

(19)



(11)

EP 3 417 127 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

22.07.2020 Bulletin 2020/30

(51) Int Cl.:

E04H 12/22 ^(2006.01)

E02D 27/42 ^(2006.01)

(86) International application number:

PCT/NO2017/050040

(21) Application number: **17725370.5**

(22) Date of filing: **16.02.2017**

(87) International publication number:

WO 2017/142419 (24.08.2017 Gazette 2017/34)

(54) **APPARATUS AND METHOD FOR FASTENING A COMPOSITE POLE TO THE GROUND**

VORRICHTUNG UND VERFAHREN ZUR BEFESTIGUNG EINER VERBUNDSTANGE AM BODEN

APPAREIL ET PROCÉDÉ DE FIXATION AU SOL D'UN POTEAU COMPOSITE

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

• **FJELDE, Torbjørn**

4130 Jørpeland (NO)

• **HÅBAKK, Sigurd**

4120 Tau (NO)

(30) Priority: **16.02.2016 NO 20160270**

(74) Representative: **Håmsø Patentbyrå AS**

P.O. Box 171

4301 Sandnes (NO)

(43) Date of publication of application:
26.12.2018 Bulletin 2018/52

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(73) Proprietor: **Comrod AS**
4120 Tau (NO)

(72) Inventors:

• **FJELDE, Ole Gunnar**
4120 Tau (NO)

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Description

FIELD OF THE INVENTION

[0001] This invention relates to an apparatus for fastening a hollow composite pole to the ground where a slit formed opening is present in the ground. The invention also relates to a method for fastening a hollow composite pole to the ground.

BACKGROUND OF THE INVENTION

[0002] It is known to fasten composite poles in the ground by excavating a recess, and thereafter positioning the composite pole in the recess and fill in around the pole. Regarding poles for overhead power lines, such a method will often involve relatively large environmental damage, particularly when a recess is made in rock. When fastening poles by use of said method, frost damage may occur due insufficient draining.

[0003] It is also known to mount a composite pole to a column raised from the ground. The column may be made from concrete and having reinforcement that extends into the ground. The composite pole may be inserted over the column. If the column is made from concrete, it is necessary to bring the concrete to the position of the column often by use of a helicopter, or make concrete at the position of the column. Both methods comprises extra costs and work.

[0004] WO2004/101914 discloses a hollow pole that is drilled into a slit the ground.

[0005] Documents EP1911912A2, WO2004/101914A1, GB2444411, US2011/047900A1 and GB2429229A show other solutions from the prior art.

SUMMARY OF THE INVENTION

[0006] The invention has for its object to remedy or to reduce at least one of the drawbacks of the prior art, or at least provide a useful alternative to prior art.

[0007] The object is achieved through features, which are specified in the description below and in the claims that follow.

[0008] The invention is defined by the independent patent claims. The dependent claims define advantageous embodiments of the invention.

[0009] In a first aspect, the invention relates more particularly to fastening element in accordance with claim 1.

[0010] The invention concerns having a circular slit-formed opening, in the ground, where a fastening element is positioned in the slit-formed opening. The fastening element has a conical upper portion above the ground and a lower cylindrical end portion. A hollow composite pole, has a complementary conical inner portion at its lower end, and is positioned on and abutting the fastening element.

[0011] By hollow means that the composite pole must have an inner opening, at least in the portion that is moved

over the fastening element.

[0012] The slit formed opening may be formed by drilling or hammering a body into the ground.

[0013] The fastening element may be equipped with drill elements at its lower end portion to enable the fastening element to be used as a drill.

[0014] The drill elements may comprise metal or ceramic material or combinations thereof.

[0015] In a second aspect the invention relates more particularly to a method for fastening a hollow composite pole for overhead power lines to the ground in accordance with claim 6.

[0016] The method comprises fixing the fastening element to the ground, for instance by adhesive or a concrete based material.

[0017] The method may comprise making the slit formed opening by drilling into the ground.

[0018] The method may comprise making the slit formed opening by hammering the fastening element into the ground.

[0019] The method comprises providing the lower end portion of the fastening element with drill elements and drilling the fastening element into the ground.

