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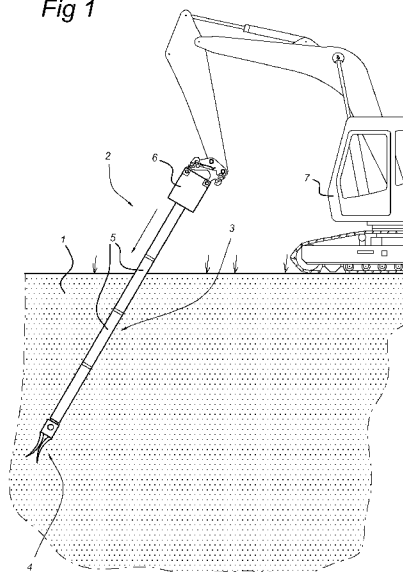
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Fig 1



(57) Abstract: The anchor assembly consists of an anchor rod which is sufficiently strong to be able to withstand the introduction forces of a deployable anchor which is attached thereto. The deployable anchor consists of a number of anchor blades which are hingedly attached to an anchor body and can be locked both in the introduction position and in the anchoring position. Locking takes place by striking against the free end of the anchor rod. The distance between the anchor body and the anchor rod can be altered by means of a rotation of the anchor body and the anchor rod with respect to one another, as a result of which the lock can be released.

Deplogable anchor assembly and method for the fitting thereof

The present invention relates to a deplogable anchor assembly comprising an anchor rod and a deplogable anchor which is attached thereto, wherein said anchor
5 comprises a number of anchor blades, each of which is hingedly attached to an anchor body and is displaceable between an introduction position and an anchoring position.

In the prior art, various kinds of deplogable anchor assemblies are known. An example thereof are structures in which, when the deplogable anchor is loaded in one direction, the blade or the blades thereof are in line with the anchor rod or anchor
10 driver. When a retracting force is applied, the anchor blade or the anchor blades pivot back into a position which is substantially transverse to the anchor rod or anchor driver, as a result of which an anchoring force can be exerted on the respective part of the ground.

With such structures, it is essential to avoid complications as the tilting
15 movement of the anchor blade in principle takes place in an uncontrolled manner.

JP 2002 121735 discloses an anchor assembly in which the anchor blades are hingedly attached to the end of the anchor body. During the introduction of the anchor, the free ends of the anchor blades are directed downwards. When the desired anchoring site is reached, the anchor blades are folded out by means of a rod system, after which
20 anchoring takes place.

US 2 490 465 discloses an anchor in which the anchor blades are also brought from a folded-in position to a folded-out position via a rod system. BE 403 749 discloses an anchor in which the anchor blades are directed upwards during the introduction stage and fold out as a result of a folding movement while exerting a
25 retracting force on the anchor rod.

It is an object of the present invention to provide an anchor assembly in which the anchor blades are displaceable in a controlled manner, that is to say that the anchor blades cannot move out of the introduction position during the introduction stage which would interfere with the introduction of the anchor, and the anchor blades also cannot
30 under any circumstance assume a non-anchored position while they are in the anchored position.

In addition, it is an object of the present invention to ensure minimal disturbance of the ground material at the location where the anchor is fitted. The reason for this is

that if the ground is churned up at the location of the anchor blades, the retaining force of the ground at that location will decrease, thus limiting the anchoring action.

The above-described purposes are achieved by means of a deplogable assembly having the features of Claim 1.

5 According to the present invention, the anchor blades are locked in the introduction position, as a result of which it can always be ensured that the anchor blades (or the anchor blade) are in an optimum position for introduction into the ground, without having to take undue account of the ground conditions. That is to say that, if the anchor blade or the anchor blades are elongate, the longitudinal axis will
10 substantially be in line with the introduction device.

By releasing the lock near the fitting position of the anchor, the anchor blades can be placed in the anchoring position. According to the present invention, such unlocking is achieved by moving the anchor rod with respect to the deplogable anchor. According to a particular embodiment, the deplogable anchor is provided with an anchor body to
15 which the anchor blade or the anchor blades are fitted. By the above-described mutual displacement of the anchor body with respect to the anchor rod, the anchor blades can move freely from the introduction position into an anchoring position. This mutual displacement can, for example, be achieved by pulling on the anchor rod, since during the introduction of the anchor, only pressure is exerted on the anchor rod which is
20 transmitted to the anchor body. When exerting a retracting force on the anchor rod, it is possible that the anchor rod moves away from the anchor body and thus creates space for moving the anchor blades.

In addition, it is possible that spreading of the anchor blades is achieved by moving the anchor body further downwards when the anchor blades are unlocked, as a
25 result of which the anchor blades carry out a scooping movement in the ground, as it were, and thus end up in a spread anchoring position which is then fixed. The ground material is disturbed as little as possible by this scooping movement, so that the retaining force of the ground material is optimal. Since, according to the present invention, the anchor blades are only connected to the anchor body at the hinge and no
30 further operating rods or other rods or the like are present which are displaced in the ground, the disturbance of the ground material can be limited to the greatest extent.

