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(54) **A SCREW PILE**

(57) The invention relates to a screw pile (1) having a first screw pile end (10) and a second screw pile end (20), said screw pile (1) including a first metal band (25) helically wound around said first stem portion (6) to define a first thread (T1) of said screw pile (1), and a second metal band (30) helically wound around said second stem portion (7) to define a second thread (T2) of said screw pile (1).

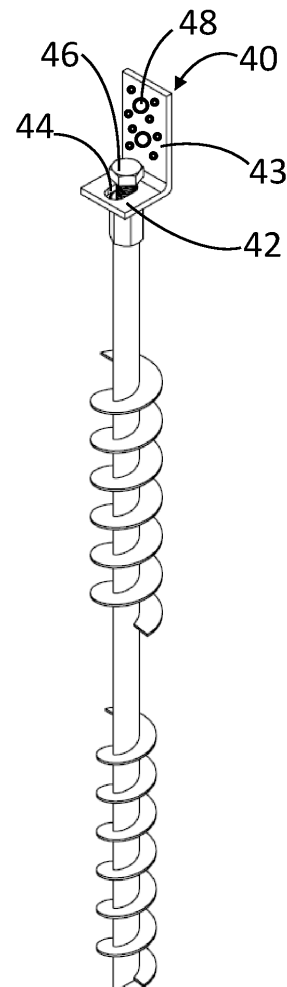


**Fig. 3**

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## Description

**[0001]** The present invention relates to screw piles suitable for supporting beams/rafters of a structure, such as a building structure. Screw piles generally consist of a metal stem for insertion into soil. They are inserted into the soil to bring about or add support for the structure above the screw pile. Further, some screw piles comprise helical bands that act like threads to pull the screw pile into the soil on rotation of the screw pile.

**[0002]** Screw piles are commonly used in residential foundations, bridges, decks, and patios. Screw piles can replace a concrete foundation at times. They are used due to their quick installation time, as there is no curing time required compared to concrete. Additionally, they require less excavation than a concrete foundation, and their reusability is advantageous for temporary structures.

**[0003]** The soil is usually loosened by a pre-boring, making a hole for the screw pile. The screw piles are then screwed into the soil by use of a tool. The tool may either be connected to the outer side of the screw pile or the inner side of the screw pile. The tool and the screw piles are then rotated about the same axis, with the helical bands acting like threads to pull the screw pipe into the soil.

**[0004]** CN104878759 discloses a screw pile with a first and a second screw thread adjoining one another.

**[0005]** GB2552176A discloses a ground pile suitable for forming a ground foundation for supporting a structure. The ground pile features an elongate threaded pile member which is screwed into the ground and has a hollow interior section. It further features a structural load-bearing insert which has an elongate main section arranged to be inserted into and secured within the hollow interior section. There is also provided an insert coupling at the upper end of the main section to which a structure can be coupled. GB2552176A comprises multiple different diameters along its length.

**[0006]** However, prior art screw piles may face problems. One of such occurs when the soil is dense. The dense soil may prove difficult for the screw piles to penetrate even after a pre-boring, and the sideways/horizontal stability provided may not be sufficient. Also, the load-bearing capacity of the prior art screw piles may not be sufficient for the purpose.

**[0007]** The present invention aims at solving the problem of how to provide a higher sideways/horizontal stability and a higher load-bearing capacity in both the upward and/or the downward direction.

## Summary

**[0008]** In view of this object, a screw pile as defined in claim 1 is provided in accordance with the invention.

**[0009]** The screw pile has a first screw pile end and a second screw pile end. The screw pile includes a right circular cylindrical elongated metal stem with a length

and a diameter. The stem extends between the first screw pile end and the second screw pile end. Of the stem, a first stem portion is closer to the first screw pile end and has a first length. Of the stem, a second stem portion is closer to the second screw pile end and has a second length. Of the stem, a third stem portion extends right from the first stem portion and right to the second stem portion, and has a third length. The screw pile also includes a first metal band helically wound around the first stem portion to define a first thread of the screw pile. The screw pile also includes a second metal band helically wound around the second stem portion to define a second thread of the screw pile. Further, the screw pile has no screw thread provided on and along the third portion. The first thread and the second thread have the same thread pitch and hand. The first thread has a first major diameter, and the second thread has a second major diameter, wherein the first major diameter is larger than the second major diameter. The third length is at minimum 50mm.

**[0010]** In this way, the second thread provides a driving force to screw into the soil while the first thread provides an additional driving force as well as an improved sideways/horizontal stabilising of the screw pile and an improved load-bearing capacity. The third portion provides an enhanced frictional force which, together with the fact that the first thread has a larger major diameter than the second thread major diameter, contributes to solving the aforementioned problem.

**[0011]** The stem may have a threaded portion defining the first screw pile end. The threaded portion may preferably have an internal thread accessible at the first screw pile end.

**[0012]** The screw pile may include an elongated portion with a polygonal outer contour adjoining the stem at the first screw pile end.

**[0013]** The elongated portion with a polygonal outer contour may define the first screw pile end.

**[0014]** The elongated portion with a polygonal outer contour may have a thread, preferably an internal thread accessible at said first screw pile end.