[0020] The fastening element may be made from composite material or metal or combinations thereof.

[0021] If parts of the ground that is positioned on the inner side of the slit should loosen or where it is advantageous to have it removed partly or fully, the material on the inner side of the slit may be at least partly removed.

[0022] When drilling in soil or march, it may be advantageous to have frost in the ground to avoid movement in the ground during drilling.

[0023] Tests show that the drill or the fastening element must be aligned with the vertical axes prior to being moved into the ground.

[0024] The apparatus and method according to invention solves the problem of fastening a hollow composite pole to the ground in a relatively simple and cost effective way.

BRIEF INTRODUCTION OF THE DRAWINGS

[0025] In the following is described examples of preferred embodiments and methods illustrated in the accompanying drawings, wherein:

Fig. 1 shows a vertical section of a drill and a power drill during drilling of a slit formed opening in the ground according to the invention;

Fig. 2 shows a vertical section of a composite pole that has been moved into the slit formed opening that was drilled by use of the drill in fig. 1;

Fig. 3 shows an embodiment where a fastening element has been moved into the slit formed opening that is drilled by the use of the drill shown in fig. 1, and where the fastening element is fixed to the com-

posite mast;

Fig. 4 shows another embodiment where the fastening element, at its lower portion, is equipped with drill bodies:

Fig. 5 shows a section IV-IV in fig. 4; and

Fig. 6 shows in a larger scale a segment V-V in fig. 5 of the lower portion of the fastening element and a drill body.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0026] On the drawings, the reference numeral 1 denotes a drill that by the help of a power drill 2 is under displacement into the ground 4. The ground 4 may constitute for example rock, soil, or marsh, alternatively combination thereof.

[0027] The power drill 2 is typically aligned and is fixed to the ground 4 or another suitable, not shown device. Thereafter the power drill 2 that may be electrically or hydraulically driven, displaces the drill 1 into the ground 4 while rotating the drill 1. Thus, a slit formed opening 6 is formed in the ground 4. The drill 1 is then removed from the slit formed opening 6.

[0028] A composite pole 8 that has been moved into the slit formed opening 6 is shown in fig. 2. Additional fixing of the composite pole 8 to the ground 4 may be achieved by inserting grouting, fixing compound or other material (not shown) in between the composite pole 8 and the ground 4.

[0029] In an embodiment of the invention, shown in fig. 3, a sleeve formed fastening element 10 is positioned in the slit formed opening 6. Additional fixing of the fastening element 10 to the ground 4 may be carried out as described for the composite pole 8. A composite pole 8 that is conical inside is placed about the fastening element 10 that has a conical upper portion 18 and a lower cylindrical end portion 12, and moved against the fastening element until abutment is established.

[0030] In some cases, as when the ground 4 mainly constitutes suitable soil, the fixing element 10 may be forced into the ground 4 by hammering.

[0031] In a further alternative embodiment as shown in fig. 4, the fastening element 10 is by its lower end portion 12 equipped with several drill elements 14. The section IV-IV in fig 5 shows a possible distribution of the drill elements 14 about the centre axis 16 of the fastening element 10. The drill elements may be made from material from the fastening element 10 or constitute other materials that is fixed to the fastening element 10.

[0032] A typical drill element 14 is shown in fig. 6 where the drill element 14 that constitutes hard metal, is braced to the in use lower cylindrical end portion 12 of the fixing element 10.

[0033] The fixing element 10 shown in fig. 4 is shown in two parts where in use an upper portion 18 that is fixed

to the composite pole 8 is fixed to the in use lower portion 22 of the fixing element 10 by a flange connection 20. The lower portion 22 is here drilled into the ground 4.