According to the present invention, the displacement of the anchor rod with respect to the anchor body and the deplogable anchor, respectively, is achieved by

means of a rotating movement. Preferably, a screw/nut assembly is present in which a forced mutual displacement is achieved as a result of the rotation of the anchor rod with respect to the deplogable anchor, and the anchor blades are released. Thus, it is possible to ensure in a controlled manner that mutual displacement of the anchor rod and the deplogable anchor and, more specifically the anchor body, is achieved.

According to a particularly simple embodiment of the invention, the deplogable anchor blades are provided with two external blocking surfaces which are arranged at an angle and can cooperate with a locking surface which is arranged at the end of the anchor rod. Preferably, both surfaces are of a flat embodiment and the free end of the anchor rod which comprises a locking surface can be pushed against the respective blocking surface in the locking position. By moving away the anchor rod and thus the locking surface of the respective blocking surface, the anchor blade is free in the movement thereof.

According to the present invention, a displacement is carried out between the anchor rod and the deplogable anchor after the anchor assembly has reached the introduction position. This cancels the unlocking of the blades and the anchor rod and ensures that the anchor blades will fold out when moving further and deeper into the ground. By embodying the ends thereof in such a way that they have a slightly curved shape, such an outward movement can be assisted. Subsequently, the return movement of the anchor rod to the anchor body can be achieved, as a result of which the anchor blades are secured in the folded-out position. This ensures that the anchor blades will not under any circumstance assume an undesired position.

The introduction of the anchor rod with the deplogable anchor can be carried out in any conceivable way. Thus, it is possible to work with a separate driver. It is likewise possible to introduce the relevant parts by means of drilling, striking or in any other way.

It is preferred to introduce the anchor rod with the deplogable anchor into the ground by vibration. In this case, use is preferably made of high-frequency vibration, such as vibration at a frequency of at least 50 – 300 Hz and more particularly at least 100 Hz.

As the anchor rod has to be sufficiently strong to be able to carry out the above-described movement with respect to the anchor body in order to lock and/or unlock the latter, it is possible, according to an advantageous embodiment, to configure the anchor

rod in such a manner that a separate driver is not necessary, as a result of which the introduction load on the deplogable anchor can be applied directly via the anchor rod.

The structure according to the present invention can be introduced completely autonomously, that is to say that it is not necessary to use separate retaining pipes through which, for example, a deplogable anchor is pushed. In particular, such a structure with separate retaining pipes is disadvantageous, as when such a separate retaining pipe is removed in order to enable the anchor to fold out, the anchor rod which remains behind will not be able to absorb any sticking force.

According to an advantageous embodiment, the anchor blades are in scoop form. More particularly, two hingedly attached anchor blades are provided which are convex.

The present invention also relates to a method for introducing a deplogable anchor assembly into the ground, which anchor assembly comprises an anchor rod and a deplogable anchor which is attached thereto and provided with a number of anchor blades, each of which anchor blades is hingedly attached to an anchor body and is displaceable between an introduction position and an anchoring position, wherein during the introduction of said anchor assembly, said anchor blades are in the introduction position, wherein the free ends of the anchor blades are directed downwards, the anchor blades are released from the introduction position when the anchoring site is reached by moving back the anchor rod with respect to the anchor body, wherein when the anchor rod is moved further into the ground, said anchor blades carry out a spreading movement corresponding with the movement in the ground, whereupon the anchoring position is reached and the anchor blades are locked.

Removal can be effected in the same manner as the introduction in the method described above, that is to say by only using a retracting force, (high-frequency) vibration and the like. In the particular embodiment of the invention in which a threaded structure is provided between the anchor body and the anchor rod, the anchor rod will have to be rotated in order to achieve unlocking or relocking, respectively.

The invention will be explained in more detail below with reference to an exemplary embodiment illustrated in the drawing, in which:

Fig. 1 diagrammatically shows the introduction of the deplogable anchor according to the present invention into the ground;

Fig. 2 shows a detailed view of the deplogable anchor in the locked introduction position;

Fig. 3 shows the deplogable anchor from Fig. 2 in the unlocked introduction position;

Fig. 4 shows the deplogable anchor in the unlocked anchoring position;

Fig. 5 shows the deplogable anchor in the locked anchoring position;

5 Figs. 6a-c show the various steps of folding out the anchor blades;

Fig. 7 diagrammatically shows a perspective view of a part of the anchor in the folded-out position; and

Fig. 8 shows the anchoring position in the ground.

