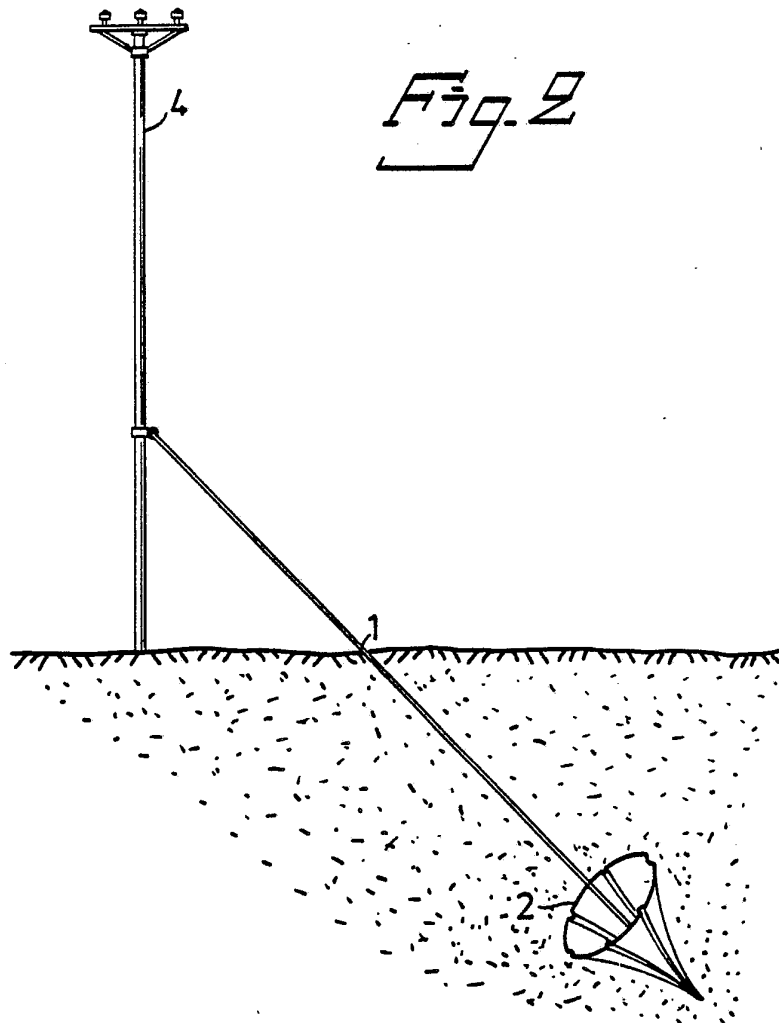
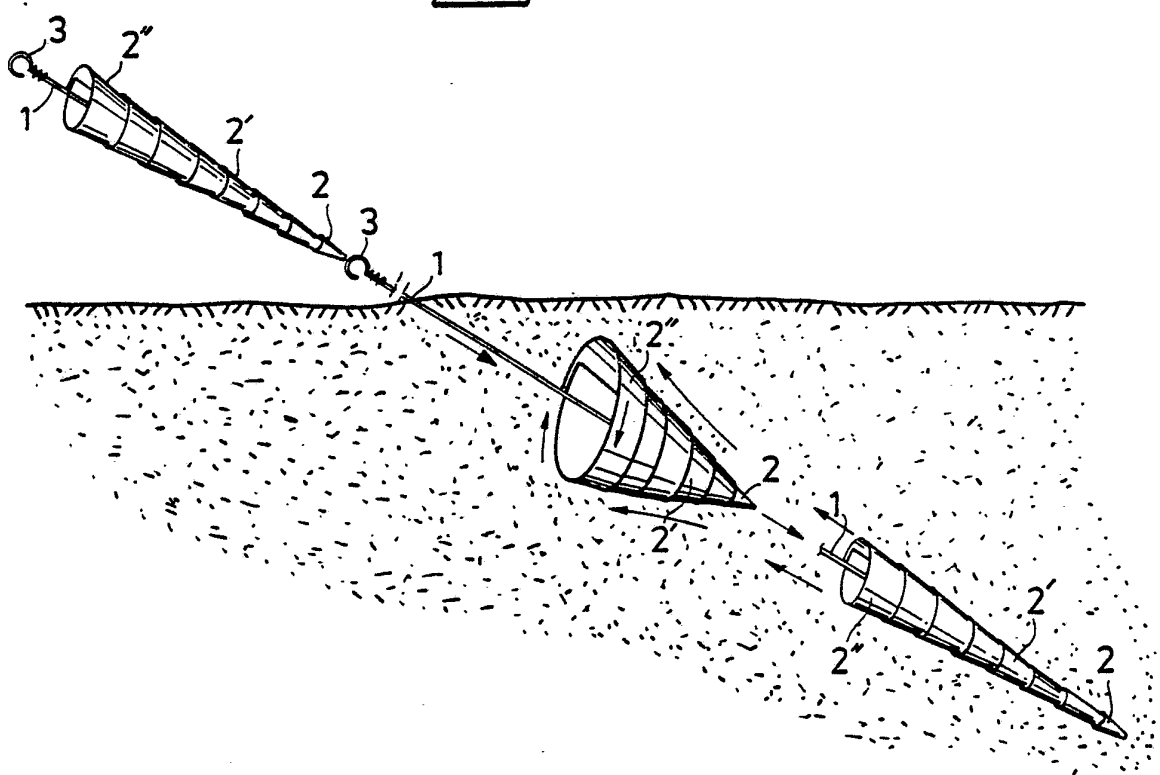


Fig. 3





## FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

II

Fields Searched (cont):US CI      52:155-165; 61:53.6, 53.68, 411:15-80V.  OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE <sup>10</sup>

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1.  Claim numbers ..... because they relate to subject matter <sup>13</sup> not required to be searched by this Authority, namely:2.  Claim numbers ..... because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out <sup>13</sup>, specifically:VI.  OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING <sup>11</sup>

This International Searching Authority found multiple inventions in this international application as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.2.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:3.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:4.  As all searchable claims could be searched without effort justifying an additional fee, the international Searching Authority did not invite payment of any additional fee.

## Remark on Protest

 The additional search fees were accompanied by applicant's protest. No protest accompanied the payment of additional search fees.