**[0015]** The screw pile may include a bracket with a flange. The flange has a through-going hole. The through-going hole receives a bolt engaging the internal thread. The bracket includes a first leg and at least a second leg. The second leg extends perpendicularly to the first leg. The first leg preferably defines an upwardly oriented surface having a width of at least 40 mm, to provide support for a building structure rafter having a width in the same order.

**[0016]** The metal stem may have an elongated central bore extending to the second screw pile end.

**[0017]** The screw pile may be pointed at the second screw pile end.

**[0018]** The metal stem preferably has a smooth outer surface. It is to be understood, however, that the present invention does not rule out the presence of irregularities, such as minor protrusions or indentations, ar-

ranged on or formed in the third stem portion surface where such irregularities do not substantially control, or control, the screwing into the soil of the screw pile.

**[0019]** The first metal band and/or the second metal band may be welded to the stem.

**[0020]** The aforementioned dimensions are preferably selected to be in the following ranges, in any desired combination: stem diameter  $\varnothing=18\text{-}25\text{mm}$ , first major diameter  $\varnothing1=46\text{-}55\text{mm}$ , second major diameter  $\varnothing2=41\text{-}50\text{mm}$ , metal stem length  $L=550\text{-}1200\text{mm}$ , first length  $L1=125\text{-}300\text{mm}$ , second length  $L2=125\text{-}300\text{mm}$ , third length  $L3=90\text{-}200\text{mm}$ . The first and the second lengths may preferably be the same. The thickness of the first and second bands may preferably be the same, or essentially the same, preferably selected in the interval of 1,5-4mm.

**[0021]** The number of metal band windings defining the first thread at the first portion may be in the range of 4 to 14, and the number of metal band windings defining the second thread at the second portion may be in the range of 4 to 14. The pitch of the windings at the first portion may be in the range of 20 to 50 mm and at the second portion may be in the range of 20 to 50 mm.

#### Brief description of the drawings

#### **[0022]**

Fig. 1 shows a side view of a screw pile.

Fig. 2 shows an isometric view of the screw pile.

Fig. 3 shows an isometric view of the screw pile with a bracket attached.

Fig 4 shows the lengths and diameter of different portions of the screw pile.

Figs. 5a-5b show a cross-sectional side view of the bracket with and without a recess for a bolt.

Figs. 6a-6b show a partial, cross-sectional side view of the screw pile with and without a recessed bracket supporting a beam.

Fig. 7a shows a partial, cross-sectional side view of the stem of the screw pile with an internally threaded portion defining a first screw pile end.

Fig. 7b shows a side view of the threaded portion with an external thread.

Fig. 8a-8b show a side view of the bracket and the elongated portion with a polygonal outer contour adjoining the stem at the first screw pile end.

#### Detailed description

**[0023]** The invention will now be explained in more detail below by reference to preferred embodiments.

**[0024]** Figures 1-4 show a screw pile 1 with a first screw pile end 10 and a second screw pile end 20. The screw pile 1 includes a right circular cylindrical elongated metal stem 5 with a length L and a diameter  $\varnothing$ . The stem 5 extends between the first screw pile end 10 and the second screw pile end 20. Of the stem 5, a first stem portion 6 is closer to the first screw pile end 10 and has a first length L1. Of the stem 5, a second stem portion 7 is closer to the second screw pile end 20 and has a second length L2. Of the stem 5, a third stem portion 8 extends from the first stem portion 6 to the second stem portion 7 and has a third length L3. The screw pile 1 also includes a first metal band 25 helically wound around the first stem portion 6 to define a first thread T1 of the screw pile 1. The screw pile 1 also includes a second metal band 30 helically wound around the second stem portion 7 to define a second thread T2 of the screw pile 1. Further, the screw pile 1 has no thread along the third length L3. The first thread T1 and the second thread T2 have the same thread pitch and hand. The first thread T1 has a first major diameter  $\varnothing1$  along its length L1, as seen, and the second thread T2 has a second major diameter  $\varnothing2$ , along its length L2, as seen, wherein the first major diameter  $\varnothing1$  is larger than the second major diameter  $\varnothing2$ . The third length L3 is at minimum 50mm.

**[0025]** The metal stem 5 and the metal bands 25, 30 may be galvanized or of untreated metal. One such untreated metal may be carbon steel.

**[0026]** The third stem portion 8 may have a smooth outer surface S. The first metal band 25 and/or the second metal band 30 may be welded to the stem 5.

**[0027]** In figure 2, an embodiment is shown with an elongated portion 3 with a polygonal outer contour adjoining the stem 5 at the first screw pile end 10. The elongated portion 3 with a polygonal outer contour may as shown define the first screw pile end 10. The elongated portion 3 may have an internal thread 2 accessible at the first screw pile end 10. The metal stem 5 may as shown have an elongated central bore 100 extending to the second screw pile end 20. The screw pile 1 may be pointed at the second screw pile end 20.