In Fig. 1, an anchor assembly according to the present invention is denoted
10 overall by reference numeral 2 and has to be introduced into the ground 1. The deplogable anchor assembly consists of a deplogable anchor 4, details of which will become clear from the following figures, and an anchor rod 3. The anchor rod 3, as shown diagrammatically here, is composed of anchor rod parts, thus making it possible to construct a long anchor rod from the relatively short parts 5. In the illustrated
15 example, a vibrating force is exerted on the free end of the part which protrudes from the ground by means of vibrating device 6. The vibrating device 6 is brought into the desired position by means of a crane or the like. Any other introduction method is likewise possible.

Fig. 2 shows the deplogable anchor in the locked introduction position and Figs.
20 3 and 4 show it in the unlocked introduction position. This is the position which is assumed when the structure consisting of anchor rod 3 and the deplogable anchor 4 is fitted. The deplogable anchor 4 consists of an anchor body 10 to which anchor blades 9 are hingedly attached by means of a hinge 11. It will be understood that it is also possible to position the hingedly attached blades 9 in another manner. In addition, it is
25 also possible to use more or fewer than two anchor blades 9. The anchor body 10 is provided with a threaded part 12 which can be moved into internal screw thread 13 at the end 8 of the anchor rod 3 by screwing. This screw thread is preferably a Gewi screw thread, that is to say a screw thread which extends over only a part of the periphery of the respective part, as a result of which the threaded part is prevented from
30 getting stuck and becoming dirty as much as possible.

The end 8 of the anchor rod 3 is provided with a locking surface 15 which is flat in the illustrated example.

Each anchor blade 9 has two blocking surfaces which are denoted by reference numerals 16 and 17. In the illustrated exemplary embodiment, the distance between the free end 8 and the anchor blades 9 is denoted by reference numeral 1.

5 In the position illustrated in Fig. 2, the blocking surface 16 will bear against the locking surface 15. That is to say that during the introduction of the anchor rod 3, the force acting on the anchor blades 9 which attempt to spread these in the direction of the arrows 14, will have no effect since the free ends of the anchor blades 9 cannot be moved apart as a result of the lock at the surfaces 15/16.

When the desired position has been reached, the driving force on the anchor rod 10 3, such as a vibrating force, ceases and the anchor rod is subjected to a rotating movement in the sense that it is "unscrewed". Due to the screw thread 12 and the internal screw thread 13, the anchor rod moves away from the anchor body, resulting in the position shown in Fig. 3 with a distance 1 between the surface 16 and the surface 15. Starting from such position, a further driving force is exerted on the anchor rod 3, as is 15 shown in Fig. 3. As the anchor blades 9 are now no longer obstructed in their movement in the direction of arrow 14 in the earlier figures, they will fold out as shown diagrammatically in Fig. 4. However, this position is not safe since the anchor blades 9 will move back again when a retracting force is exerted on the anchor rod.

This can be prevented by screwing the anchor rod down again onto the anchor 20 body after the anchor blades 9 have reached the desired anchoring position, resulting in the position shown in Fig. 5. In this position 5, blocking surface 17 bears against locking surface 15, as a result of which the anchor blades cannot move with respect to the anchor body and thus with respect to the anchor rod when a retracting force (or pressure force) is applied to the anchor rod. In this way, an accurately controlled 25 displacement of the anchor blades is achieved.

Figs. 6a-c shows the unfolding of the anchor blades.

Fig. 6a shows the position where the anchor blades 9 are unlocked when the 30 desired position is reached, that is to say the position in Fig. 3. Then, anchor rod 3 is moved further into the ground. Due to the "scoop-like" shape of the blades 9 which can now rotate freely about hinge 11, these will now spread sideways as a result of the resistance they meet from the ground, that is to say they will carry out an outwardly directed scooping movement, as is indicated by the arrows 14. This leads to as little

disturbance of the ground material as possible and optimum absorption of anchoring forces.

Fig. 7 represents the anchor 4 in the folded-out position, which shows further details of the two hinged anchor blades 9.

5 As soon as the position in Fig. 6c is reached, the position of the anchor blades with respect to the remainder of the anchor is fixed by means of the above-described screwing movement.

The figures show that only the anchor blades move in the ground material and that no other structural parts are present.

10 In the present exemplary embodiment, the anchor rod is also used as a driver, that is to say the forces used to drive the anchor into the ground are passed through the anchor rod. As a result thereof, when, with the appropriate ground, a retracting force on the anchor rod develops, the latter will be able to absorb part of said retracting force by sticking.

15 Upon reading the above description, those skilled in the prior art will immediately be able to think of variants which are obvious in view of the above and which are covered by the scope of the attached claims. The described anchor can be of any dimension, depending on the intended use.