[0034] It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. Use of the verb "comprise" and its conjugations does not exclude the presence of elements or steps other than those stated in a claim. The article "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

Claims

1. Fastening element (10) for fastening a hollow composite pole (8) for overhead power lines to the ground (4) at a location where a slit-formed opening (6) is present in the ground (4), wherein the fastening element (10) has a lower cylindrical end portion (12) that is configured for being positioned in the slit-formed opening (6) being circular, wherein the fastening element (10) has a conical upper portion (18), wherein, in operational use of the fastening element (10), a conical portion of the composite pole (8) is configured for moving over the conical upper portion (18) of the fastening element (10) until abutment with the fastening element (10) is established.
2. The fastening element (10) according to claim 1, wherein the fastening element (10) at its lower end portion (12) is equipped with drill elements (14).
3. The fastening element (10) according to claim 2, wherein the drill elements (14) comprise metal.
4. The fastening element (10) according to claim 2, wherein the drill elements (14) comprise ceramic material.
5. Method for fastening a hollow composite pole (8) for overhead power lines to the ground (4), wherein the method comprises:
 - making a circular slit-formed opening (6) in the ground (4);
 - inserting the fastening element (10) in accordance with claim 1 into the slit-formed opening (6), and
 - moving the composite pole (8) that is conical, over the fastening element (10) until abutment is established.

6. The method according to claim 5, wherein the method comprises fixing the fastening element (10) to the ground (4).
7. The method according to claim 5 or 6, wherein the method comprises making the slit-formed opening (6) by drilling into the ground (4).
8. The method according to claim 5 or 6, wherein the method comprises making the slit-formed opening (6) by hammering the fastening element (10) into the ground (4).
9. The method according to claim 5 to 7, wherein the method comprises providing the fastening element (10) in accordance with claim 2, and drilling the fastening element (10) into the ground.

Patentansprüche

1. Befestigungselement (10) zum Befestigen eines hohlen Verbundmastes (8) für Freileitungen am Boden (4) an einer Stelle, an der eine schlitzförmige Öffnung (6) im Boden (4) vorhanden ist, wobei das Befestigungselement (10) einen unteren zylindrischen Endabschnitt (12) aufweist, der so konfiguriert ist, dass er in der schlitzförmigen Öffnung (6), die kreisförmig ist, positioniert werden kann, wobei das Befestigungselement (10) einen konischen oberen Abschnitt (18) aufweist, wobei im Betriebsgebrauch des Befestigungselements (10) ein konischer Abschnitt des Verbundmastes (8) konfiguriert ist, um über den konischen oberen Abschnitt (18) des Befestigungselements (10) bewegt zu werden, bis ein Anschlag an das Befestigungselement (10) hergestellt ist.
2. Das Befestigungselement (10) nach Anspruch 1, wobei das Befestigungselement (10) an seinem unteren Endabschnitt (12) mit Bohrelementen (14) ausgestattet ist.
3. Das Befestigungselement (10) nach Anspruch 2, wobei die Bohrelemente (14) Metall aufweisen.
4. Das Befestigungselement (10) nach Anspruch 2, wobei die Bohrelemente (14) keramisches Material aufweisen.
5. Verfahren zum Befestigen eines hohlen Verbundmastes (8) für Freileitungen am Boden (4), wobei das Verfahren aufweist:
 - Herstellen einer kreisförmigen, schlitzförmigen Öffnung (6) im Boden (4);
 - Einsetzen des Befestigungselements (10) nach Anspruch 1 in die schlitzförmige Öffnung

(6), und
 - Bewegen des Verbundmastes (8), der konisch ist, über das Befestigungselement (10), bis ein Anschlag hergestellt ist.

6. Verfahren nach Anspruch 5, wobei das Verfahren das Befestigen des Befestigungselements (10) am Boden (4) umfasst.
7. Verfahren nach Anspruch 5 oder 6, wobei das Verfahren das Herstellen der schlitzförmigen Öffnung (6) durch Bohren in den Boden (4) umfasst.
8. Verfahren nach Anspruch 5 oder 6, wobei das Verfahren das Herstellen der schlitzförmigen Öffnung (6) durch Einhämmern des Befestigungselements (10) in den Boden (4) umfasst.
9. Verfahren nach den Ansprüchen 5 bis 7, wobei das Verfahren das Bereitstellen des Befestigungselements (10) nach Anspruch 2 und das Bohren des Befestigungselements (10) in den Boden umfasst.