**[0028]** The thread 2 may be used for engaging with a tool (not shown). The elongated portion 3 may also be used for engaging with the tool. The screw piles 1 can be screwed into the soil by use of the tool. The tool may either be connected to the outer side of the screw pile 1, when the thread 2 is external, or the inner side of the screw pile 1, when the thread 2 is internal. The tool and the screw piles 1 are then rotated about the same axis and the helical bands acting like threads pull the screw pipe into the soil.

**[0029]** Figure 3 shows the screw pile 1 including a bracket 40 with a flange 42. The flange 42 has a

through-going hole 44. The through-going hole 44 receives a bolt 46 engaging the internal thread 2. The bracket 40 includes a first leg 42 and at least a second leg 43. The second leg 43 extends perpendicularly to the first leg 42. The first leg 42 preferably defines an upwardly oriented surface having a width W of at least 40 mm.

**[0030]** Figure 4 shows the dimensions of the screw pile 1. The dimensions may, by way of example, be selected to be in one or more of the following intervals:  $\varnothing=18\text{-}25\text{mm}$ ,  $\varnothing1=46\text{-}55\text{mm}$ ,  $\varnothing2=41\text{-}50\text{mm}$ ,  $L=550\text{-}1200\text{mm}$ ,  $L1=125\text{-}300\text{mm}$ ,  $L2=125\text{-}300\text{mm}$ ,  $L3=90\text{-}200\text{mm}$ . The first and the second lengths L1, L2 may optionally be the same. The thickness of the first and second bands 25, 30 may optionally be the same, or essentially the same, and optionally be selected in the interval of 1,5-4mm.

**[0031]** Figures 5a and 5b show two embodiments of the bracket 40. In figure 5a, the bracket 40 has a recess 47 in the first leg 42 for a bolt 46 for securing the bracket 40 to the aforementioned threaded portion 3. In figure 5b, the bolt 46 sticks out as there is no recess 47 in the first leg 42. In figure 5a, the recess 47 may align the bolt 46 with the first leg 42 such that the bolt 46 and the first leg 42 together may define a supporting surface for a beam 200 (see fig. 6a) part of a structure supported by a plurality of the screw piles 1. If the bolt 46 does not align with the first leg 42, such that the bolt 46 is further down in the recess 47, only the first leg 42 may define the supporting surface. In figure 5b, without the recess 47, the bolt 46 becomes the supporting surface, and the founding of the bracket may be easier.

**[0032]** Figures 6a and 6b show how a beam 200 may be supported by the embodiments with and without a recess 47 in the first leg 42. In figure 6a, the bracket 40 with the first leg 42 without the recess 47 supports the beam 200 with the head of the bolt 46. In figure 6b, the bolt 46 hides in the recess 47, and the beam 200 is thereby supported by the first leg 42, thereby defining the supporting surface.

**[0033]** Figure 7a shows the right circular cylindrical stem 5 which may as shown have a threaded portion 3 defining the first screw pile end 10. The threaded portion 3 may as shown preferably have an internal thread 2 accessible at the first screw pile end. The internal thread 2 is arranged inside of the bore 100. The threaded portion 3 may alternatively comprise an external thread 2, as shown in figure 7b.

**[0034]** Figures 8a and 8b show embodiments with the elongated portion 3 with a polygonal outer contour adjoining the stem 5 at the first screw pile end 10. The elongated portion 3 does not have to define the first screw pile end 10. As in figure 8a, the bracket 40 may be connected to the stem 5 by the bolt 46. Alternatively, in figure 8b, the bracket 40 is not connected by the bolt 46, but by an alternate means such as welding or being founded in one piece, for engagement with the tool for driving the screw pile 1 into the soil.

**[0035]** Figure 8b also show that the screw pile 1 may include the bracket 40 with the first leg 42 and at least the second leg 43 extending perpendicularly to the first leg 42. The first leg 42 preferably defines an upwardly oriented support surface having a width W of at least 40mm. Figure 8b may illustrate how the screw pile 1 and the bracket 40 may be cast as one piece.

**[0036]** The number of metal band windings defining the first thread T1 at the first portion 6 may be in the range of 4 to 14. The number of metal band windings defining the second thread T2 at the second portion 7 may be in the range of 4 to 14. The pitch of the windings at said first portion 6 may be in the range of 20 to 50 mm, and the pitch of the windings at the second portion 7 may be in the range of 20 to 50 mm.

## Claims

1. A screw pile (1) having a first screw pile end (10) and a second screw pile end (20), said screw pile (1) including:
  - a) a cylindrical elongated metal stem (5) having a length (L) and a diameter ( $\varnothing$ ), said stem (5) extending between said first screw pile end (10) and said second screw pile end (20), a first stem portion (6) being closer to said first screw pile end (10) and having a first length (L1), a second stem portion (7) being closer to said second screw pile end (20) and having a second length (L2), a third stem portion (8) extending from said first stem portion (6) to said second stem portion (7) and having a third length (L3),
  - b) a first metal band (25) helically wound around said first stem portion (6) to define a first thread (T1) of said screw pile (1), and
  - c) a second metal band (30) helically wound around said second stem portion (7) to define a second thread (T2) of said screw pile (1),
    - said third stem portion (8) having no thread along said third length (L3),
    - said first thread (T1) and said second thread (T2) having the same thread pitch and hand,
    - said first thread (T1) having a first major diameter ( $\varnothing1$ ),
    - said second thread (T2) having a second major diameter ( $\varnothing2$ ),
    - wherein said first major diameter ( $\varnothing1$ ) is larger than said second major diameter ( $\varnothing2$ ), and
    - wherein said third length (L3) is at minimum 50mm.
2. The screw pile of claim 1, said stem (5) having an elongated portion (3) defining said first screw pile end (10), said portion (3) preferably having an internal thread (2) accessible at said first screw pile