Claims

1. Deplogable anchor assembly (2) comprising an anchor rod (3) and a deplogable
5 anchor (4) which is attached thereto, wherein said anchor (4) comprises a number
of anchor blades (9), each of which is attached to an anchor body (10) by means of
a hinge (11) and is displaceable between an introduction position and an anchoring
position, wherein a lock is present for locking said anchor blades in the introduction
position, and for unlocking in order to move them into said anchoring position,
10 wherein said lock is operated by varying the distance of the anchor rod (3) to the
anchor body (10), characterized in that said anchor blades (9) are only connected to
the remainder of said anchor assembly (2) by said hinge (11) and in that said lock
acts on said hinge (11).
- 15 2. Assembly according to Claim 1, wherein a screw/nut assembly (12, 13) is present
between said anchor body (10) and said anchor rod (3) and the mutual distance
thereof is varied by rotating said anchor rod (3) with respect to said anchor body
(10).
- 20 3. Assembly according to Claim 2, wherein said screw thread extends over only a part
of the periphery of the screw or nut, respectively.
4. Assembly according to one of the preceding claims, wherein the end (8) of said
anchor rod comprises a locking surface (15).
- 25 5. Assembly according to one of the preceding claims, wherein said anchor blade
comprises two blocking surfaces (16, 17) arranged at different angles.
6. Assembly according to Claim 4 and 5, wherein said locking surface (15) and said
30 blocking surfaces (16, 17) cooperate.
7. Assembly according to one of the preceding claims, wherein said anchor blades are
scoop shaped.

8. Method for introducing a deplogable anchor assembly (2) into the ground (1), which anchor assembly comprises an anchor rod (3) and a deplogable anchor (4) which is attached thereto and provided with a number of anchor blades (9), each of which anchor blades (9) is hingedly attached to an anchor body (10) and is
5 displaceable between an introduction position and an anchoring position, wherein during the introduction of said anchor assembly, said anchor blades are in the introduction position, wherein the free ends of the anchor blades are directed downwards, the anchor blades are released from the introduction position when the anchoring site is reached by moving back the anchor rod with respect to the anchor
10 body, characterized in that when the anchor rod is moved further into the ground, said anchor blades carry out a spreading movement corresponding with the movement in the ground, whereupon the anchoring position is reached and the anchor blades are locked.
- 15 9. Method according to Claim 7, wherein said retraction comprises screwing said anchor rod off an anchor body (10), wherein said anchor blades (9) are hingedly attached to said anchor body.
- 20 10. Method according to one of Claims 8 or 9, wherein said introduction comprises vibration.
11. Method according to Claim 10, wherein said vibration comprises vibration at a frequency of at least 100 Hz.
- 25 12. Method according to one of Claims 8-11, wherein said removal comprises vibration.
13. Method according to one of Claims 8-12, wherein the driving force is applied to the anchor via said anchor rod during the introduction.