Revendications

1. Un élément de fixation (10) conçu pour fixer un poteau composite creux (8) pour lignes électriques aériennes au sol (4), à un emplacement où une ouverture en forme de fente (6) est présente dans le sol (4), dans lequel l'élément de fixation (10) présente une partie d'extrémité inférieure cylindrique (12) qui est conçue pour être positionnée dans l'ouverture en forme de fente (6) étant circulaire, dans lequel l'élément de fixation (10) a une partie supérieure conique (18), dans lequel, dans une utilisation de fonctionnement de l'élément de fixation (10), une partie conique du poteau composite (8) est conçue pour se déplacer sur la partie supérieure conique (18) de l'élément de fixation (10) jusqu'à ce qu'une butée contre l'élément de fixation (10) est établie.
2. L'élément de fixation (10) selon la revendication 1, dans lequel l'élément de fixation (10) au niveau de sa partie d'extrémité inférieure (12) est équipé d'éléments de forage (14).
3. L'élément de fixation (10) selon la revendication 2, dans lequel les éléments de forage (14) comprennent du métal.
4. L'élément de fixation (10) selon la revendication 2, dans lequel les éléments de forage (14) comprennent un matériau céramique.
5. Un procédé pour fixer un poteau composite creux (8) pour lignes électriques aériennes au sol (4), dans lequel le procédé comprend:

- réaliser une ouverture en forme de fente (6)
dans le sol (4);
 - insérer l'élément de fixation (10) selon la re-
vendication 1 dans l'ouverture fendue (6), et
 - déplacer le poteau composite (8) qui est coni- 5
que, sur l'élément de fixation (10) jusqu'à ce que
une butée est établie.
6. Le procédé selon la revendication 5, dans lequel le
procédé comprend fixer l'élément de fixation (10) au 10
sol (4).
7. Le procédé selon la revendication 5 ou 6, dans lequel
le procédé comprend réaliser l'ouverture en forme
de fente (6) en forant dans le sol (4). 15
8. Le procédé selon la revendication 5 ou 6, dans lequel
le procédé comprend réaliser l'ouverture en forme
de fente (6) en martelant l'élément de fixation (10)
dans le sol (4). 20
9. Le procédé selon les revendications 5 à 7, dans le-
quel le procédé comprend fournir l'élément de fixa-
tion (10) selon la revendication 2, et le forer l'élément
de fixation (10) dans le sol. 25