- end (10).
3. The screw pile (1) of claim 1, including an elongated portion (3) with a polygonal outer contour adjoining said stem (5) at said first screw pile end (10). 5
4. The screw pile (1) of the previous claim, said elongated portion (3) with a polygonal outer contour defining said first screw pile end (10). 10
5. The screw pile (1) of the previous claim, said elongated portion (3) with a polygonal outer contour having a thread (2), preferably an internal thread (2) accessible at said first screw pile end (10). 15
6. The screw pile (1) of claim 2 or 5, wherein said elongated portion (3) having an internal thread (2), said screw pile (1) including a bracket (40) with a flange (42), said flange (42) having a through-going hole (44) receiving a bolt (46) engaging said internal thread (2), said bracket (40) including a first leg (42) and at least a second leg (43) extending perpendicularly to said first leg (42), said first leg (42) preferably defining an upwardly oriented surface having a width (W) of at least 40 mm. 20 25
7. The screw pile (1) according to any of the previous claims, said metal stem (5) having an elongated central bore (100) extending to said second screw pile end (20). 30
8. The screw pile (1) according to any of the previous claims, said screw pile (1) being pointed at said second screw pile end (20). 35
9. The screw pile (1) according to any of the previous claims, said third stem portion (8) having a smooth outer surface (S). 40
10. The screw pile (1) according to any of the previous claims, said first (25) and/or said second metal band (30) being welded to said stem (5).
11. The screw pile (1) of any of claim 1-3, including a bracket (40) with a first leg (42) and at least a second leg (43) extending perpendicularly to said first leg (42), said first leg (42) preferably defining an upwardly oriented support surface having a width (W) of at least 40mm. 45 50
12. The screw pile (1) according to any of the previous claims, said dimensions being selected to be in one or more of the following intervals: 55
- $\varnothing=18-25\text{mm}$ ,  
 $\varnothing1=46-55\text{mm}$ ,  
 $\varnothing2=41-50\text{mm}$ ,
- $L=550-1200\text{mm}$ ,  
 $L1=125-300\text{mm}$ ,  
 $L2=125-300\text{mm}$ ,  
 $L3=90-200\text{mm}$ ,  
said first and said second lengths (L1, L2) preferably being the same,  
the thickness of said first and second bands (25, 30) preferably being the same, or essentially the same, and preferably selected in the interval of 1,5-4mm.
13. The screw pile (1) according to any of the previous claims, the number of windings of said first thread (T1) at said first portion (6) being in the range of 4 to 14 and of said second thread (T2) at said second portion (7) being in the range of 4 to 14, and/or the pitch of the windings at said first portion (6) being in the range of 20 to 50 mm and at said second portion (7) being in the range of 20 to 50 mm.