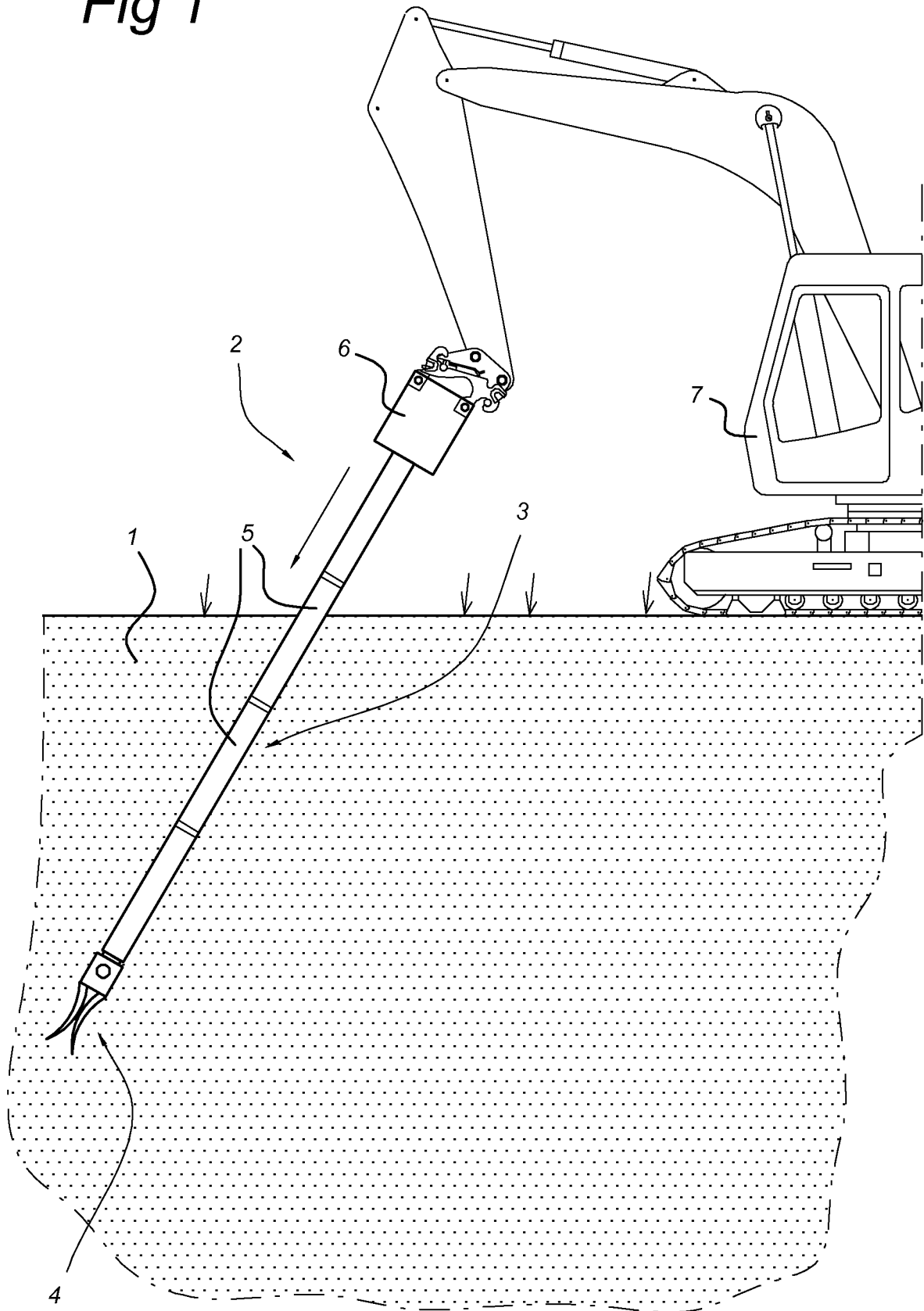
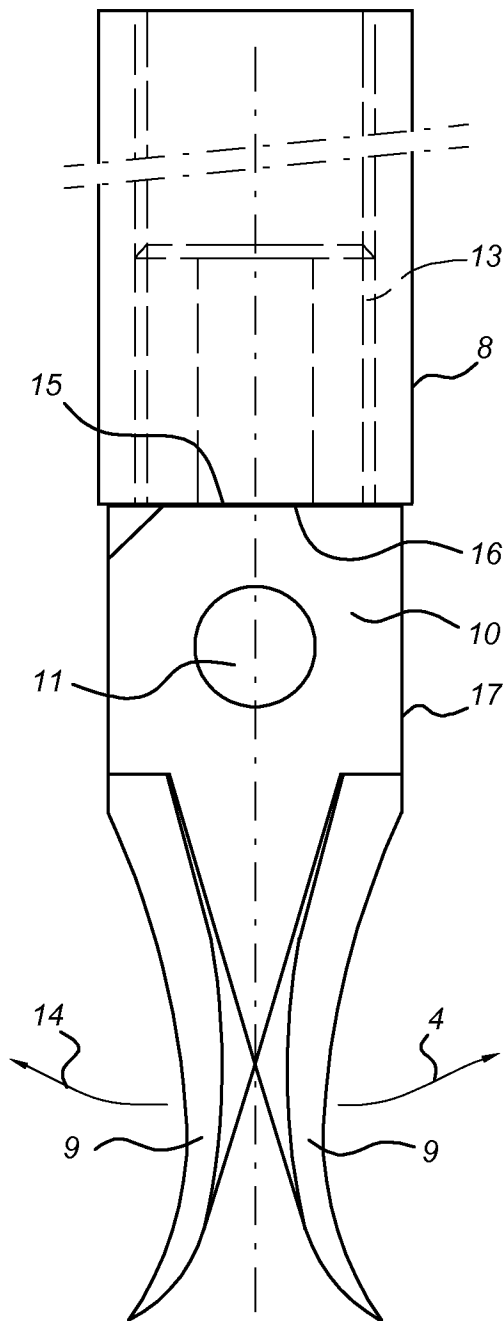