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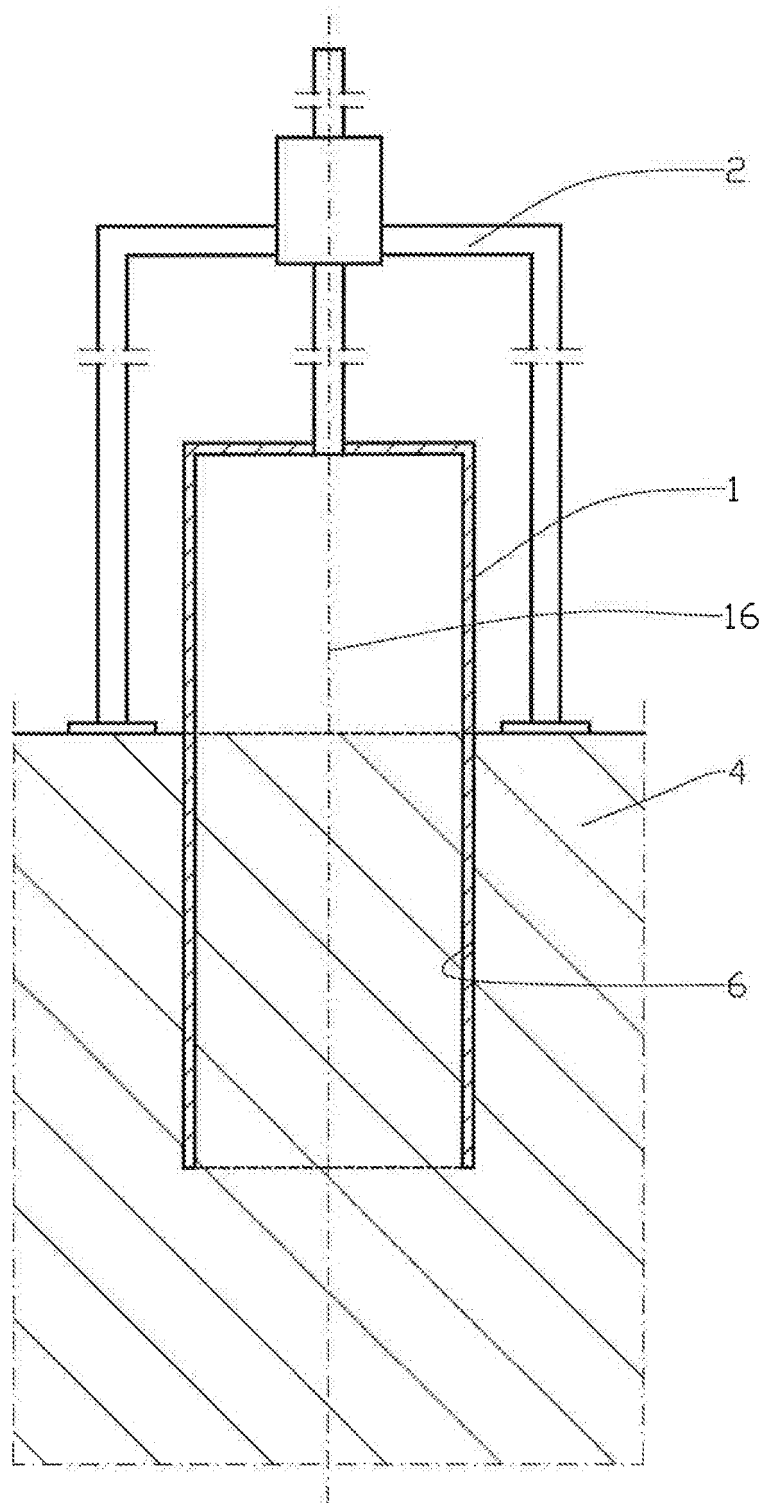