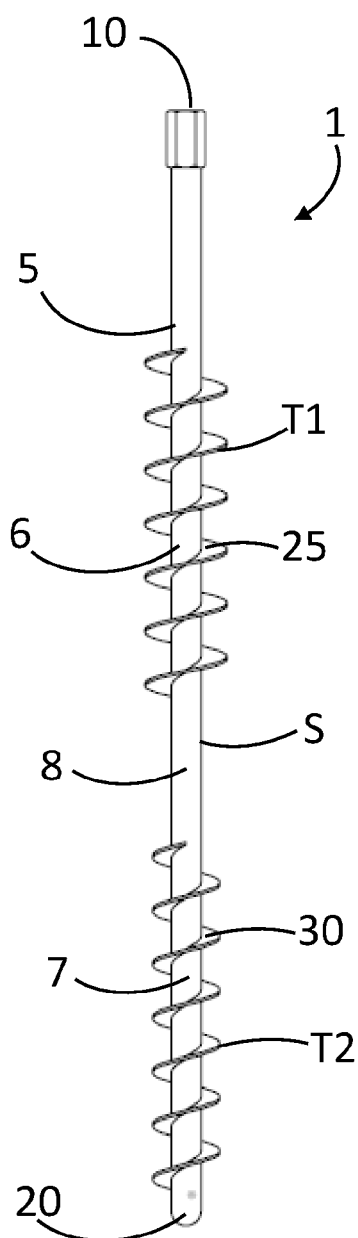


Fig. 1

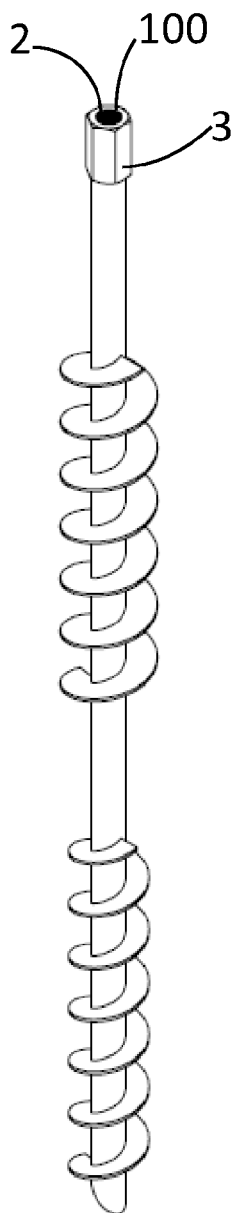


Fig. 2

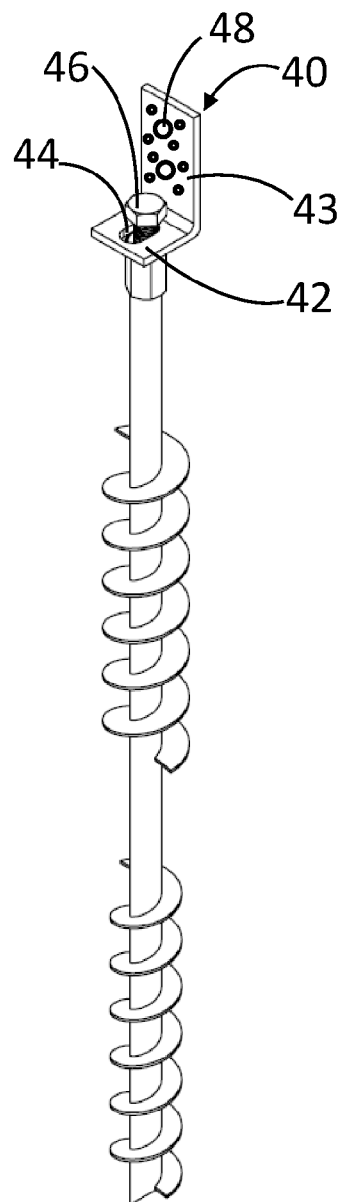


Fig. 3

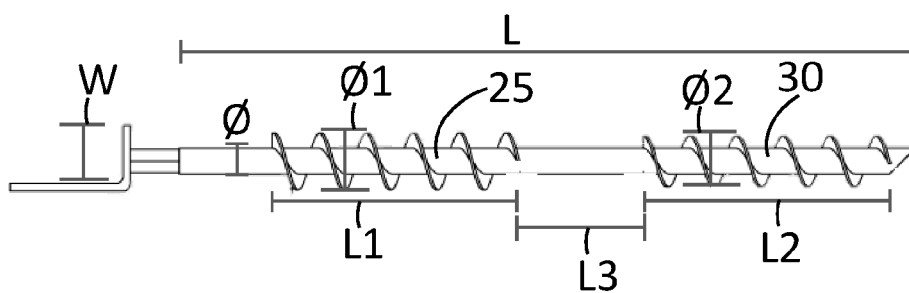