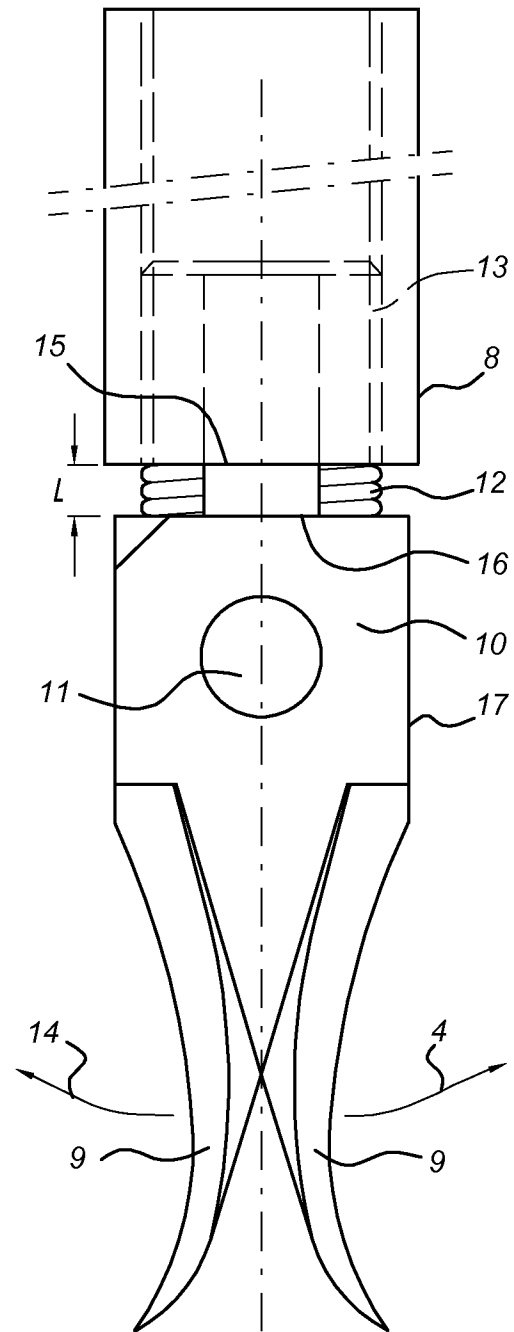
Fig 1