Fig. 1

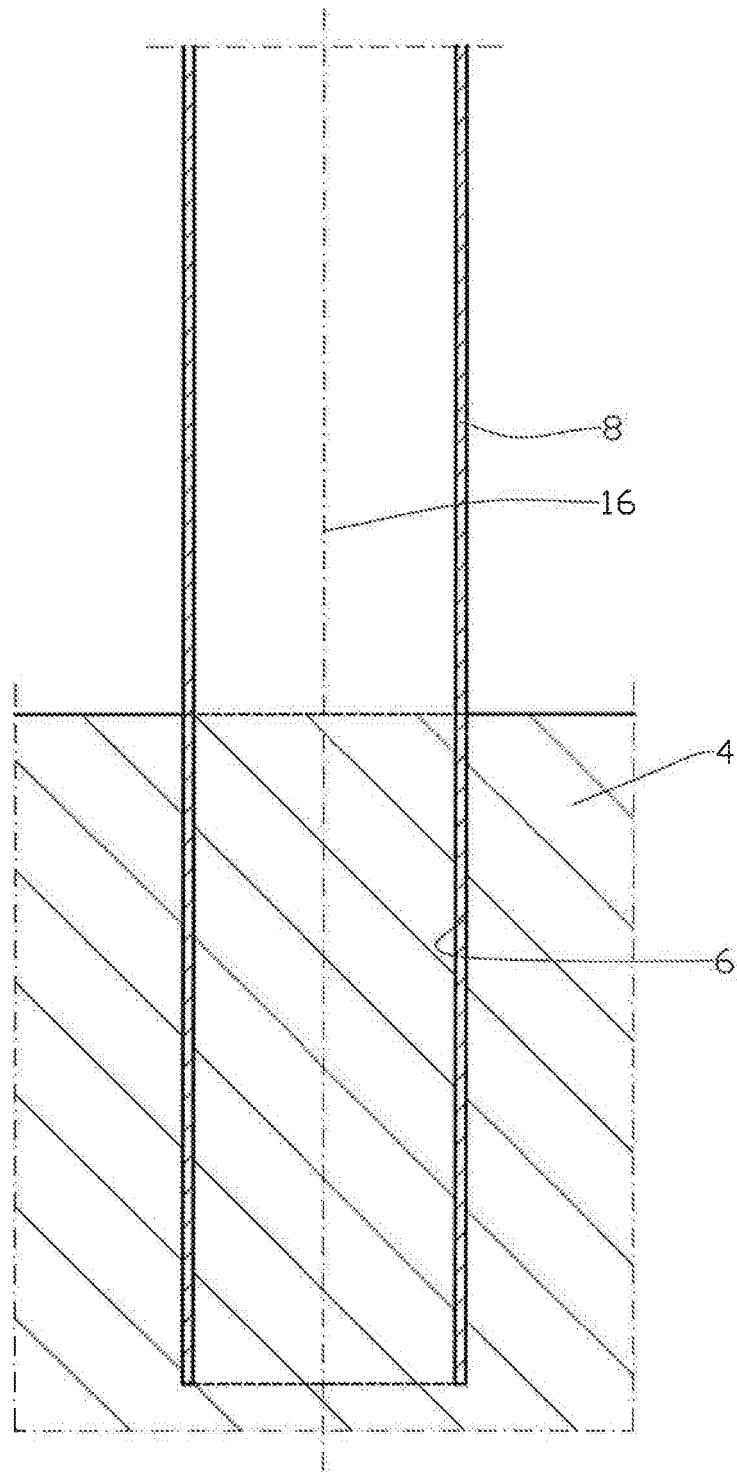


Fig. 2

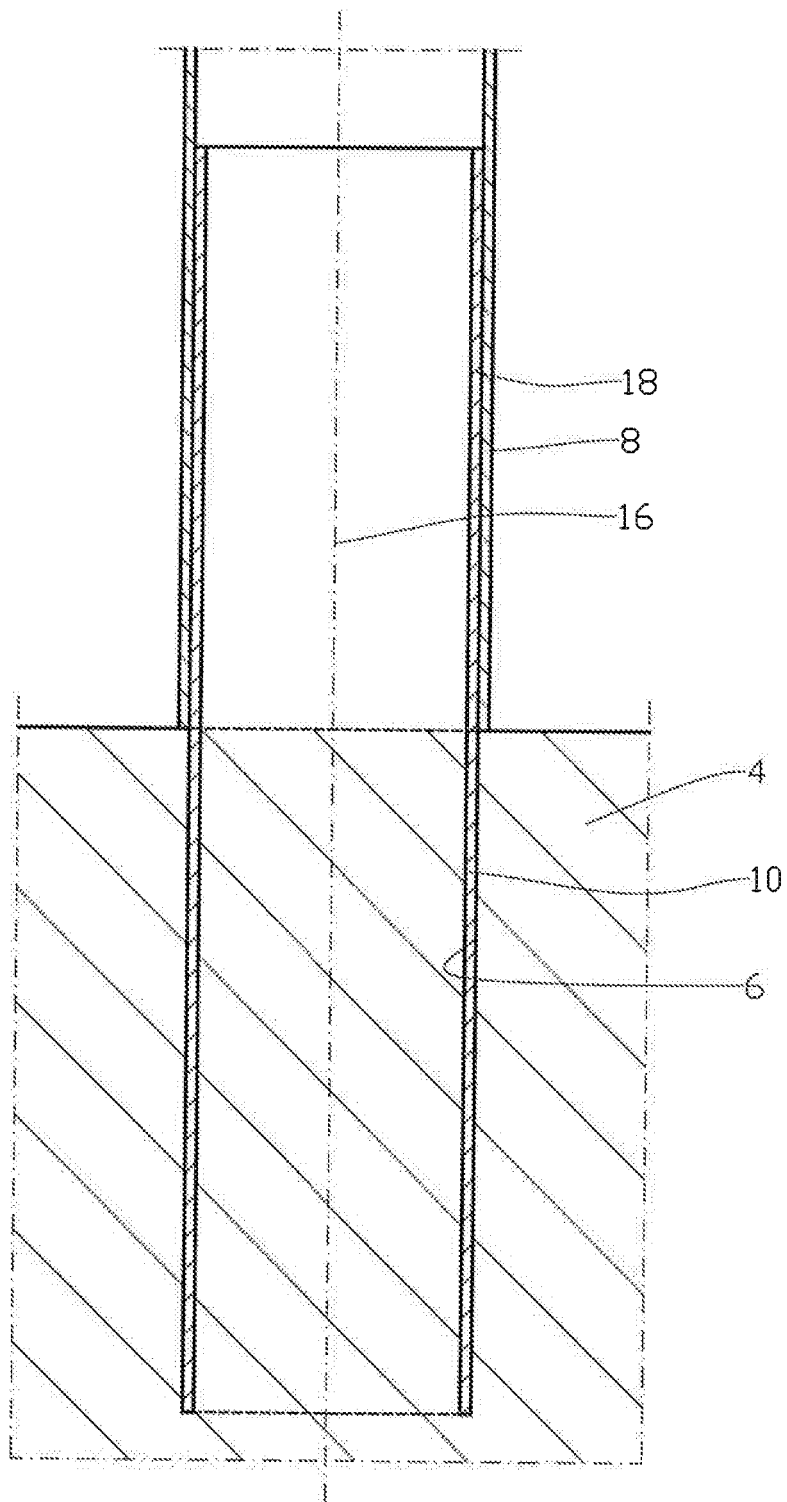


Fig. 3