Fig. 4

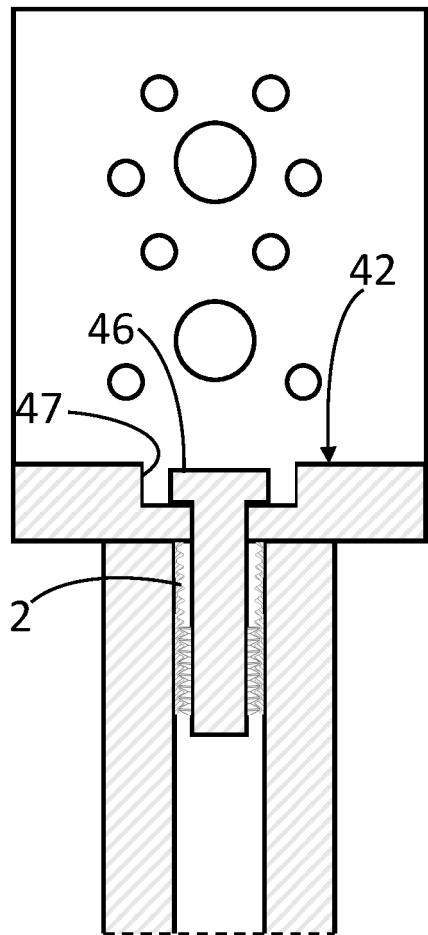


*Fig. 5a*

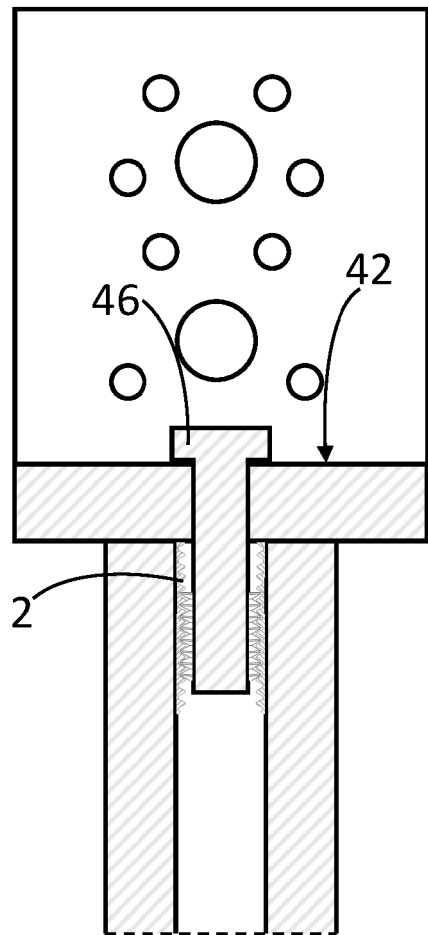


*Fig. 5b*

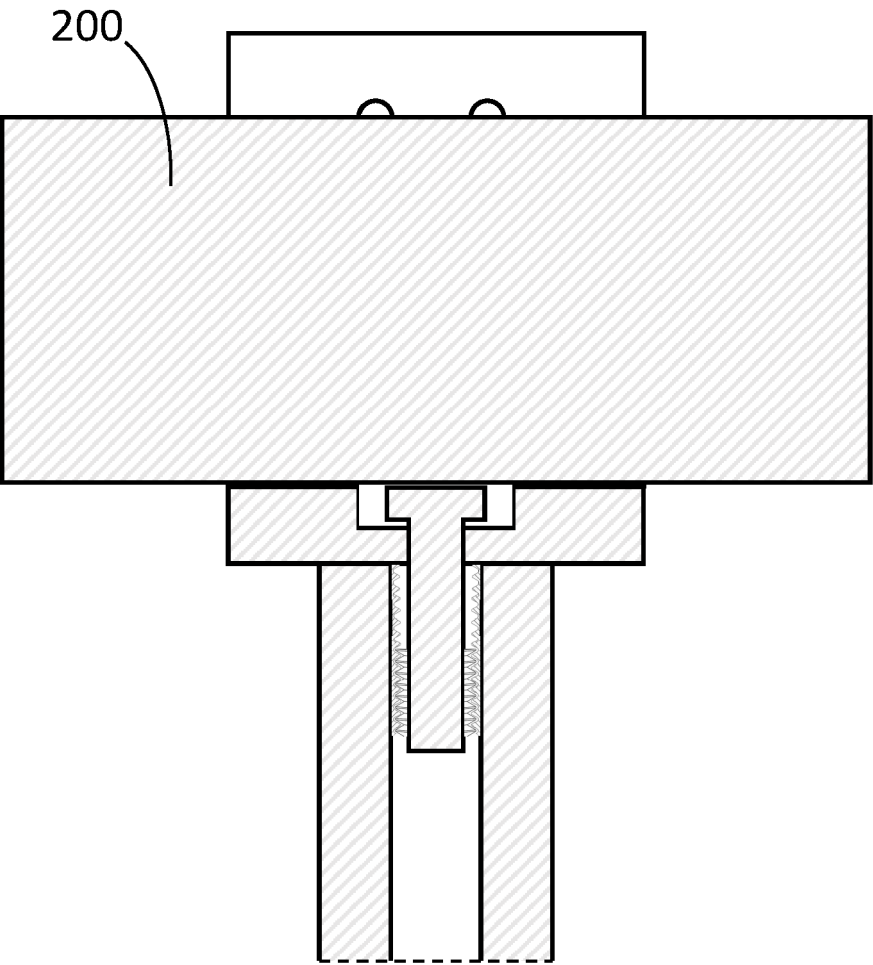