Fig 2*Fig 3*

3/6

Fig 4

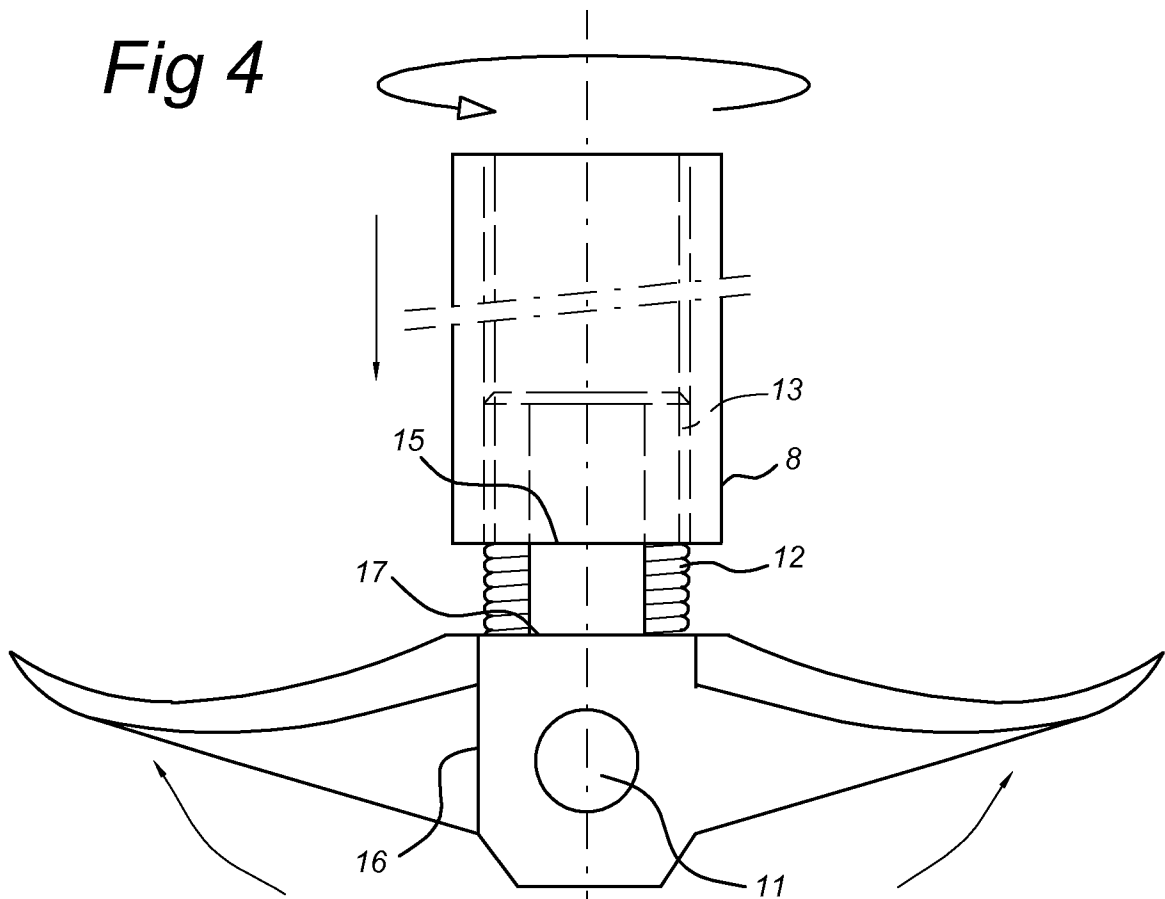


Fig 5

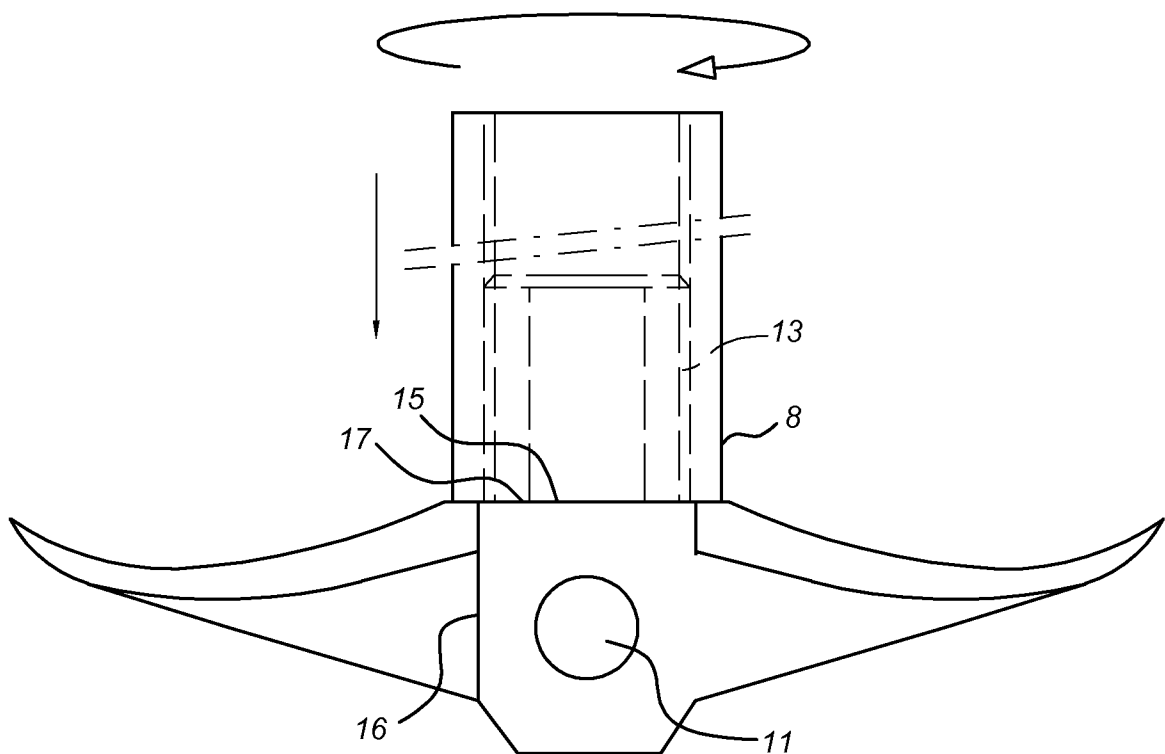


Fig 6a

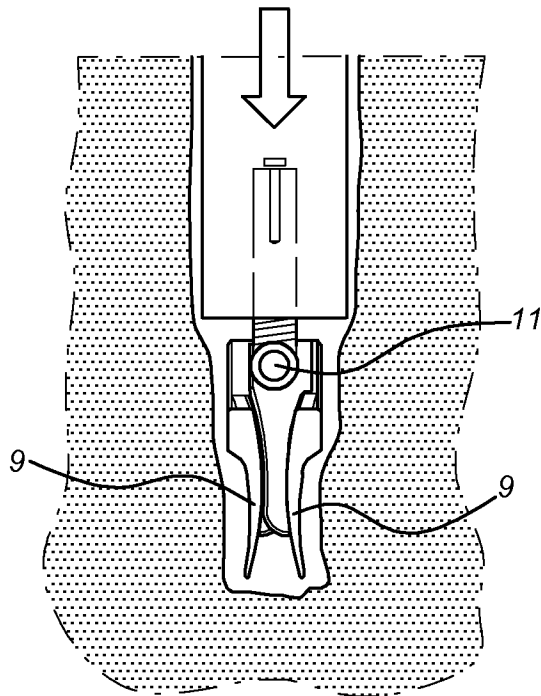