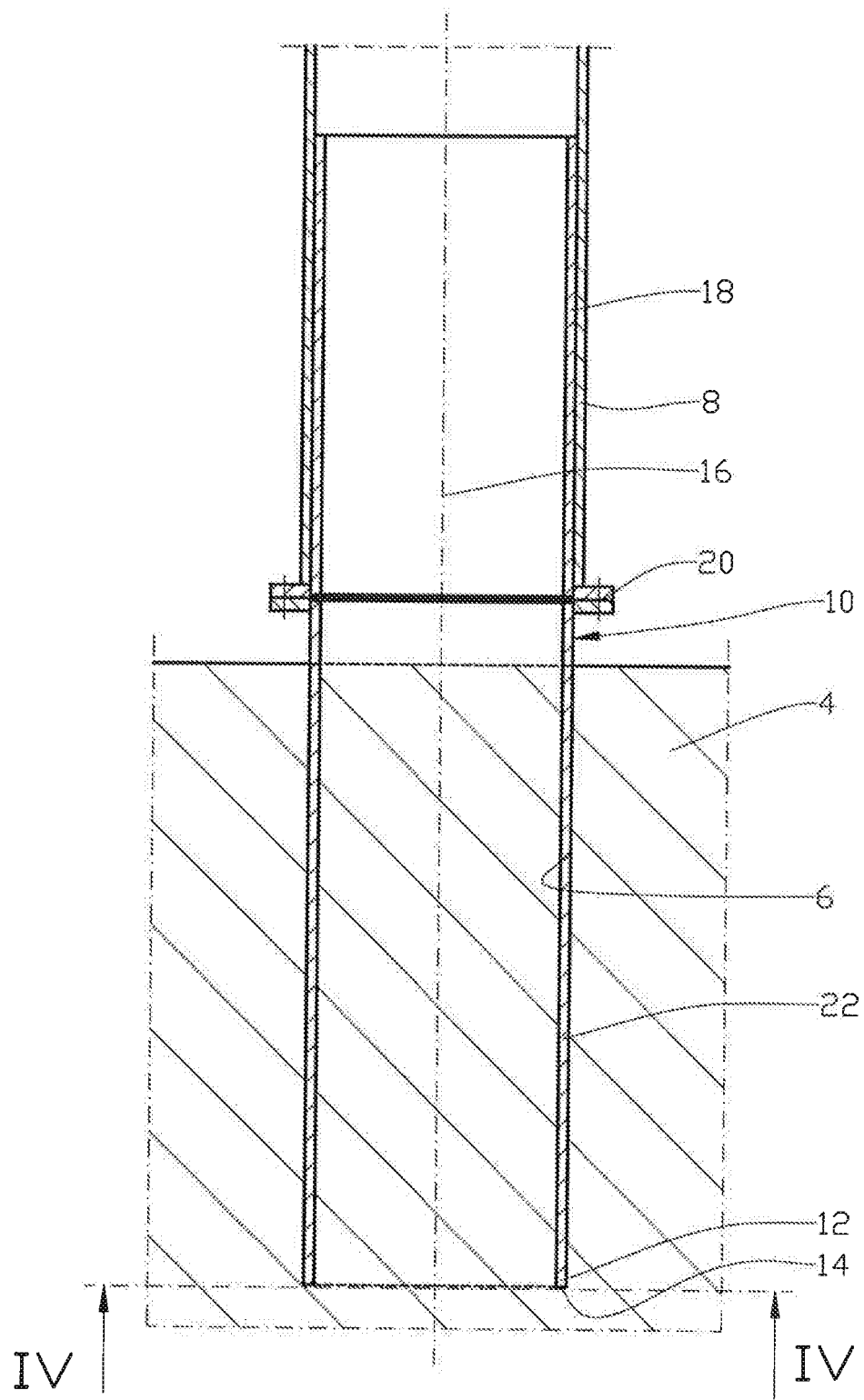


Fig. 4

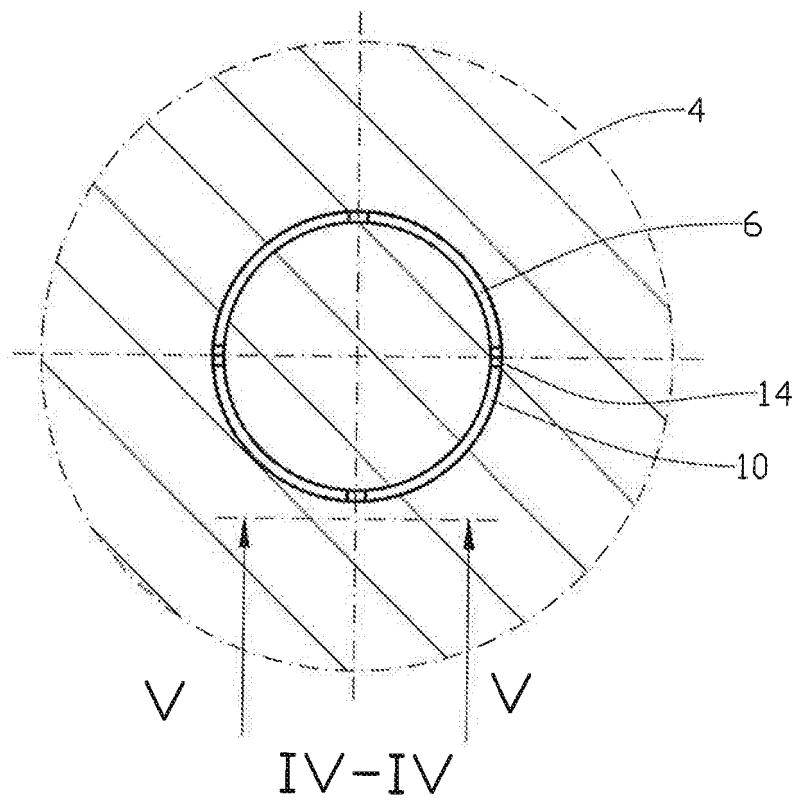
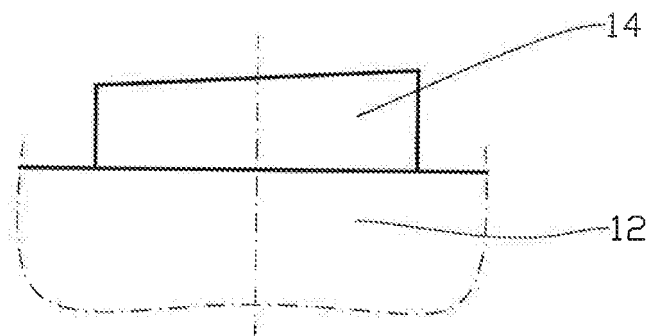


Fig. 5



V-V

Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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