*Fig. 6a*

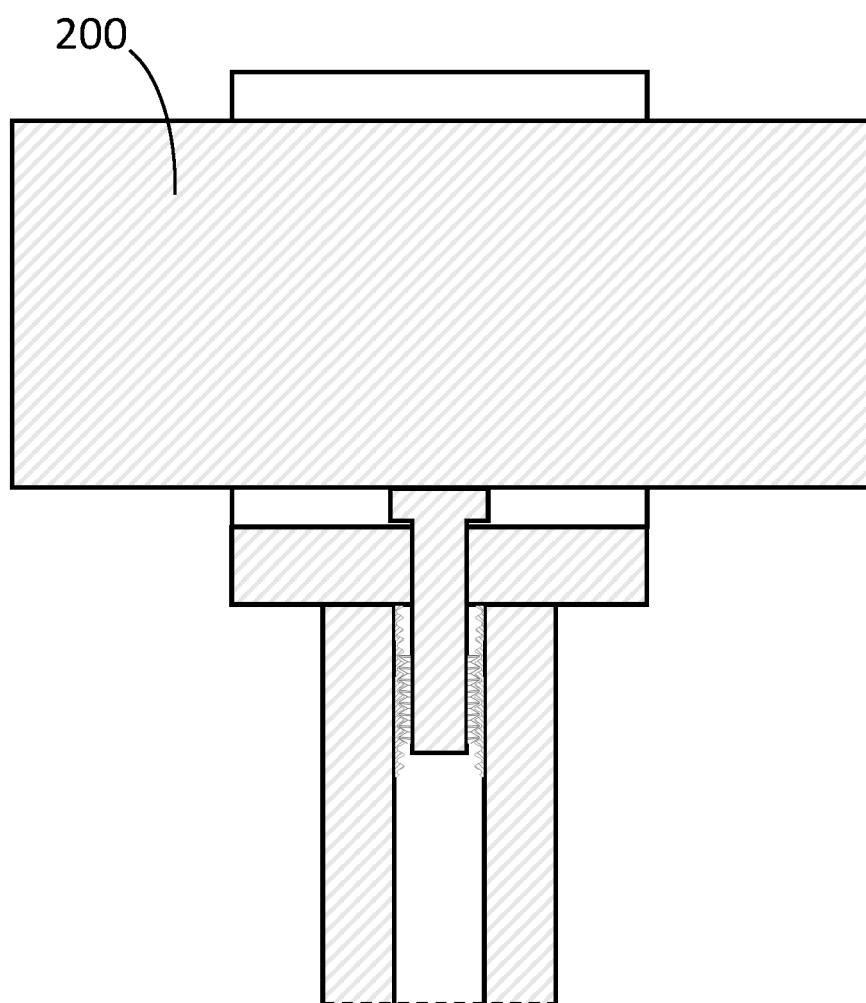
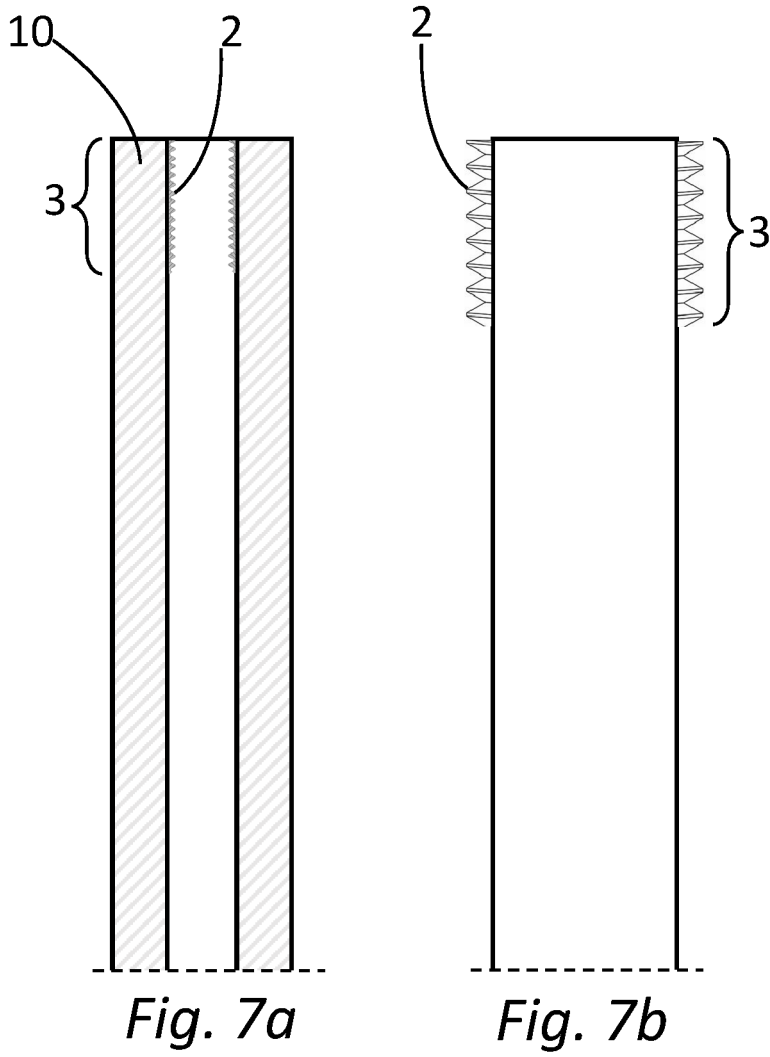
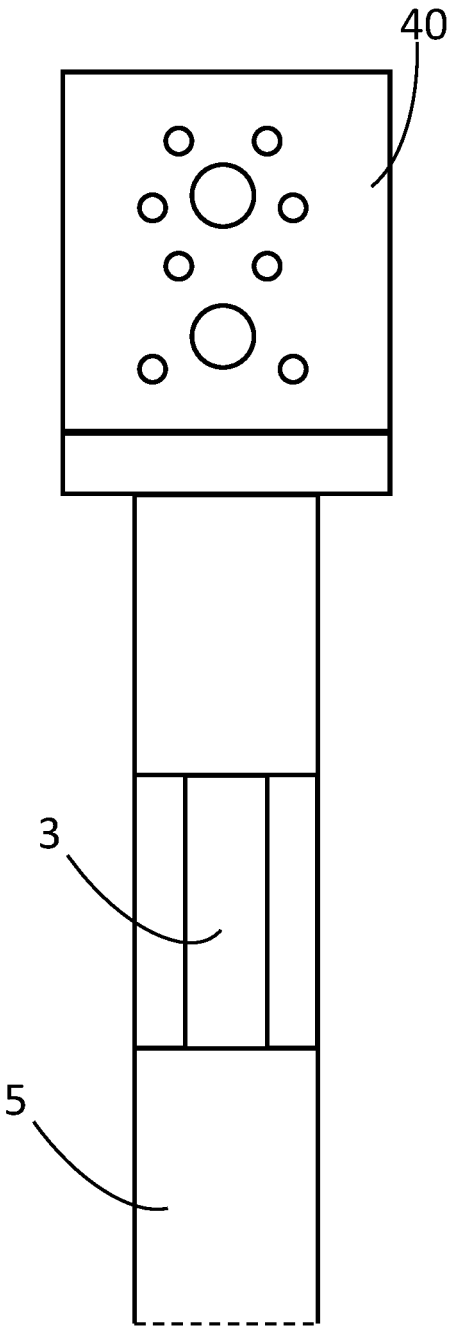
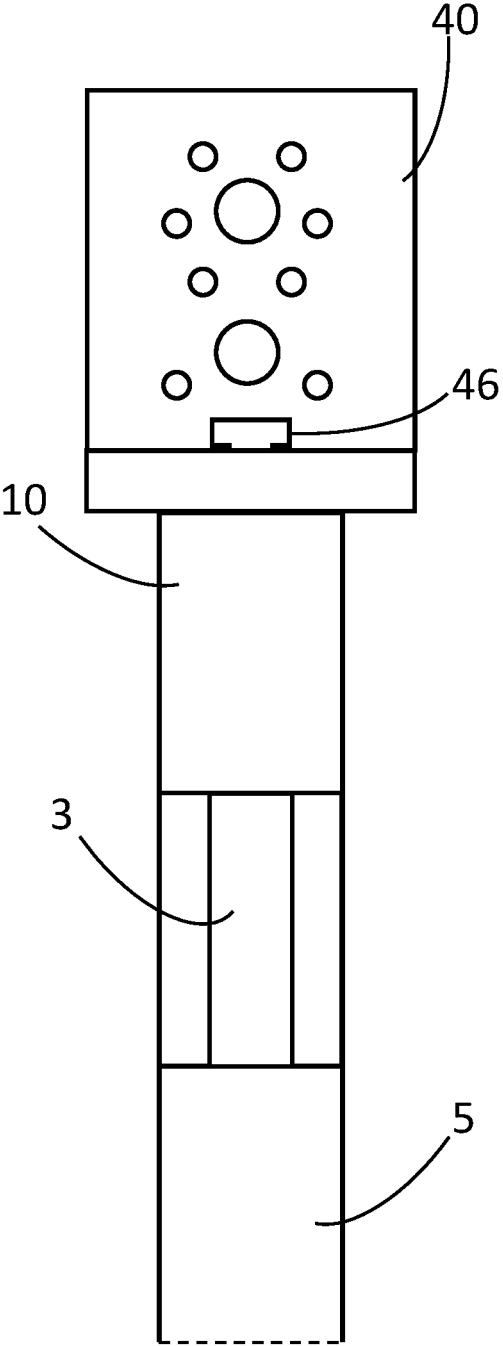