Fig 6b

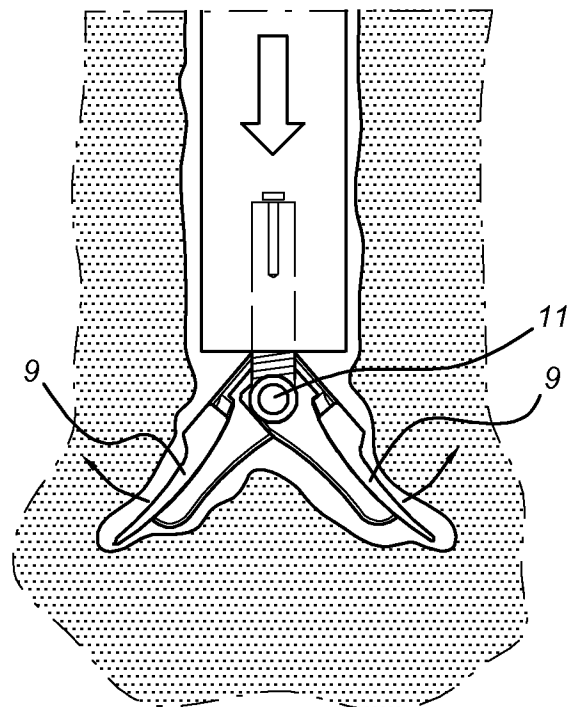


Fig 6c

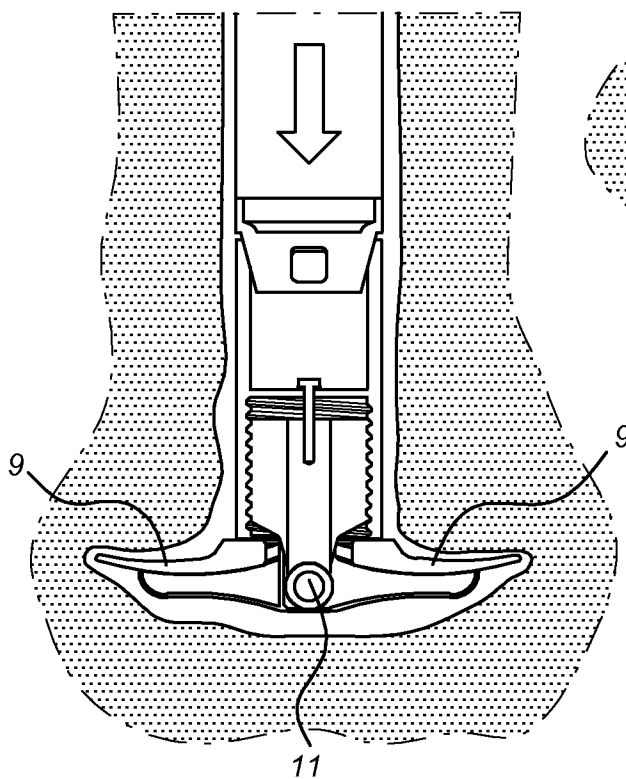


Fig 7

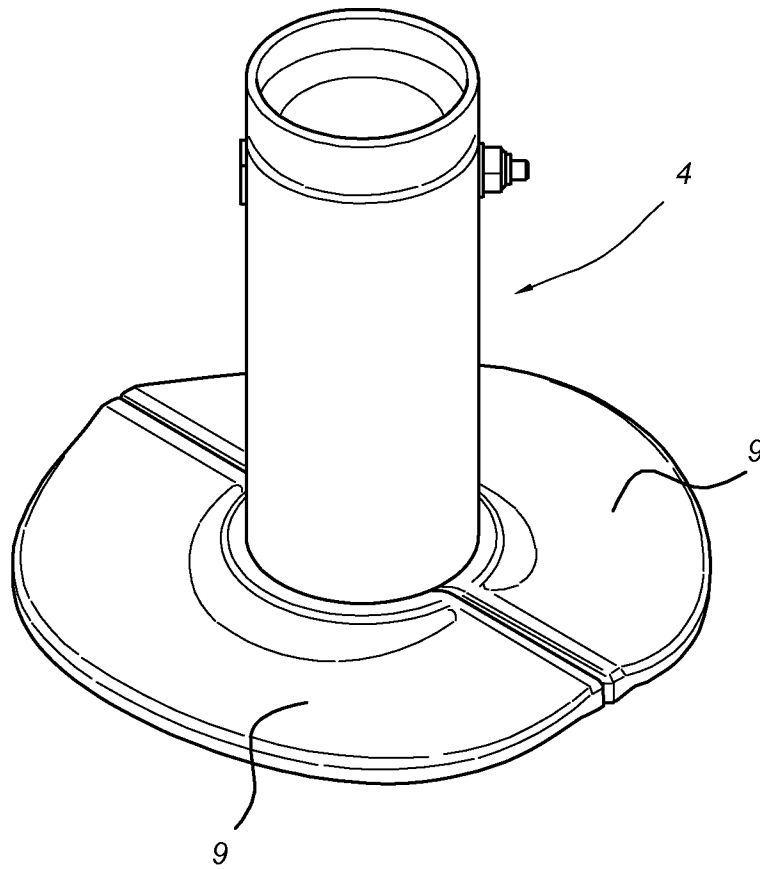


Fig 8