*Fig. 6b*







## EUROPEAN SEARCH REPORT

Application Number

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## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category                                                                                                                                                                                                                | Citation of document with indication, where appropriate, of relevant passages                                                                            | Relevant to claim                                                                                                                                                                                                                                                                     | CLASSIFICATION OF THE APPLICATION (IPC)             |
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| Y                                                                                                                                                                                                                       | KR 102 071 982 B1 (C G ENG & CONSULTING CO LTD [KR]; KEUM KANG CO LTD [KR])<br>31 January 2020 (2020-01-31)<br>* figure 9 *<br>-----                     | 2-5                                                                                                                                                                                                                                                                                   |                                                     |
| Y                                                                                                                                                                                                                       | DE 10 2021 108739 A1 (MAXERIO GMBH [DE])<br>13 October 2022 (2022-10-13)<br>* figures 6, 14 *<br>-----                                                   | 6,11                                                                                                                                                                                                                                                                                  |                                                     |
| A                                                                                                                                                                                                                       | US 9 464 397 B1 (ABRAHAM PHILIP [US])<br>11 October 2016 (2016-10-11)<br>* figure 2c *<br>-----                                                          | 1-13                                                                                                                                                                                                                                                                                  | TECHNICAL FIELDS SEARCHED (IPC)<br><br>E02D<br>E04H |
| The present search report has been drawn up for all claims                                                                                                                                                              |                                                                                                                                                          |                                                                                                                                                                                                                                                                                       |                                                     |
| Place of search<br><b>Munich</b>                                                                                                                                                                                        |                                                                                                                                                          | Date of completion of the search<br><b>17 August 2026</b>                                                                                                                                                                                                                             | Examiner<br><b>Brucksch, Carola</b>                 |
| CATEGORY OF CITED DOCUMENTS                                                                                                                                                                                             |                                                                                                                                                          |                                                                                                                                                                                                                                                                                       |                                                     |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                                                          | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                                     |

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# ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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